Thomas L. Forbes, MD, Section Editor
From the Southern Association for Vascular Surgery

A real world analysis of payment per unit time in a Maryland Vascular Practice

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Purpose: In 1992, Centers for Medicare and Medicaid Services instituted the Resource Based Relative Value Scale (RBRVS) system to determine physician reimbursement. Relative value units (RVU) were assigned to each Current Procedure Terminology (CPT) code and intended to reflect the time and intensity of work. Little data exist correlating actual procedural and clinical time with respect to reimbursement within the RVU value system. The purpose of this study was to determine how well this system distributes payments per hour for hospital-based procedures in a single vascular practice in the state of Maryland between July 1, 2008 and June 30, 2009.

Methods: As part of an ongoing prospective outcomes program, procedural times for all vascular procedures (time into until time out of room) were recorded. Fifteen minutes were added for administrative functions on procedural day, each hospital day, and office visits during the global period. The combination of all times was reflected in the total care time (TCT) for each procedure. We recorded all physician fees collected for each procedure. This total fee collected for each procedure was then divided by the TCT to determine the procedure-specific payment per unit time. All similar procedures were grouped together and the average reimbursement per procedure was reported.

Results: Data was collected on all 1103 procedures performed during this period. Insurance carrier distribution was 75% Medicare and 25% private insurance. The average reimbursement was $316/hour for open procedures and $556/hour for endovascular. Higher reimbursing procedures included visceral endovascular procedures ($701/hour) and caval filters ($751/hour). Lower reimbursing procedures included lower extremity bypass ($292/hour), dialysis access ($268/hour) and lower extremity amputations ($223/hour). Striking was the difference between payment based on approach for similar conditions. Reimbursement for carotid stent vs carotid endarterectomy was $643/hour vs $383/hour, endovascular abdominal aortic aneurysm (AAA) repair vs open $593/hour vs $359/hour.

Conclusion: This unique study demonstrates a "real world" experience of reimbursement per unit time and raises questions as to the validity of the RBRVS process. The disparity between payments for open and endovascular repair of similar conditions are typical of this inequality. These data do not reflect the intangible time of operative planning, administrative matters, or overhead, and these factors must be considered when interpreting this data. Regardless, this study suggests that capturing detailed financial data is possible and is a more accurate source for future discussions on reimbursement. (J Vasc Surg 2010;52:1094-9.)

In 1992, Centers for Medicare and Medicaid Services (CMS) instituted the Resource Based Relative Value Scale (RBRVS) system to determine physician reimbursement which incorporated three components of physician services: physician work, practice expense, and liability insurance. The initial physician work service relative value units (RVUs) assigned to specific Current Procedure Terminology (CPT) codes were based on a Harvard University study.[1-3] These values were intended to be a reflection of the time it takes to perform the service, the technical skill and physical effort, the required mental effort, judgment, and the stress due to the potential patient risk. Recognizing the need for ongoing review of the RVU values, the American Medical Association (AMA), in conjunction with specialty societies, created the relative value RVS Update Committee (RUC) to make recommendations to the CMS. The appropriate specialty for specific CPT codes then survey their members to provide subjective data on time

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Table I. Results of endovascular procedures

Procedure	*Cases*	*Total OR hrs*	*OR hrs/ case*	*POD*	*POD/ case*	*Office visits/ case*	*Additional hrs*	*Additional hrs/case*	*Total MD payment*	*Payment/ case*	*Payment/hr*
Aortic endograft	25	66.9	2.68	36	1.4	1.9	27.25	1.09	$55,807	$2232	$593
Abdominal endovascular	39	62.4	1.6	0	0	0	9.75	0.25	$44,200	$1133	$613
Carotid stent	20	27.4	1.37	20	1.0	0.7	13.25	0.66	$26,149	$1307	$643
Cerebral arteriography	7	8.2	1.17	0	0	0	1.75	0.25	$4876	$697	$487
Bypass graft revision endo	5	6.1	1.22	0	0	0	1.25	0.25	$4523	$905	$615
L. extremity endarterectomy	23	54.4	2.37	34	1.5	1.7	23.75	1.03	$38,452	$1672	$492
L. extremity endovascular	180	271.2	1.51	0	0	0	45	0.25	$192,993	$1072	$610
Dialysis graft revision endo	119	125.5	1.05	0	0	0	31	0.26	$85,725	$720	$548
L. extremity arteriography	106	117.4	1.11	0	0	0	26.5	0.25	$52,656	$497	$366
Fistulogram	13	9.7	0.75	0	0	0	3.25	0.25	$3261	$251	$252
Caval filter insert/remove	22	17.3	0.79	14	0.6	0	9.2	0.42	$19,891	$904	$751
Visceral endovascular	33	43.3	1.31	0	0	0	8.25	0.25	$36,128	$1095	$701

