Refinement and Expansion of the Harvard Resource-Based Relative Value Scale: The Second Phase

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Abstract: The Harvard resource-based relative value scale (RBRVS) for physician services has assumed a critical role in physician payment reform. We have demonstrated that the relative resource costs of providing physician services can be defined and measured in a rational and systematic way and that the results are reliable and valid. Consequently, the RBRVS is a viable basis for national payment policy and could be used for establishing a national fee schedule for physician services or to identify "mispriced" physician procedures. Since the release of the final report of the first phase of the Harvard RBRVS study in September of 1988, there has been extensive review, discussion, and criticism of the RBRVS. Dr. Laurence F. McMahon, Jr., in the accompanying article, provides a further critique of our research. In this paper, we review the RBRVS study and results and respond to the major criticisms that have been raised by Dr. McMahon and others. We then describe the tasks we are currently undertaking to expand and validate our research and address the important criticisms and limitations. (*Am J Public Health* 1990; 80:799–803.)

Introduction

The Harvard resource-based relative value scale (RBRVS) study, funded by the Health Care Financing Administration (HCFA) and others, has shown that the relative resource costs of physician services can be measured in a rational and systematic way and that the results are reliable and valid. Currently, the Secretary of Health and Human Services (HHS), the Physician Payment Review Commission (PPRC), and the American Medical Association (AMA) have all supported legislation to adopt the RBRVS as a basis for Medicare physician payment and this legislation is being considered by Congress.

The RBRVS provides a very different alternative to the prevailing charge-based system in establishing the levels of physician payment. It bases payment on the relative resource-input costs physicians incur in their work. As such, the RBRVS would change the economic incentive structure to physicians, and thus may affect the cost, quality, and access of medical services. Consequently, the Harvard RBRVS study has been widely reviewed, discussed, and criticized.

Dr. McMahon's paper, in this issue of the *American Journal of Public Health*,[1] represents an example of the criticisms that have been raised about our study. In this paper, we respond to McMahon's criticisms and other concerns that have been raised. In doing so, we provide an overview of our current research activities that are underway to address the shortcomings and limitations of our first phase work. This paper will provide the health care community with a better understanding of the RBRVS and provide a broader overview of how the criticisms are being addressed and the refinement we are making to the RBRVS.

We begin by first restating the scope and objectives of the RBRVS research and discuss the major findings to date. Next, we summarize the critical reviews of our study and note the major criticisms, including those of McMahon. We then discuss the second phase of our work, noting the tasks undertaken to expand the scope of our study and address its limitations. Finally, we summarize some remaining issues that need to be addressed.

Overview of the RBRVS Study

The RBRVS study was designed to develop an alternative method of compensating physician services based on the relative resource input costs required in performing them. As the PPRC noted in its second annual report to Congress reviewing our work, a RBRVS approach is desirable because it reflects estimates of what the relative costs of efficient physicians would be if a perfectly competitive market functioned in the medical environment.[2]

We began with a systematic exploration of the factors that physicians identify as constituting their work input and other resource costs. We then developed methods to measure these components of resource costs. A detailed description of our methods, data, and results has been published elsewhere,[3] but the major aspects of our work include the following steps:

- To measure physicians' resource-input costs, we developed a model that defines resource inputs to physicians' services as: 1) the work expended by the physician on particular services, encompassing time spent before, during, and after the service, and the intensity with which that time is spent; 2) the practice costs necessary to supply the service; and 3) the opportunity cost of training, which represents the income forgone when physicians pursue additional years of training to be a qualified specialist. These three factors are combined in a multiplicative model to produce the resource-based relative value of a given medical service.
- In the first phase of the RBRVS study, we estimated the total work for more than 400 services using a national survey of approximately 3,000 physicians in 18 specialties. Using the technique of magnitude estimation,[4] we gathered information on the work, time, and the intensity of the time required during the performance of selected services in each specialty. The work before and after a given service — pre- and post-service work—were also calculated from the survey data.

