Research Report

Using Claims-Based Estimates of Post-Operative Visits to Revalue Procedures with 10- and 90-Day Global Periods

Andrew W. Mulcahy, Harry H. Liu, Teague Ruder, Susan L. Lovejoy, Katie Merrell, Ateev Mehrotra

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Preface

Medicare payment for many health care procedures covers not just the procedure itself but also post-operative care provided by the same practitioner over a fixed period of time (the "global period"). When the Centers for Medicare & Medicaid Services (CMS) sets the payment rate for a given procedure, it assumes a certain number of post-operative visits will typically occur during the global period. In other research (Kranz et al., 2019), RAND found the number of visits actually performed was less than what CMS assumes. This report describes how these new claims-based data on the number of post-operative visits could be used to adjust valuation of procedures with 10- and 90-day global periods. These results may inform further policy development around revaluation for global procedures.

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RAND Health Care Communications
1776 Main Street
P.O. Box 2138
Santa Monica, CA 90407-2138
(310) 393-0411, ext. 7775
RAND_Health-Care@rand.org

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Background

Medicare payment for many health care procedures covers not just the procedure itself but also most post-operative care over a fixed period of time (the "global period").[1] The Centers for Medicare & Medicaid Services (CMS) sets payment rates assuming that a certain number and type of post-operative visits specific to each procedure typically occur. In other RAND research (Kranz et al., 2019), we found that the number of visits actually performed is fewer than CMS's assumptions.

This report describes how these new claims-based data on the number of post-operative visits could be used to adjust valuation for procedures with 10- and 90-day global periods. The idiosyncrasies of the resource-based relative value scale system (RBRVS) used to determine payment for Medicare services result in some ambiguity about how procedures should be revalued to reflect reductions in post-operative visits. We intend for the results presented in the report to be a starting point for further policy development for revaluation.

Current Approach to Collect Information on Post-Operative Visits

Currently, the number of post-operative visits that CMS assumes typically occur during global periods is informed by practitioner surveys administered by the American Medical Association/Specialty Society Relative Value Scale Update Committee (the RUC) and its individual specialty society members. The primary purpose of the surveys is to collect information on the *work* and *time* associated with individual procedures and other health care services (i.e., based on health care common procedure coding system [HCPCS] codes), including an estimate of the total work involved in furnishing the service and related post-operative care. When a procedure has a 10- or 90-day global period, the surveys also ask practitioners to report the number and type of post-operative visits that typically occur during the global period. Respondents use evaluation and management (E&M) visit codes, including codes for office and inpatient visits of different levels, discharge visits, and critical care visits, to describe the number and level of these post-operative visits. CMS, when determining the valuation for the procedure,

[1] Medicare's global service policy bundles (a) related services provided by the practitioner furnishing an initial procedure and (b) related services provided by other practitioners in the same practice and specialty as the practitioner furnishing the initial procedure into the payment for the procedure itself. Practitioners meeting these criteria can bill for unrelated services that are provided to the same patient during the global period by using a payment modifier to indicate that the services are unrelated. Practitioners not meeting these criteria can bill normally during a global period. Post-operative visits and most other follow-up care are included. There are some exceptions; for example, follow-up care resulting in a return to the operating room begins a new global period and is paid separately.

may adjust the counts of visits recommended by the specialty societies. The number of post-operative visits assumed to typically occur during the global period are published by E&M HCPCS code in the Physician Time File ("Time File"), which is posted annually with the Medicare Physician Fee Schedule. The Time File also publishes an estimate of the physician time spent on post-operative visits.[2]

Summary of Prior RAND Studies and Implications for Revaluation

The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) required CMS to collect information on the *number* and *level* of post-operative visits actually provided and to potentially revalue misvalued procedures using these newly collected data and other information. In response, CMS collected information on the *number* of post-operative visits by requiring select practitioners[3] to report post-operative visits following 296 high-volume or high-cost procedures[4] using the no-pay HCPCS code 99024. CMS also collected information on the *level* of visits for three chosen procedures using a provider survey focusing on the time, activities, staff, and work associated with post-operative visits following the three procedures (cataract surgery, hip arthroplasty, and complex wound repair).

RAND analyzed data collected through both of these channels. RAND's analysis of the *number* of visits reported using HCPCS code 99024 found that only 4 percent of procedures with 10-day global periods had any post-operative visits reported.[5] While 71 percent of procedures with 90-day global periods had at least one associated post-operative visit, only 39 percent of the total number of expected post-operative visits for these procedures were reported.

These findings imply that procedures with 10- and 90-day global periods are overvalued, that is, they are valued as having too many relative value units (RVUs). Overvaluation of procedures with 10- and 90-day global periods leads to overpayment for these procedures and reduces payment for all other services paid under Medicare's Physician Fee Schedule, distorting incentives for practitioners to overprovide these services and inflating beneficiary cost-sharing burden for these services.