hrs, Hours; *L*, lower; *MD*, doctor; *OR*, operating room; *POD*, postop days.

and expenses; this information is provided to the RUC, who analyzes the data and makes final recommendations to the CMS. Having participated in these surveys in the past, we were struck by the subjective nature of the surveys and believed a more objective study would more accurately reflect at least the time element of the RVU system. We sought to evaluate the "real world" reimbursement by determining the hourly payment for the total care involved in the performance of common vascular procedures.

METHODS

As part of an ongoing prospective quality assurance and outcomes program between July 1, 2008 and June 30, 2009 at Anne Arundel Medical Center, procedural times for all vascular procedures (time into room until time out of room) were recorded into an outcomes tracking software (TrakNet; BioMedix Inc, St Paul, Minn) for four vascular interventionalists (3 vascular surgeons and 1 cardiologist). All procedures were performed by experienced physicians in private practice without the involvement of residents. An additional 15 minutes were added for all nonoperative functions on the day of the procedure, each postoperative hospital day, and each office visit during the global period. This additional time included dictation, rounding, medical chart documentation, and discussion with the patient's family. The combination of this additional time with the procedure time were then reflected in the total care time (TCT) for each procedure. We then recorded the actual physician collections for each procedure into the database, including all payments from multiple payers and the patients, to capture the entire fee paid for the procedure. This total fee collected for each of these procedures was then divided by the TCT to determine the procedure-specific payment per unit time. We did not isolate unbundled codes, but rather reported the total reimbursement for an entire procedure to more accurately reflect the typical vascular experience. All similar procedures were grouped together (ie, all lower extremity bypasses) and the average reimbursement per procedure was reported. Mixed procedures performed together, ie, iliac angioplasty and distal bypass were excluded as their times and reimbursement were combined. Minor procedures such as wound debridements, digital amputations, central venous access, and temporary dialysis catheters were excluded as many were performed at the bedside and accurate times were not recorded. This study was performed as part of our ongoing quality assurance program, therefore, it was not required to have institutional review board supervision.

RESULTS

Data were collected on all eligible 1103 procedures performed during this period. Thirty-seven procedures were excluded from analysis (35 were for no payments received and 2 were incomplete times recorded [bedside procedures]). Carrier distribution was 75% Medicare, 23% private insurance, and 2% Medicaid. The total number of procedures, total operating room time, time per case, total postoperative days, postop days per case, office visits per case, additional time, additional time per case, total payment, payment per case, and payment per unit time in dollars is represented in Tables I and II for common procedures. Table I includes the common endovascular procedures and Table II shows the common open procedures. Lower extremity endarterectomy includes remote endarterectomy, angioplasty, and stent and, therefore, is included with the endovascular group. The average reimbursement was $316/hour for open procedures and $556/hour for endovascular procedures.