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- Since each specialty rated work using a different scale, it was necessary to link the relative value scales of different specialties. To do this, we first asked physicians in the 18 specialties to identify pairs of surveyed services that had the same or equivalent amounts of work in their respective specialties. We then used these services to align specialty-specific ratings of work onto a common scale.
- Because we were unable to survey physicians directly on all 7,000 Medicare billing codes, we needed to extrapolate the work values of surveyed services to non-surveyed services. To do so, we identified small homogenous families of services and assumed that charges within these families bore a reasonable relationship to the relative work within such families. From each family, we selected a benchmark service whose total work was available from the national survey. After calculating the ratio of charges between this service and non-surveyed services in the same family, we extrapolated work values by multiplying that of the benchmark service by these charged-based ratios for the non-surveyed services.[5–15]

RBRVS Study Findings

Our investigation led to several major technical and substantive findings.[16] Technically, we found that physicians' work can be defined by a systematic and rational approach and measured using the magnitude-estimation method. The measurements of work were found to be both reliable and valid. There is a high degree of agreement among physicians on how much work is required in performing each of the selected services studied. Review by practicing physicians found, in general, the ratings to be reasonable and to conform to the reality they had experienced in clinical practice.

We also found that a common scale can be developed to serve as a basis for inter-specialty relative values: cross-specialty alignment. Further, we found it feasible to develop an RBRVS for most of the common services and procedures without having to study each of the 7,000 uniquely coded services in Medicare's payment system.

The major substantive finding from the first phase of the RBRVS study is that current physician charges are not closely related to resource costs. Relative to resource costs, evaluation and management services are compensated at a lower rate than invasive, imaging, and laboratory services. Roughly speaking, evaluation and management services are compensated two to three times less than the rate of invasive services. This finding holds true whether evaluation and management services are performed by surgeons, internists, or family practitioners.

Scientific Review of the RBRVS Study

There have been substantial review, discussion, and criticism of the methods, results, and limitations of the first phase of the RBRVS study. First, over 100 physicians from the different specialty panels involved in all phases of the study have commented on the reasonableness and validity of our methods and results. Second, 11 nationally renowned experts in medicine, statistics, economics, and survey methods reviewed our preliminary results while the study was still in progress and presented their findings at the National Consultative Conference of the RBRVS, which included prominent and respected representatives of many interests — medicine, government, health-services research, third party payers, consumers, business, and unions.[17] Third, 11 papers describing the study's approach and findings were subjected to peer review by professional journals. Fourth, detailed reviews were undertaken by three organizations serving significant roles in physician payment reform: PPRC, AMA, and HCFA. Finally, extensive reviews were undertaken by many specialty societies and organizations with interest in physician payment reform.

The reviews by PPRC, HCFA, and the AMA represent perhaps the most definitive and exhaustive analyses. In general, the reviews and analyses of these three organizations have supported our methods and findings. The PPRC concluded ". . . that the basic methodology of the study is sound," and ". . . the study's estimates of physician time and effort should be used as the initial basis for the physician work component of the RVS [relative value scale] in the Medicare Fee Schedule."[18] Similarly, HCFA determined ". . . that it is possible to use physician resource inputs to establish RVSs [relative value scales] with specialties and demonstrates that it is possible to align these specialty-specific scales to create a common scale of relative values that are meaningful across specialties."[19] Finally, the AMA concluded ". . . that the current Harvard RBRVS study and data, when sufficiently expanded, corrected, and refined, would provide an acceptable basis for a Medicare indemnity payment system."[20]

However, as might be expected with any research effort that undertakes a task as formidable and complex as developing an alternative method of paying physicians, these reviewers have raised a number of concerns about our research and identified a number of unresolved issues that require further analysis and refinement. We have also discussed many of these concerns in our final report and articles.

Concerns Raised about the RBRVS Study

The limitations identified in the first phase of our work span the breadth of our research, including: the scope of our study, our conceptual and theoretical approach, validation of the results of the RBRVS, and factors that may affect physician resource-inputs which we did not measure. The specific concerns raised by McMahon in his critique include: selection and development of the vignettes used in our survey work; sampling of physicians for our survey; cross-specialty linkage; estimation of pre- and post-service work; extrapolation of surveyed results of work to non-surveyed services; measurement of practice and opportunity costs; potential impacts of the RBRVS; and limitations of the RBRVS approach related to outcome assessment, the skills and qualification of the physicians sampled, and the lack of severity indicators.

Many of these criticisms warrant further investigation. We address many of the major concerns in the next section in a review of our second phase research. Additional limitations of the RBRVS approach which we were unable to deal with are discussed in the Limitations section. In the remainder of this section, we respond to a number of specific issues raised by McMahon that are unwarranted, and, where necessary, correct inaccuracies.