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[2] The Time File includes estimates of (a) physician time for the entire global service, including post-operative visits, and (b) physician time for all components of the global service *except* post-operative visits. The difference between these times is the time associated with post-operative visits and is also mathematically the sum of physician time for each E&M HCPCS code assumed to occur during the global period.

[3] Reporting of post-operative visits was required for practitioners in groups with ten or more in nine randomly selected states (Florida, Kentucky, Louisiana, Nevada, New Jersey, North Dakota, Ohio, Oregon, and Rhode Island). Reporting was required on procedure codes that had a 10- or 90-day global period, were performed by more than 100 practitioners, and were either (a) performed more than 10,000 times or (b) had allowed charges greater than $10 million.

[4] The selected HCPCS codes accounted for 96.5 percent of all the procedures furnished with 10-day global periods and 85.3 percent of all procedures with 90-day global periods in 2017.

[5] Nearly all procedures with 10-day global periods have a single visit on the Time File.

RAND's analysis of information on the *level* of visits submitted also has implications for revaluation. The survey focused on three procedures (cataract surgery, hip arthroplasty, and complex wound repair). RAND found that the work involved in post-operative visits for the three procedures differs from the post-operative visits assumed during the valuation process—slightly less in the case of cataract surgery and hip arthroplasty and significantly more for complex wound repair (Gidengil et al., 2019).

The goal of this report is to describe an approach where these newly collected data—particularly the claims-based data on the number of post-operative visits—could be used to revalue global surgery procedures and determine the impact of this approach.

Revaluation Approach

There are links between the number of bundled post-operative visits and five factors that contribute to valuation addressed in this report: work RVUs, direct practice expenses, physician time, practice expense (PE) RVUs, and malpractice RVUs. There is some ambiguity regarding how a reduction in post-operative visits translates into changes in work RVUs as described below. In contrast, a reduction in post-operative visits has clear implications on physician time and direct practice expenses. Changes in physician work, physician time, and direct practice expenses will in turn affect PE and malpractice RVUs.

The ambiguity associated with changes to work RVUs stems from an intrinsic tension in RBRVS related to the alignment between information on the discrete "building blocks" that contribute to physician work (such as the number of post-operative visits) and estimates of the total work for the global service. As noted above, the RUC/specialty society surveys collect—and CMS publishes—information on most but not all of the building blocks required to calculate total physician work, such as the time involved in different components of a procedure and the number of post-operative visits. Each of these building blocks contributes work RVUs to the total work for the procedure.

However, total work is estimated via surveys using an approach called "magnitude estimation" in which respondents select an already-valued service that is most similar to the service being valued and then compare them in terms of total work, including post-operative visits that are assumed to be delivered in global periods. Because of this method of valuation, it is conceptually possible that a procedure's total work may be correct in cases where the assumptions on the number of post-operative visits are inaccurate. Even in such a case, however, the direct practice expenses and physician time associated with that code would be clearly incorrect, which would have implications for PE RVUs.

To provide estimates to frame the discussion of improving payment for global services, we revalued procedures by adjusting work RVUs, physician time, and direct practice expenses based on the difference between the number of post-operative visits observed via claims-based

reporting and the expected number of post-operative visits used during valuation. This approach has been called the "reverse building block approach." There are three steps in this approach:

1. *Calculate updated work RVUs* and physician time values by adjusting (i.e., in all cases in our report, subtracting) work RVUs and minutes to reflect the number of observed rather than assumed post-operative visits.
2. *Calculate updated PE RVUs* by adjusting (again, in all cases in our report, subtracting) direct PE clinical labor, equipment, and supply inputs to reflect the number of observed rather than assumed post-operative visits. Note that updated work RVUs do not contribute to the results from this step.
3. *Calculate updated total RVUs*, including allocated PE and malpractice RVUs, using updated physician work RVUs, physician time, and direct practice expenses.

We modeled changes to work RVUs and changes to PE RVUs due to reductions in direct PE inputs separately for two reasons. First, it allows for consideration of more targeted changes to valuation using just one of these components. For example, only PE RVUs might be updated because there is a very direct link between the number of assumed visits and direct PE inputs (in contrast to work, where the link is more ambiguous). Second, work results are reported separately because work RVUs, unlike PE and malpractice RVUs, are assumed to be exogenous in the RBRVS system—that is, they enter into valuation directly based on RUC recommendations and CMS decisions. Assessing changes to work RVUs alone also avoids spillover effects from allocation under RBRVS (as occurs with PE and malpractice RVUs) that can obfuscate the effect of our modeled changes. Changes in aggregate work RVUs will lead to changes in the conversion factor to maintain total spending, so net changes in RVUs across specialty will differ from changes in payments.