DISCUSSION

Over the course of the past 3 decades, substantial changes have been made to reimbursement systems for physician services, but none more significant than the adoption of the RBRVS in 1989. With the signing of the Consolidated Omnibus Budget Reconciliation Act, President George H. Bush ushered into medicine the current system of physician reimbursement. Prior to passage of this bill, payments for services were at least partially based on customary and prevailing charges. The impetus for this drastic change was due to two major factors: first, the rapid

Table II. Results of open procedures

Procedure	*Cases*	*Total OR hrs*	*OR hrs/ case*	*POD*	*POD/ case*	*Office visits/ case*	*Additional hrs*	*Additional hrs/case*	*Total MD payment*	*Payment/ case*	*Payment/ hr*
Aortic bypass	15	65.9	4.39	52	3.5	1.6	22.75	1.52	$31,809	$2121	$359
Carotid endarterectomy	118	242.9	2.06	150	1.3	1.7	116	0.98	$137,559	$1166	$383
Bypass graft revision open	6	14.8	2.47	15	2.5	1.3	7.25	1.21	$8439	$1407	$383
L. extremity bypass	45	166.5	3.7	145	3.2	2.4	74	1.64	$70,211	$1560	$292
Dialysis graft revision open	46	73.5	1.6	56	1.2	2.7	56	1.22	$32,019	$696	$247
Dialysis access graft/ fistula	76	127.7	1.68	15	0.2	1.8	56.25	0.74	$49,328	$649	$268
Extra-anatomic bypass	4	10.9	2.73	10	2.5	2.5	6	1.5	$6091	$1523	$360
L. extremity venous (phleb)	30	34.8	1.16	0	0	1	15.25	0.51	$19,498	$650	$390
L. extremity amputation	47	65.6	1.4	244	5.2	1.5	90.25	1.92	$34,686	$738	$223
L. extremity thrombectomy	13	32.1	2.47	57	4.4	1.7	23	1.77	$21,166	$1628	$384

hrs, Hours; *L*, lower; *MD*, doctor; *OR*, operating room; *POD*, postop days; *phleb*, phlebectomy.

$$MFS=[(RVUw \times GPCIw) + (RVUpe \times GPCIpe) + (RVUm \times GPCIm)] \times CF$$

MFS= medicare fee schedule, RVU= relative value unit, GPCI=geographic practice cost index, w=work, pe=practice expense, m=malpractice, CF=conversion factor

Fig 1. Relative Value Score (RVS) System for Medicare payment for physician services. *CF*, Conversion factor; *GPCI*, geographic practice cost index; *m*, malpractice; *MFS*, medicare fee schedule; *pe*, practice expense; *RVU*, relative value unit; *w*, work.

expansion of health care expenditures through the Medicare system, and second, the rise in Medicare reimbursement for physician services. In 1985, the annual budget for healthcare expenditures topped $540 billion annually or 11% of the gross national product.[4] Additionally, Medicare reimbursement for physician services between 1975 and 1987 grew at a compound rate of 15%, double the growth of the gross national product.[5] Extensive debate ensued regarding the medical necessity of physician services and the federal government stepped in with third party private payers following not long after.

The current system is predicated on a Harvard University School of Public Health project to develop a national study of RBRVS for physician services.[1-3] It was accepted by the AMA, funded by the Health Care Finance Administration, and began its work in 1985. In the first phase, RBRVS were developed for 12 physician specialties and subsequent specialties were added with additional private funding. The final report was not published until 1992 when it appeared in the *November Federal Register*. The final system of payment included (at the insistence of the AMA) geographic and professional liability components and (at the opposition of the AMA) limits on balanced billing to patients. The final equation is shown in Fig 1.

Congress approved Consolidated Omnibus Budget Reconciliation Act and mandated the Medicare Fee Schedule based on this system. Recognizing the need for adjustments and understanding the need to adapt to new technology and procedures, the AMA in 1991 formed the AMA/Specialty Society, RUC. This committee established the Research Subcommittee, RUC Advisory Committee, and the Health Care Professionals Advisory Committee. With this entire system in place and with federal law for enforcement, the Medicare RBRVS was fully implemented in January 1992. It is important to understand the RUC