First, McMahon asserts that the RBRVS research effort in phase one involved numerous approximations, assumptions, and compromises and that the implications of these approaches must be fully assessed. We would agree with these generalizations. However, the RBRVS is a broad and complex undertaking which has many parts. The question is not whether we did a perfect job because there is no "gold standard" by which the final resource-based relative values (RBRVS) can be definitively judged. The issue is whether our

work will stand the scrutiny of formal scientific review by credible reviewers and whether it conforms to the experience of practicing physicians. Extensive review identified several portions of our work which require refinement and further validation. However, the basic RBRVS method of measuring physician work and developing a common scale of the resource-based relative values across all specialties was judged to be sound. In general, review by practicing physicians found the results to be reasonable and to conform to the reality they experienced in their clinical practices.

Second, many of McMahon's comments on our methodology and data are inaccurate and misleading. On issues such as the response rate for services included in our national survey, number of physicians represented on panels, and number of services surveyed in a specialty, he misses several important points. For example, consider McMahon's concern that physicians who responded to the survey did not provide ratings for all the services in their specialty. First, interviewers were instructed to inform physicians who did not perform a service or did not feel comfortable giving an estimate of the work involved to refrain from doing so. Second, we did not expect physicians to rate all surveyed services because part of our research design was to include some new and emerging services in each specialty. Third, the example used by McMahon—the case of the low response rate for a fibroscopic examination surveyed in allergy and immunology—is unrepresentative of our general results. On average, physicians surveyed provided ratings for more than 90 percent of the services on the survey. Thus, for several reasons, low response rates for some services reflect the responses of physicians most familiar with these services and were to be expected.

A similar misrepresentation occurs when McMahon notes that the fibroscopic examination serves as a cross-specialty link and implies that the low response rate for the procedure biases cross-specialty linkage. McMahon fails to note that an average of seven cross-specialty links were used between pairs of specialties. The minimum number of links for any particular specialty was four. The average response rate by physicians for services used as cross-specialty links was 95 percent. We found a high level of agreement between the ratings of work for link procedures in the cross-specialty process and that these results did not vary by response rate. Moreover, our final report included extensive analysis of all 133 cross-specialty linked services showing that the common scale is not sensitive to individual links.

Third, some of McMahon's concerns relate to limitations we uncovered in our analysis of the CPT-4 coding system used by physicians and shortcomings in other data sources used in our study. For example, McMahon described the problems we encountered in extrapolating the work of surveyed evaluation and management services in the CPT-4 codes to non-surveyed services. We have learned that problems with extrapolation of these services stem primarily from differences in specialty usage of the CPT-4 coding system rather than from our extrapolation approach. Our findings on the lack of specificity of the definitions for the CPT-4 codes for evaluation and management services and our proposal to refine these definitions and construct an RBRVS for these codes is an important implication of the first phase[21] which has been confirmed and accepted by others, including the PPRC.

Fourth, in terms of McMahon's concerns about the scope of our research, the first phase covered, by design, only 18 medical and surgical specialties. Although these specialties represent the large majority of Medicare's physician payments, many important specialties were omitted. Clearly, before any comprehensive fee schedule can be implemented, the services of all specialties must be incorporated into the RBRVS. Similarly, for some of those specialties studied in the first phase, it was feasible to study only a subset of the services these specialties perform. Therefore, for selected specialties, the RBRVS for important services were not developed. As we discuss below, we are studying the additional specialties and services in the second phase of the RBRVS study.

Finally, McMahon implies that HCFA and Harvard's work on RBRVS were a result of the PPRC's recommendation for a resource-based fee schedule. In fact, our work on RBRVS began in 1978[22] and HCFA's grant solicitation occurred several years prior to PPRC's 1988 recommendations.

The Refinement and Expansion of the RBRVS

Our second phase research on the RBRVS was undertaken with the objective of addressing the major limitations and shortcomings identified from the first phase of our study.

Survey of New Specialties and Further Study of Selected First-Phase Specialties

We are expanding the scope of the RBRVS study in the second phase of our research to include 15 additional medical and surgical specialties. These specialties are: cardiology, emergency medicine, gastroenterology, hematology, oncology, infectious disease, nephrology, neurology, neurosurgery, nuclear medicine, osteopathic medicine, physical and rehabilitative medicine, plastic surgery, pulmonary medicine, and radiation oncology.