Our revaluation approach makes four key assumptions. First, it assumes that the bundled post-operative visits that were not observed did not occur. A concern here is that the visits did occur but were simply not reported. This topic is addressed in more detail later in the report. Second, it assumes that the amount of physician work involved in post-operative visits is the same as the amount of work in the corresponding E&M visits indicated in in the Time File.

Third, we chose between a number of metrics to capture the "typical" number of post-operative visits actually provided. We used the median observed visits as a primary approach because medians are used elsewhere in the valuation process. We considered other estimates of the number of visits when updating work RVUs, including the modal and mean reported visits as other potential approaches. We also included the 75th percentile, which may be of interest as it decreases the magnitude of potential reductions in work RVUs.

Fourth, and most importantly, our approach removes all of the work RVUs associated with visits that did not occur. As noted above, the "reverse building block" approach that we used assumes total work is the sum of work associated with discrete components of the procedure and global package (including post-operative visits). The approach that is the most different from the one that we used would be to assume that the total work from magnitude estimation is accurate

and to not adjust work RVUs at all. It is impossible to know when RUC/specialty society respondents and CMS arrived at their estimates of total work via magnitude estimation when they were shown an inflated number of post-operative visits. It is our understanding of both the CMS and RUC process that code-specific assumptions regarding the number of post-operative visits are available and considered when making final work RVU recommendations/determinations.

Data and Methods

We combined Medicare claims data and the Time File posted with the 2018 Medicare Physician Fee Schedule to calculate the share of post-operative visits that were reported for each procedure for which reporting was required. The data and methods related to our analysis of post-operative visits reported via claims is discussed in a prior report (Kranz et al., 2019). We used regression models to impute the share of reported relative to assumed post-operative visits for procedures with 10- and 90-day global periods for which reporting was not required.

For revaluation, our starting point was work, PE, and malpractice RVUs for procedures with 10- and 90-day global periods as listed in the calendar year (CY) 2018 Medicare Physician Fee Schedule. The baseline CY 2018 valuations were associated with the assumed number of post-operative visits included in the global period as listed in the Time File.

We first calculated updated physician work RVUs by subtracting RVUs equal to the product of the difference between assumed and reported visits and the average work RVUs per post-operative visit for each procedure. We used four different observed post-operative visit metrics: the median, 75th percentile, mean, and modal count of observed visits. The median, mean, and modal count of reported visits are all potential approaches to define the "typical" case that is relevant for valuation, and the 75th percentile may be of interest to CMS as a policy alternative because it may mitigate some concerns about the magnitude of potential reductions in work RVUs. While changes to work RVUs results in changes to the allocation of PE and malpractice RVUs, we report changes narrowly to work RVUs in this initial analysis and return to the implications for total RVUs, including allocated PE and malpractice RVUs, in a subsequent analysis.

As a second step, we adjusted PE RVUs by proportionally reducing certain direct PE inputs in the facility setting for each procedure code by the ratio of the median observed to expected post-operative visits. Because facilities bill separately for procedures (under, for example, the Outpatient Prospective Payment System fee schedule and the Ambulatory Surgical Center Payment System fee schedule), the only direct PE costs that contribute to facility payment rates under the Physician Fee Schedule are for pre- and post-operative services. We used CMS's Direct PE Inputs workbook posted with the Physician Fee Schedule as a starting point and adjusted post-service labor, supply, and equipment downward in the facility setting.[6] We applied the same reductions (regarding the magnitude of the reductions) to the nonfacility direct PE

[6] We assumed that all listed postservice labor, supplies, and equipment were associated with post-operative visits.

inputs for each procedure. We then calculated allocated PE RVUs for each procedure. Note we did not use updated work RVUs or time values as inputs when allocating PE RVUs in this narrow PE analysis—but we do so in the following analysis.

As a final step, we estimated the impacts of reductions in post-operative visits on work, PE, and malpractice RVUs together, including the allocative implications on indirect PE and malpractice RVUs using updated work RVUs, physician time, and direct practice expenses based on the median of observed post-operative visits.

We report the impacts of revaluation, first on work alone, next for PE alone, and finally adjusting all components together, by applying the status quo and updated valuations to CY 2018 fee-for-service Medicare volume of procedures with 10- and 90-day global periods. We report results for each of the 296 procedure codes for which reporting was required as well as results by specialty reflecting the relative volume of services across all services billed by the specialty. We also report results in terms of aggregated payments across services using an updated conversion factor to offset the change in total RVUs.