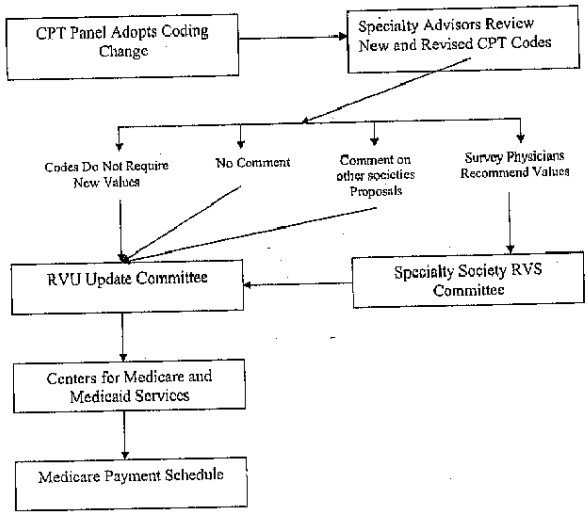

Fig 2. Relative Value Unit review process.

committee does not dictate policy but merely makes recommendations to the CMS. The vast majority of the recommendations made by the RUC are accepted, (90% between 1993 and 1998). As a result, this is an extremely important element of the reimbursement process. A schematic of how the RUC process works is depicted in Fig 2. The RUC appeals process is a very important element of the RBRVS. As early as May 1994, the RUC had submitted over 1000 work RVU recommendations. The complexity of this process is underscored by the fact that the Balanced Budget Act mandated that increases in RVU must come at the expense of others. To address this issue, most changes were made within a single family of codes such as vascular. Allowances were made to account for innovation creating the opportunity for growth within a family of codes.

At the heart of this entire system and focal point of universal controversy is the appropriate valuation of physician practice expense and work for specific procedures. We do make the assumption that our practice expense is evenly distributed across all our procedures and, therefore, a constant that can be equally applied. Clearly a patient that comes to the office for multiple visits within a global period reflects more cost than a patient that returns with no global period, but we do not think that compromises the conclusions we derived from this study (and may even underscore their importance).

Physician work assessment in the RVU system was intended to be a reflection of the time it takes to perform the service, the technical skill and physical effort, the required mental effort, judgment, and the stress due to the potential risk to the patient, all except time, are subjective factors. The relative values of these subjective factors are open for debate and vulnerable to opinion, but that should not be the case for operative time. We recognize that some surgeons are faster than others, and that procedures performed in teaching hospitals may take longer, but an average time can be determined for most procedures. Unfortunately in the initial Harvard Study, the time for vascular procedures was grossly underestimated. In their 5-year review, Zwolak and Trout[5] published the work of the Society of Vascular Surgery and the North American Society for Vascular Surgery Joint Council on Government Relations. In this publication, the authors reaffirmed the discrepancy between the Harvard procedural estimates and outlined the successful changes made to reimbursement (increases from 11.5% to 44.6% for nine vascular procedures). Unfortunately, this resulted in other cuts to maintain "budget neutrality." In another study with respect to time, Morehouse et al[6] analyzed procedure time and overall treatment time in detail and concluded that the rate of reimbursement per unit time was inadequate to meet the physicians' costs for the treatment of ruptured abdominal aortic aneurysms. A number of articles have addressed the issue of decreasing reimbursement for vascular surgeons with this system, but none have specifically taken the approach we have of comparing payment per unit time for all procedures done by vascular interventionalists.[7-12]

It is also important to note that specialty societies, as identified in Fig 2, survey physicians to obtain the data it uses to make recommendations to the RUC on new CPT codes and changes to old codes. These surveys ask questions regarding expenses, operative time, and the subsequent care. We believe few respondents have objective databases that reliably report data and, therefore, respondents are left with subjective answers to objective questions. This unfortunately limits the strength of the data given forth to the RUC, and as a specialty we must rely heavily on the expertise of the Society RVS Committee in interpreting the surveys.

The manner in which one analyzes the data provided in this study can lead to varied conclusions, but all must be taken into consideration of the importance of the process in which reimbursement is determined and the RBRVS system. For example, the reimbursements for carotid stents vs carotid endarterectomy or aortic endograft vs open aneurysm repair are excellent examples (Tables I and II). The payment to a physician for total care of the patient with an aortic aneurysm or carotid stenosis may not vary significantly based on treatment approach, but the efficiency (ie, payment per unit time) is markedly different.