Besides these 15 specialties, we are further studying seven specialties that were included in the first phase. These specialties are dermatology, general surgery, internal medicine, ophthalmology, orthopedic surgery, pathology, and psychiatry. Additional study of these specialties will increase substantially the number of services covered by the RBRVS. In addition, for some of these specialties, concerns were raised about the methods and results used in phase one. Further study for these specialties will address these concerns.

The Measurement of Pre- and Post-Service Work

Pre- and post-service work comprises a large part of the total work for each service. In the first phase, we found pre- and post-service work to represent close to 50 percent of the total work of a typical invasive service, and 33 percent of that for a typical evaluation and management service.

Reviewers have characterized our first phase approach to measuring pre- and post-service work as involving insufficient data for work and time, numerous assumptions, and a lack of validation of the work and time estimates. Benefitting from these comments and the knowledge we gained from the results of the first phase, we are expanding our efforts to obtain pre- and post-service work and time data in the second phase and are also investigating different methods of measuring this work and time.

In the second phase, we again plan to use surveys as an important method to gather data for pre-, intra-, and post-service work and time. However, we will: 1) increase the number of services for which we obtain surveyed estimates of pre- and post-service work and time; 2) conduct pilot studies of different methods of surveying pre- and post-

service work and time for evaluation and management services; and 3) explore different approaches to validate the estimated values obtained from surveys including the use of objective data bases for these times.

We plan to collect new and more comprehensive primary data on the pre- and post-service work and time through surveys. We will again use different survey methods for evaluation and management, invasive, imaging, and laboratory services in different settings.

The nature and characteristics of evaluation and management pre- and post-service work make its measurement a difficult task, as we experienced in the first phase. While the pre- and post-invasive service work is comprised primarily of discrete and identifiable physician services, such as an admission work-up or pre- and post-operative hospital visits, the pre- and post-service work of evaluation and management is often fragmented and intermingled with other activities. In the second phase, we will conduct pilot studies of different methods of surveying the pre- and post-service work and time for evaluation and management services. One approach we will explore is to ask physicians to estimate the work and time of the *total* service, including the pre-, intra- and post- service periods. Another method we will investigate is to ask physicians to estimate the pre- and post-service work as a percent of total-service work.

We believe that the importance and nature of pre- and post-service work requires a validation of estimates obtained through surveys. In the second phase, we are exploring different ways to validate our survey estimates. First, for evaluation and management services, we plan to collect and use aggregate time data to validate the results for individual services. For example, we will survey physicians and ask them how many hours they spent on pre-, intra-, and post-service work during a typical week and compare these results with our individual survey estimates. Second, we will investigate the use of physician time logs and the results of time studies conducted by HMOs (health maintenance organizations) as a means to validate the survey results. Third, to validate post-surgical service work estimates, we plan to explore the use of data on hospital length of stay.

Cross-Specialty Alignment

A critical component of the RBRVS study is the method placing the different specialties on a common scale: cross-specialty alignment. The RBRVS has been criticized for not having chosen adequate cross-specialty linking services for all specialties. In addition, others have commented that we need to further validate our results and perform additional sensitivity analyses. In this phase of the project, we propose to develop several new methods for selecting cross-specialty links and validating the results.

First, as in the phase one, we will again establish a cross-specialty panel composed of representatives of all the specialties surveyed in the second phase. Similar to the first phase, these panelists will choose pairs of services performed in different specialties which are equivalent in work. These cross-specialty links will serve as a basis of establishing an RBRVS on a common scale. We will increase our efforts to expand the number of links between specialties.

Second, we will establish separate panels of salaried physicians to develop independent sets of cross-specialty links. Salaried physicians may be less influenced by direct economic interests and the current charge patterns in identifying links. We will establish two sets of cross-specialty panels of these salaried physicians in different parts of the United States. Both panels will go through a process similar to the regular cross-specialty panel in developing independent lists of cross-specialty links. We will compare the results of all three salaried physician panels to evaluate the reliability of the methodology.

A third method we are exploring is the use of selected groups of "double-boarded" physicians. Nearly 14,000 physicians are board-certified in two or more specialties.[23] These physicians might be able to provide direct ratings of work and time for services performed in their respective specialties, and thus provide data across specialties without going through a linking process.

Extrapolation

Criticism of our extrapolation approach in phase one has focused on the scope of services covered by extrapolation and the validation on the results of this process. Our efforts in the second phase will address both of these criticisms.