Results

Updated Work RVUs

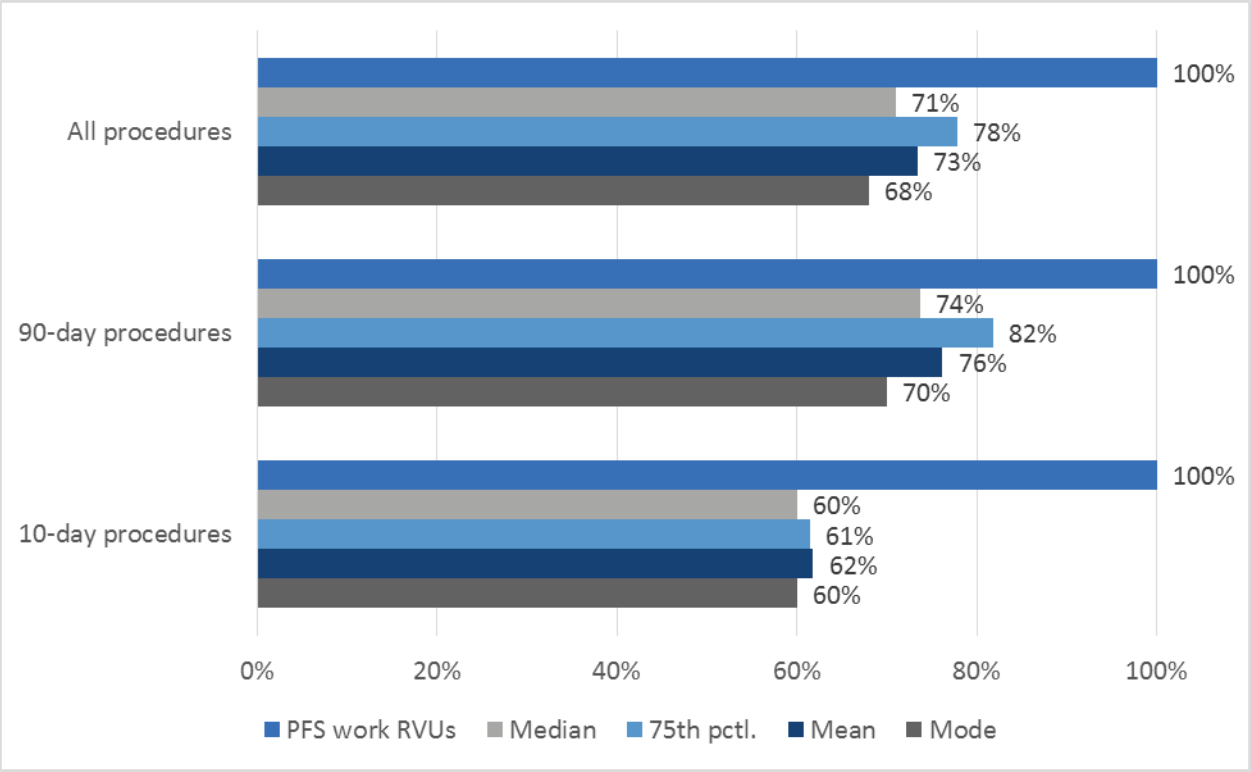
Figure S.1 reports updated work RVUs after removing work RVUs associated with post-operative visits that were assumed but not provided.[7] Depending on which observed visit metric was used as an input in revaluation, the updated work RVUs were between 18 percent and 30 percent lower for procedures with 90-day global periods and between 38 percent and 40 percent lower for procedures with 10-day global periods compared with current work valuations. The choice of using the median, 75th percentile, mean, or modal count of post-operative visits had more of an impact for procedures with 90-day global periods where there was more variation within each procedure code in terms of the number of observed visits. This choice had less of an impact for procedures with 10-day global periods where visits were rarely reported.

We report the impact of revaluation by specialty using aggregate Medicare utilization at the following levels:

- For the 296 procedures for which claims-based reporting was required.
- All procedures with 10- and 90-day global periods, including lower-volume and payments procedures for which claims-based reporting was not required. As noted above, we imputed changes in post-operative visits for these other procedures and calculated new work RVUs in the same way as we did for procedures where reporting was required.

[7] Note that changes in RVUs will not translate directly into changes for payment rates because RVUs are multiplied by a conversion factor that is determined in part by the pool of total RVUs. It is therefore possible for a procedure code to have a higher payment rate even if its RVUs are reduced.

Figure S.1. Share of Work RVUs Remaining After Revaluation Using Different Observed Visit Metrics, 296 Procedures for Which Reporting Was Required



SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: Results reflect the 2018 Medicare volume mix across the 296 procedures where reporting of post-operative visits was required. "PFS" is Physician Fee Schedule. "Pctl." is percentile.

- All Medicare services billed by the specialty, including procedures with 0-day global periods and other services such as E&M visits without any global period.