As a physician, the optimal financial approach would be to perform an endovascular procedure. When taken as a family, most of the open procedures are reimbursed at an unfavorable rate per hour. One could easily argue that the rate of $292 per hour for a limb salvage, technically demanding distal bypass falls well below the hourly fee for many other professional services and lower than the reimbursement for high level Evaluation and Management services. Indeed, the top five reimbursements per unit time procedures are endovascular procedures (Table I). Is this a function of unbundled codes or because open procedures are grossly undervalued for the work they require? It is not the scope of this report to answer this question, but it does indicate why physicians focused on more profitable endovascular procedures can recognize more financial rewards than those whose practices are heavily weighted toward open procedures. It is also important to note that the global period for open procedures is often 90 days and is zero days for many endovascular procedures. This has a substantial impact on the reimbursement as is demonstrated by the large number of 'additional hours' for open procedures in Table I. An outstanding example of this disparity can be seen with lower extremity amputation. The average reimbursement of $738 for a 1.4 hour procedure does not seem unreasonable until you note that almost two additional nonreimbursed hours are required for rounding for 5 postoperative days and 90 days worth of office visits.

Although legislative directives drive the RVU system, adjustments have also been made for reimbursement independent of the RVU. For example, the work RVU in Maryland for a carotid stent is 29.6 and total RVU of 91.12, while the values for carotid endarterectomy are 19.53 and 29.61, respectively. Despite these dramatic differences, our typical physician reimbursement for both procedures was similar ($1094). Reimbursement for ca-

rotid stent, and other high volume procedures, has been set independent of the RVU. The noted difference in the reimbursement per unit time in our study was based on the decreased total time it took to manage carotid stenosis by an endovascular approach. Similar discrepancies are noted with endovascular abdominal aortic aneurysm (AAA; total RVU 90.11) vs open AAA repair (total RVU 48.74). Again, similar total reimbursement (average $2232 endovascular approach, $2120 open approach) but reimbursement per unit time favored an endovascular approach.

Although we have not addressed specifically the intangible issues of the technical skill, physical effort, required mental effort, judgment, and the stress due to the potential patient risk, we were struck by the fact that reimbursement per hour may be actually inversely related to these factors. We acknowledge this may be a physician-specific issue as one procedure may be more technically demanding from one physician to another. That being said, few would argue that the open aortic aneurysms we do today are much more technically demanding, creates higher stress, and poses a greater risk than the endovascular counterpart, as most open aortic aneurysms have challenging anatomy. All of this underscores the complexity of the issue of reimbursement, RVU, and the budget constraints of this system. This article was not designed to simplify those complexities, but rather identify a unique manner in which to view the current system and offer the suggestion that more objectivity can be introduced into the reimbursement process with respect to time.

This data must be interpreted in context with all the variables that clearly affect the final financial figures. Those include the regional differences in reimbursement for like procedures, the speed and experience of these particular surgeons, the efficiency of the operating room and interventional staff, length of stay, clinical outcomes, follow-up protocols, case mix, and insurance mix. In addition, there were other aspects of patient management that are not considered in this analysis; those include turn over time, phone calls, and medical record completion.

CONCLUSIONS

The RUC committee uses information gathered by subjective surveys, rather than prospectively collecting accurate workload data. This unique study demonstrates a "real world" experience of reimbursement per unit time in the state of Maryland and raises questions as to the validity of the RBRVS process. The disparity between payments for open and endovascular repair of similar conditions, such as aortic aneurysm and carotid stenosis, are typical of this inequality. These data do not reflect the intangible time of operative planning, administrative matters, or overhead, and these are factors that must be considered when interpreting this information. Regardless, this study suggests that capturing detailed financial data is possible and is a more accurate source for future discussions on reimbursement.