In phase one, we employed, with small modifications, the Current Procedural Terminology (CPT-4) classification system as the basis for identifying families of services for extrapolation. To date, we have been conservative in our use of the CPT-4 classification scheme to extrapolate the study data in that we have used the most refined categories of services defined within CPT-4. Generally, when defined in this manner, the families are relatively small; on average, each contains less than 10 services. In using this conservative approach, we ensured that we would have maximum homogeneity within families of services, but we also limited the scope of the extrapolation. Since we can survey only a limited number of services, many of the small, CPT-defined families did not contain a surveyed service. Hence, we did not produce RBRVS for these families. While our method produced extrapolated values for CPT-4 codes that encompassed about 80 percent of Medicare's allowed charges, values were produced for a far smaller proportion of total codes, since many of the CPT-4 codes are used infrequently.

During the second phase, we will expand the scope of the extrapolation to a larger number of codes; our target is 95 percent of the charges. Our approach to this task will involve obtaining an increased number of work estimates from the national survey of the new second phase specialties and the seven specialties we are studying further from the first phase. In addition, expanding the scope of extrapolation will involve further conceptual development of the methodology for identifying extrapolation families, data analysis, and expert judgment.

Our second major objective in the second phase will be to validate the results of the extrapolation. We will employ several approaches, including: 1) expansion of the number of directly surveyed services within each family; 2) obtaining procedure times and using these as a potential basis for validation; and 3) use of physician panels.

Alternative Methods of Developing Relative Values

One potential need of any new payment system is the ability to update and add relative values for new services in a timely and inexpensive manner. In contrast, we have found the process of resurveying and analyzing specialties to be time-consuming and costly. In this phase, we are exploring the possibility of using physician panels as a simpler and less expensive alternative for developing and updating relative values. We will explore this process by using a panel of general surgeons. This would involve a modified Delphi method to obtain an "agreed" value of work for each service. This group consensus process will be conducted parallel, but

independently of the survey process. Thus, we will be able to compare the results obtained from two different methods and evaluate how closely they agree.

Limitations

The RBRVS has its limitations. This approach does not attempt to measure all the attributes of medical services. First, we consider inputs to services and not the outputs, notably health outcomes. The underlying construct of our work is that measuring resource inputs provides a proper basis for estimating prices in a perfectly competitive market. Further, these benefits are very difficult to measure: most medical services affect quality rather than length of life, and methods for measuring the quality of life remain primitive and highly controversial. The current state of the art does not permit inclusion of outcomes or benefits in an RBRVS.

With respect to the inputs, our work to date does not take into account all the elements of the work input. For example, the RBRVS does not take into account the quality of services. It is currently unfeasible to differentiate the quality of the 500,000 physicians practicing in the United States. Nonetheless, the RBRVS could incorporate a quality index when accurate physician-specific information does become available. Years of experience or certification by a specialty board have been suggested as crude proxies for quality. We had neither the time nor the budget to investigate these possibilities and thus omitted a quality adjustment from the RBRVS.

Further, the RBRVS are based on the CPT-4 classification system. Any classification system encompasses some variation within its classes; in this case, the severity of patients conditions within a given CPT-4 code may differ systematically from one physician to another. Our study does not take into account such possible systematic differences in patients' severity. This shortcoming is generic to any payment system using a uniform fee schedule.

Finally, the RBRVS does not take into account patients' demand for services. In a reasonable competitive market, fees for physicians' services would be driven down by competition to the resource costs required to produce these services. Services whose costs exceed patients' willingness to pay would not be demanded by patients. While RBRVS may reasonably represent the relative costs of different services, RBRVS-based payment rates for some services could exceed patients' valuation of them. This problem has to be considered if the RBRVS is ultimately used to pay physician services.

Summary Comments

Distortions in the prices of physician services have been blamed for creating undesirable incentives in the health care system that are at the root of many of its problems. In light of these problems, alternatives methods of valuing physician services need to be developed and implemented. In this article, we have reviewed our previous work on the resource-based relative value scale and our current efforts to expand, refine and further validate the methods and result.

It should be noted, however, that our work is but one aspect of a comprehensive package of recommendations and proposals being developed for Congress by the PPRC and HCFA. In general, these proposals deal with all aspects of Medicare physician payment policy: prices, the volume and intensity of services, the quality and effectiveness of services, and access of care. Given the far-reaching implications of this work, public discussion and debate among all interested parties is essential.

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