Table S.1 compares specialty-level aggregate changes in work RVUs using the median of observed visits to calculate updated work RVUs. Overall, we found a 29-percent reduction for procedures for which reporting was required and a 28-percent reduction for all procedures with 10- and 90-day global periods. The latter reduction accounts for a 3-percent reduction in work RVUs aggregated across all services paid under the Physician Fee Schedule (i.e., when expanding the denominator beyond procedures with 10- and 90-day global periods to include all services).[8] The aggregate change in work RVUs is very small for specialties in which the work associated with procedures with 10- and 90-day global periods is small relative to total work (cardiology, diagnostic radiology, interventional radiology, neurology, nurse practitioner/

[8] Our revaluation approach did not adjust the number of work RVUs for any services on the Physician Fee Schedule that did *not* have a 10- or 90-day global period.

physician assistant, podiatry, primary care, and urology). The change in work RVUs remains substantial (greater than a 10-percent reduction in work RVUs) for procedure-focused specialties (e.g., cardiac surgery, colorectal surgery, dermatology, general surgery, hand surgery, neurosurgery, orthopedic surgery, plastic and reconstructive surgery, surgical oncology, thoracic surgery, and vascular surgery). These results reflect changes *only* to work RVUs. Changes in work RVUs would directly change PE and MP RVUs, so the change in total RVUs by specialty would differ from that reported in Table S.1. The PFS conversion factor would be increased to offset any overall change in total RVUs so that total spending would remain unchanged. Therefore, payments would change to a different degree than RVUs. The impacts of changes to work and other inputs on total RVUs are explored in later analyses.

Table S.1. Reduction in Aggregate Work RVUs from Different Revaluation Approaches by Specialty, Across Different Subsets of Procedures

Specialty	296 Procedures Where Reporting Is Required (Percent)	All Procedures with 10- and 90-Day Global Periods Only (Percent)	Reduction in Work RVUs from Procedures with 10- and 90-Day Global Periods Relative to All Physician Fee Schedule Work RVUs* (Percent)
Total	–29	–28	–3
Cardiac surgery	–34	–33	–22
Cardiology	–29	–28	≤1
Colorectal surgery	–28	–33	–17
Dermatology	–41	–40	–14
Diagnostic radiology	–24	–24	≤1
General surgery	–23	–28	–14
Hand surgery	–37	–31	–16
Interventional radiology	–24	–24	–3
Neurology	–33	–29	≤1
Neurosurgery	–27	–27	–14
Nurse practitioner/physician asst.	–54	–32	–2
Ophthalmology	–18	–18	–7
Orthopedic surgery	–29	–27	–15
Other specialty	–32	–29	≤1
Otolaryngology	–29	–28	–5
Plastic and reconstructive surgery	–28	–27	–18
Podiatry	–40	–33	–4
Primary care	–46	–42	≤1
Surgical oncology	–23	–31	–20
Thoracic surgery	–34	–32	–21
Urology	–27	–21	–4
Vascular surgery	–24	–25	–10

SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: All updated work RVUs were calculated using the median of observed post-operative visits. Primary care includes family practice, general practice, and internal medicine.
*The "All HCPCS Codes" results update work RVUs only for procedures with 10- and 90-day global periods and express the reduction in work RVUs relative to work RVUs for all services under the Physician Fee Schedule.

Updated Direct PE Inputs

We found that changes to direct PE inputs had relatively modest specialty impacts on allocated PE RVUs when work and time are unchanged (Table S.2). Reductions in direct PE inputs resulted in a 14-percent reduction in PE RVUs and a 6-percent reduction in total RVUs for procedures with 10- and 90-day global periods. Due to a fixed pool of PE RVUs being allocated across all services under the Physician Fee Schedule, the reductions in PE RVUs for procedures with 10- and 90-day global periods were offset by *increases* in PE RVUs for other Physician Fee Schedule services for a net change of 0 percent for all services by design. The net impacts by specialty was modest when considering all services, ranging from 4-percent reductions in total

Table S.2. Change in PE and Total RVUs Due to Updated Direct PE Inputs Only, Overall and by Specialty