AUTHOR CONTRIBUTIONS

Conception and design: JDM, PW, JEM
Analysis and interpretation: JDM, JH, JEM
Data collection: JDM, PW, LW, TS, LH
Writing the article: JDM, PW, JH, JEM, SS, LW, TS, LH
Critical revision of the article: JDM, PW, JH, JEM, SS
Final approval of the article: JDM, PW, JAH, JEM, SS, LW, TS, LH
Statistical analysis: JDM, JH
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Overall responsibility: JDM

REFERENCES

1. Hsiao WC, Braun P, Dunn D, Becker ER, De Nicola M, Ketcham TR. Results and policy implications of the resource-based relative-value study. N Engl J Med 1988;319:881-8.
2. Hsiao WC, Yntema DB, Braun P, Dunn D, Spencer C. Measurement and analysis of intraservice work. JAMA 1988;260:2361-70.
3. Hsiao WC, Braun P, Becker E, Causino N, Couch P, Nicola M, et al. A national study of resource-based relative value scales for physician services: final report. Cambridge, Mass: Department of Health Policy and Management, Harvard School of Public Health, and Department of Psychology, Harvard University 1988; 1 and 2 (Supplemental Report and Phase II Final Report).
4. Jacobs P. The economics of health and medical care, 3rd edition. Gaithersberg, MD: Aspen Publishers; 1991. pp 168-74.
5. Roper WL. Statement before subcommittee on health of the committee on ways and means, US House of Representatives. Washington DC: US Department of Health and Human Services, Health Care Finance Administration; 1988.
6. Morehouse DL, Elmore JR, Franklin DP, Youkey JR. Physician work effort and reimbursement for ruptured abdominal aortic aneurysms. Am J Surg 1997;174:136-9.
7. Przybylski GJ. Understanding and applying a resource-based relative value system to your neurosurgical practice. Neurosurg Focus 2002; 12:e3.
8. Hertzer NR, Noether MG. The resource-based relative value scale in vascular surgery. A report of the activities of the Joint Council of the Society for Vascular Surgery and the North American Chapter of the International Society for Cardiovascular Surgery in Medicare reimbursement reform. J Vasc Surg 1993;18:692-701.
9. Zwolak RM, Trout HH 3rd. Vascular surgery and the Resource-based Relative Value Scale five-year review. J Vasc Surg 1997;25:1077-86.
10. Mabry CD. The use of a resource-based relative value scale (RBRVS) to determine practice expense costs: a novel technique of practice management for the vascular surgeon. Semin Vasc Surg 2001;14:29-38.
11. Zwolak RM. Resource-Based Relative Value Scale (RBRVS), coding, and Medicare reimbursement. Semin Vasc Surg 1997;10:119-27.
12. Fillinger MF, Zwolak RM, Musson AM, Cronewett JL. Vascular laboratory cost analysis and the impact of the Resource-Based Relative Value Scale payment system. J Vasc Surg 1993;17:267-78; discussion 278-9.

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DISCUSSION

Dr Eugene M. Langan III (*Greenville, SC*). This is a very interesting article. I congratulate Dr Martin and co-authors for putting it together and the program committee for a timely and excellent selection. This article offers a little bit of vascular disease,

a little more on history, and a great deal on government and reimbursement decisions. I would recommend it for reading by all vascular specialists.

An operating room database yielded the duration of time per open or endovascular procedure and the data was cross referenced with the reimbursement RVU monetary values to give the results of dollars per hour per procedure. To no one's surprise, endovascular procedures pay better than open vascular surgical cases, especially as the complexity of open cases increases. To the authors' credit, they stick strictly to the facts and do not attempt to politicize or give their personal opinions.

To keep this short, I have three questions of Dr Martin.

First, you explain and demonstrate in Fig 2 that Specialty Society RVS Committees have input for reimbursement updates. Which society represented and represents vascular surgery? In other words, were vascular surgeons consulted to set the RVUs and updates or did general surgeons assign values to our work?

Second, the Harvard Project to set resource-based relative value scale was completed in 1992 and your first reference dealing with vascular surgery RBRVS is 1993. Can you further explain how the Harvard Project gathered data and why was it used?

Last, unfortunately I am now going to have to ask you for your opinion. This article looks at reimbursement in the fee for service world of today, but there could be a large and fundamental change in the world of tomorrow. Therefore, what needs to be done to allow and ensure quality vascular care with appropriately assigned reimbursement for today's vascular specialist?

I would like to thank Dr Martin for timely receipt of the manuscript and the Association for the privilege of the floor.

Dr Martin. Thank you, Gene. I actually will answer the first two questions together. If you look at the history of this system, it started out as a project from the Harvard School of Public Health. It was intended to tackle the issue of rising federal expenditures for medical care yet provide fair payment for similar services across specialties. It was supported by the AMA and ultimately funded by Health Care Finance Administration. The data for a limited number of specialties were obtained by sending surveys to a large number of physicians evaluating the work for various services including time and intensity. There were a limited number of specialties for which detailed data was available in the initial analysis and this did not include vascular surgeons. The vascular RVU were obtained by extrapolation from those procedures included in the original work. In 1997, our joint societies reported a detailed review of vascular codes. Hugh Trout is here today and was part of that task force. That group came to the conclusion that many of the vascular codes were undervalued and corrections were made. It is also important to understand the way this process works and the ramifications of changes, it is like a seesaw. Because of the Budget Reduction Act, everything has to balance, so if some codes were valued up, other codes were valued down. There is this constant push pull of these RVUs balancing out reimbursement. This is what really poses the challenge in this system; all of these groups are competing for a fixed target. As to your last question, two things, first, my partner, Jon Hupp, asked me as we discussed this project "Do you really want to stand up there on the podium and present this? I suspect people are going to start shooting you for putting this data out there." I think this data is provocative but I believe it is useful as long as you keep it in context. Do I think there are some procedures that we are paid handsomely for? The answer is yes, but they are equally balanced from those that I think we are grossly underpaid. An overriding question one might ask; is there a defined fee we should get paid per hour and should it be constant? That is a difficult question to answer, but my impression is that there are so many variables that a single figure cannot be universally applied. What is clear is that better time data from studies like this may rectify some of the inequalities that are clearly identified in this study and the real value of this work is a demonstration that accurate time data is possible.

INVITED COMMENTARY

Thomas F. O'Donnell, MD, *Boston, Mass*

Martin and colleagues' article explores how well the Resource Based Relative Value Scale (RBRVS) compensates vascular surgeons for open and endovascular (ENDO) procedures, based on data gathered over a year of practice. In addition, the authors provide "real world" documentation on current revenue generation in a vascular practice from these procedures. Certain conditions apply to the data: 1) the authors' group of three vascular surgeons and one cardiologist practice in a "vascular center" at a non-university based hospital without residents; 2) the data focuses only on revenue from operating room (OR)/catheterization (interventional) suite-based procedures. Physician reimbursement from office-based procedures, evaluation and management visits, hospital consults, bed-side procedures, or vascular laboratory is not included in the analysis; 3) no relative value unit (RVU) productivity or expense data is provided.

The revenue data has been normalized by procedure into a dollar per hour format, which reflects not only the procedure time ($/HR.PROC), but it also is combined with the pre- and postoperative care – $/total care. As a result of their analysis, the authors question the validity of the RBRVS process. Except for examples in their discussion, the authors fail to report any data, however, on the standard metric, RVU, for assessing physician productivity in relation to net revenue for an individual procedure or for total net revenue for a vascular surgeon. The authors favor time as the metric for physician productivity. While time is the major driver (70%) of the work RVU (wRVU), which comprises one-half of the total RVU, focusing on time alone ignores the intensity dimension (mental effort and judgment, technical skill, physical effort, and stress) of a procedure. Is a 1.5 hour amputation the same as a lower extremity endovascular procedure of the same duration? Moreover, the time to perform a procedure can be quite variable from surgeon to surgeon, so that the more expeditious surgeon is reimbursed at a higher hourly rate for a procedure (Table). It is difficult to make an argument for increased reimbursement without emphasizing the complexity of the procedure.