	All Procedures with 10- and 90-Day Global Periods			All Services		
Specialty	**Status Quo PE RVUs from 10-/90-Day Procedures as a Share of Total RVUs**	**%Δ, PE RVUs**	**%Δ, Total RVUs**	**Status Quo PE RVUs from 10-/90-Day Procedures as a Share of Total RVUs**	**%Δ PE RVUs**	**%Δ, Total RVUs**
Total	45%	–14%	–6%	5%	0%	0%
Cardiac surgery	24%	–8%	–2%	14%	–3%	–1%
Cardiology	30%	–13%	–4%	0%	1%	1%
Colorectal surgery	36%	–17%	–6%	18%	–6%	–2%
Dermatology	62%	–17%	–10%	21%	–3%	–2%
Diagnostic radiology	45%	–11%	–5%	1%	1%	0%
General surgery	33%	–13%	–4%	16%	–4%	–2%
Hand surgery	51%	–19%	–9%	26%	–8%	–4%
Interventional radiology	49%	–8%	–4%	4%	1%	1%
Neurology	49%	–18%	–9%	0%	1%	0%
Neurosurgery	36%	–10%	–3%	20%	–4%	–1%
Nurse practitioner/physician asst.	49%	–17%	–8%	4%	0%	0%
Ophthalmology	52%	–12%	–6%	19%	–2%	–1%
Orthopedic surgery	40%	–12%	–5%	21%	–4%	–2%
Other specialty	49%	–11%	–5%	1%	1%	0%
Otolaryngology	48%	–24%	–11%	8%	–1%	–1%
Plastic and reconstructive surgery	48%	–14%	–7%	33%	–9%	–4%
Podiatry	54%	–19%	–10%	7%	0%	0%
Primary care	58%	–20%	–12%	0%	1%	0%
Surgical oncology	33%	–14%	–4%	21%	–7%	–2%
Thoracic surgery	24%	–8%	–2%	15%	–3%	–1%
Urology	35%	–12%	–4%	5%	0%	0%
Vascular surgery	26%	–12%	–3%	5%	1%	1%

SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "%Δ, PE RVUs" is the percent change from status quo PE RVU valuations to updated PE RVU valuations. "%Δ, Total RVUs" is the percent change from status quo total RVU valuations to updated total RVU valuations when adjusting only PE RVUs. Primary care includes family practice, general practice, and internal medicine.

RVUs for hand surgery and plastic and reconstructive surgery to 1-percent increases for cardiology, interventional radiology, and vascular surgery.

Updated Total RVUs, Including Work, PE, and Malpractice RVUs

Our adjustments to work RVUs, physician time, and direct PE inputs (rather than just work or PE individually as presented in the prior sections) resulted in a 28.7-percent reduction in total RVUs for procedures with 10- and 90-day global periods and a slight increase (0.4 percent) for all other Physician Fee Schedule services. The net reduction was 2.7 percent across all Physician Fee Schedule services or $2.6 billion at the 2019 conversion factor.[9] The impact on procedure-focused specialties was larger, with the largest being a 20.6-percent reduction in total RVUs for cardiac surgery (Figure S.2). The small increases in RVUs for primary care, neurology, cardiology, and diagnostic radiology are due to increases in allocated PE and malpractice RVUs for services without 10- and 90-day global periods. The net impact for specialties that bill primarily for services without 10- and 90-day global periods (e.g., cardiology) was positive.

As a final step, we estimated the change in Medicare payments under the Physician Fee Schedule by calculating an updated conversion factor to preserve budget neutrality.[10] Because the overall number of RVUs decreased, the conversion factor (defined as funds available to pay for Physician Fee Schedule services divided by the sum of RVUs) increased. As a result, the reductions in total RVUs for surgical specialties like cardiac surgery, surgical oncology, and thoracic surgery yielded slightly smaller reductions in payments (Figure S.3).[11] For some specialties (e.g., interventional radiology), a small reduction in total RVUs was offset by a higher conversion factor to yield a small increase in payments. Modest increases in total RVUs for other specialties (e.g., cardiology, neurology, and the specialties that report collectively as primary care) yielded a larger (but still modest) increase in payments.

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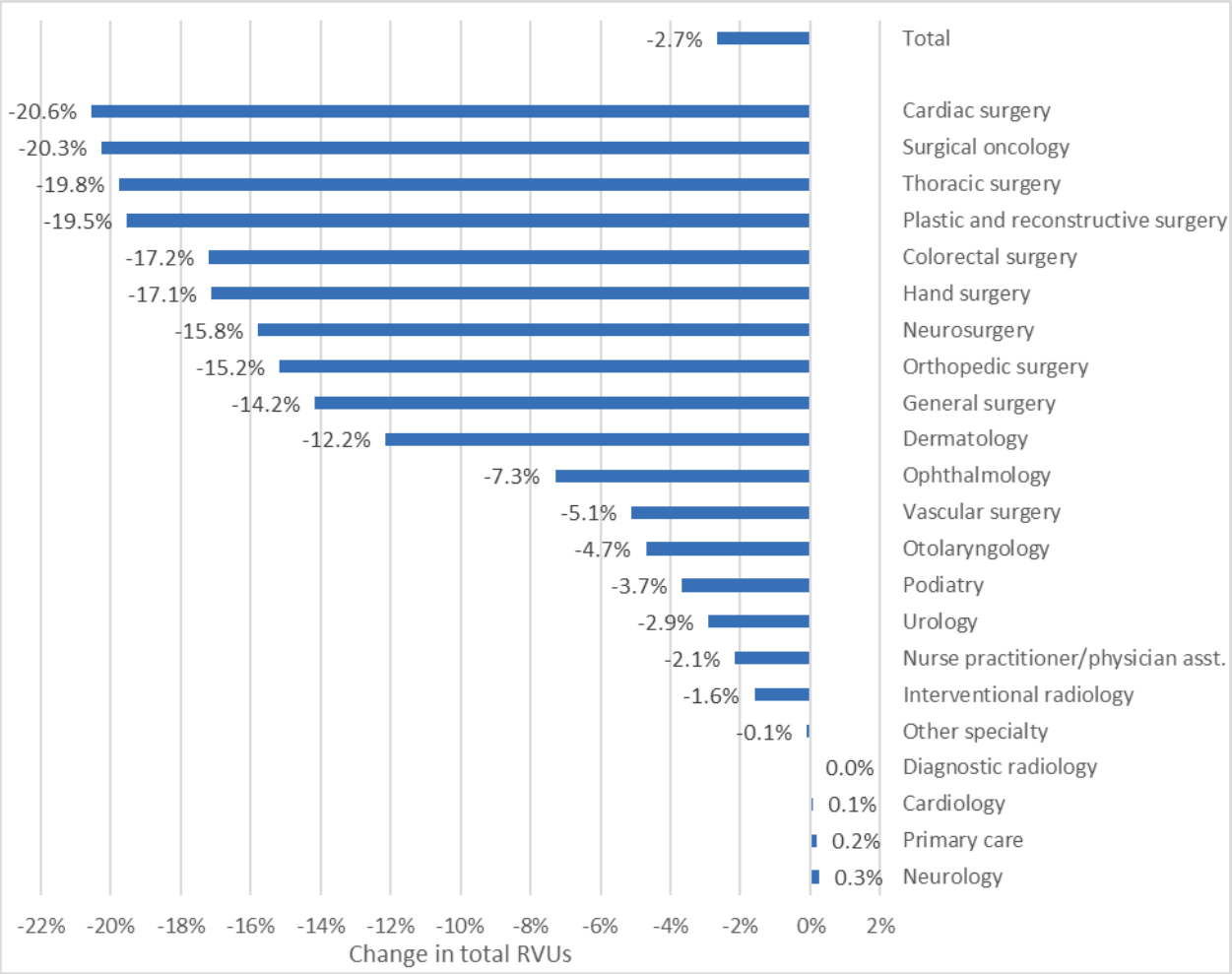
[9] If CMS implemented these reductions in RVUs, the conversion factor would increase with further redistributive implications for payments.

[10] We did not model CMS's transition policy or caps when estimating changes in payments. The actual changes in payments—both decreases and increases—would be moderated by these policies if CMS were to use our revaluations.

[11] A higher conversion factor would also increase payment for certain nonphysician practitioners and other Medicare suppliers paid under the Physician Fee Schedule.