To emphasize these points, I compared our own financial analysis presented at the New England Vascular Society in September 2007 to the current paper.[1] Our review was initiated by the dramatic 16% increase in infrainguinal procedures over the decade, but with a decided shift from open procedures (down 6.2%) to an endovascular approach.[2] To assess the impact of a predominantly endovascular approach on physician revenue (like Martin's study – actual collections) from infrainguinal procedures, we reviewed our experience with over 250 open procedures and 385 endovascular procedures and analyzed a random sample from each group.

Although the collection per case for ENDO procedures was comparable between the two studies, Martin's study had a much

Table.

	*Hours**	*RVU*	*$/RVU*	*Col/Case*	*$/HR.PROC*
Endo T	2.82	26.08	$47.35	$1235	$437
Endo A	1.51			$1072	$610
Open T	5.03	34.97	$43.40	$1518	$301
Open A	3.7			$1560	$292

A, Current paper; *Col,* collection; *Endo,* endovascular; *Proc,* procedure; *T,* Tufts.

*Procedure time.

higher procedural reimbursement per hour (+$173/Hr) for ENDO, which is directly related to the shorter procedure time of −1.3 hour. Despite a lower RVU (ENDO = 26.08) than open (34.97), the $/RVU was higher in our study for ENDO than open procedures. This reflects the better reimbursement for the physician's work effort for ENDO. There was little difference, however, in $/HR.PROC for open cases between the two studies. Also noteworthy is the minimal postoperative time (lower additional hours/case) spent with the ENDO patients, which is related to their predominantly outpatient setting versus the open cases in Martin's study (see Table 1 vs. Table 2). Seeger and associates[3] called attention to the detrimental effect of additional time spent in complex postoperative care on physician reimbursement. The comparison of the two studies emphasizes the influence of procedural time on physician reimbursement per hour, but most importantly $/RVU, which is at the heart of the question on the validity of the RBRVS. The better hourly reimbursement for ENDO emphasizes the disparity of reimbursement to work effort and becomes more evident when one compares the higher $/RVU for other general surgical or orthopedic procedures. While the authors do not state it outright, they imply that one or both of the components of the work RVU, either time or intensity, may be overvalued for ENDO. In the budget-neutral world of Centers for Medicare and Medicaid Services (CMS), what would the authors have the RUC Committee do – increase the payment for open procedures or decrease the payment for ENDO procedures?

The revenue from open and endovascular OR procedures presented in this paper was generated by three vascular surgeons and one cardiologist, and from Tables 1 and 2 averages $278,102/physician (open procedure revenue/3 [cardiologist excluded] and endovascular procedures revenue/4) or $325,159, if restricted to only the three vascular surgeons. When consideration is given to physician reimbursement and overhead requirements, an two to three-fold generation additional generation of revenue per physician, eg office-based procedures, consults, vascular laboratory, would be needed.[3] This finding emphasizes the important role of non-OR/interventional suite sources of revenue for the vascular surgeon and the "real world" difficulty vascular practices face in generating sufficient revenue from OR/interventional procedures without extremely high volumes. Imagine what a 21% decrease in CMS reimbursement, which is before Congress, would do this revenue data.

REFERENCES

1. Coleman DB, Iafrati MD, O'Donnell TF. Financial implications of endovascular vs. open femoral popliteal interventions: Is it worth the effort? Presented at The New England Society for Vascular Surgery, September 2007, Boston, Mass.
2. Nowygrod R, Egorova N, Greco G, Anderson P, Gelijns A, Moskowitz A, et al. Trends, complications, and mortality in peripheral vascular surgery. J Vasc Surg 2006;43:205-16.
3. Huber TS, Carlton LM, O'Hern DG, Hardt NS, Ozaki K, Flynn TC, Seeger JM. Financial impact of tertiary care in an Academic Medical Center. Ann Surg 2000;231:860-8.