Figure S.2. Percent Change in Total RVUs After Revaluation, by Specialty

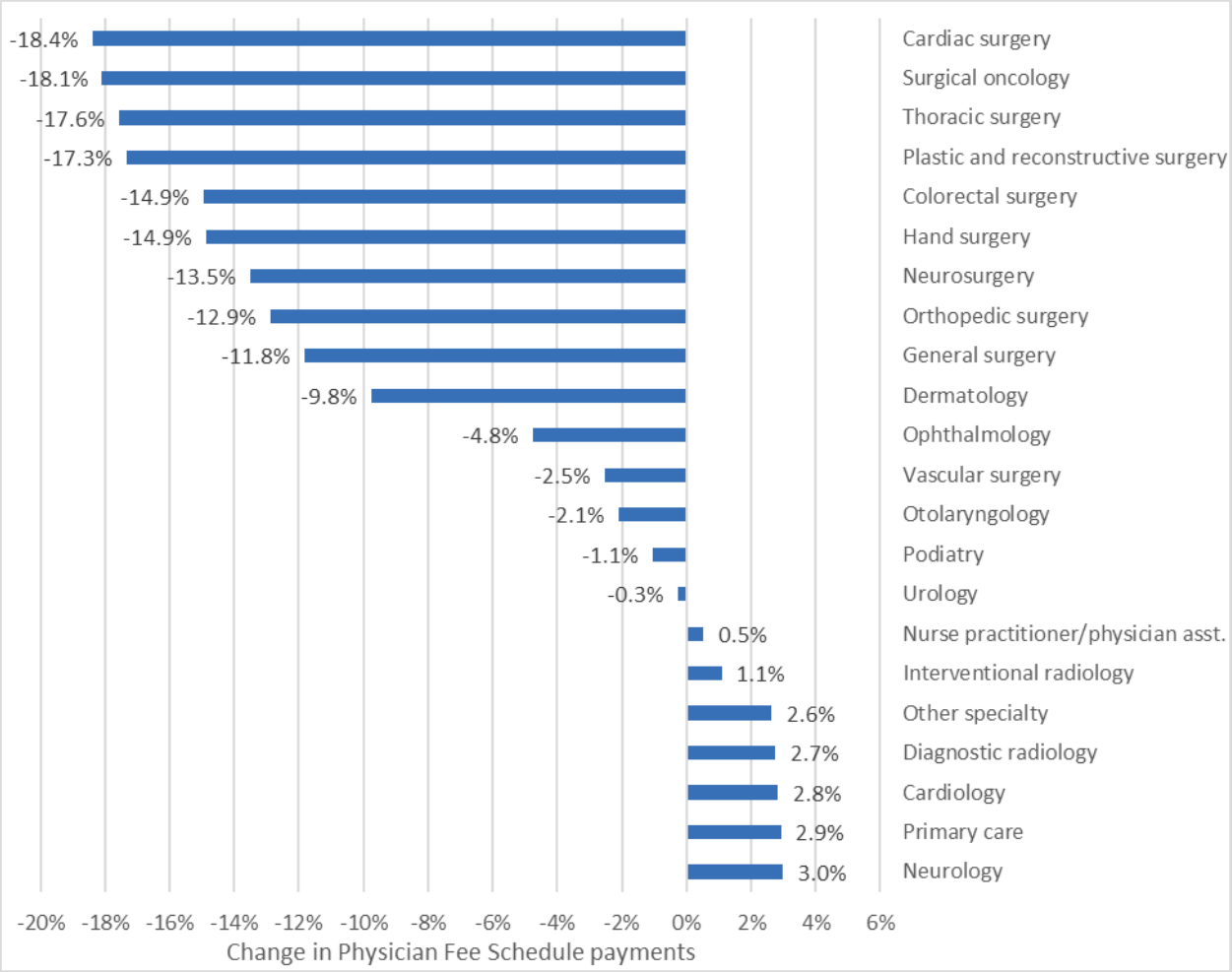


SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "Percent change in total RVUs" is the percent change from status quo total RVU valuations to updated total RVU valuations. Primary care includes family practice, general practice, and internal medicine.

Discussion and Conclusion

This report describes how the reverse building block approach could be used to adjust valuation of procedures with 10- and 90-day global periods using claims-based data on the number of post-operative visits performed. Depending on which statistic describing the number of observed visits we used (e.g., mean, median), the resulting updated work RVUs were between 18 percent and 30 percent lower for procedures with 90-day global periods and between 38 percent and 40 percent lower for procedures with 10-day global periods compared with current work RVU levels. Adjusting direct PE inputs alone resulted in relatively modest reductions in PE and total RVUs for most proceduralist specialties and increases for other specialties such as cardiology. In terms of total RVUs, changes ranged from reductions of

Figure S.3. Percent Change in Physician Fee Schedule Payments After Revaluation, by Specialty



SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "Percent change in Physician Fee Schedule payments" is the percent change from status quo total RVU valuations to updated total RVU valuations. Primary care includes family practice, general practice, and internal medicine.

5.1 percent (vascular surgery) to 20.6 percent (cardiac surgery) among proceduralist specialties and small increases for some other specialties (e.g., cardiology, neurology, and the specialties contributing to our primary care category). These changes in valuation resulted in slightly moderated reductions in payments for surgical specialties due to a higher conversion factor. Payments to primary care practitioners and some other specialties that perform procedures rarely increased—by roughly 3 percent.

There are several potential paths forward for revaluation. PE RVUs could be adjusted as outlined in this report based only on updated direct expenses and time. This approach is motivated by the direct link between the number of assumed post-operative visits and direct PE RVUs. Given that a large share of assumed visits are not actually provided, physician time and

direct practice expenses should be lower. These reductions have implications for PE RVUs allocated to procedures with 10- and 90-day global periods and, due to the allocation of a fixed pool of PE RVUs across all Physician Fee Schedule services, for all Physician Fee Schedule services. The other main revaluation approach would update work, practice expense, and malpractice RVUs based on changes to work RVUs, physician time, and direct practice expenses to reflect the actual number of post-operative visits.

In the longer term, CMS may pivot to a valuation system that is consistent with the building block approach. Such a system would allow for more direct adjustments to valuation based on changes in the number of empirically observed post-operative visits (or other inputs such as physician time).

We did not model other revaluation policies that could be considered in the future, such as changing the duration of global periods or transitioning to more standardized post-operative visit "packages." Overall, the revaluation results presented in this report provide a framework for modeling these other broader changes to Medicare global services.

Acknowledgments

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Abbreviations

CMS	Centers for Medicare & Medicaid Services
CPT®	Current Procedural Terminology
E&M	evaluation and management
GPCI	geographic practice cost index
HCPCS	Healthcare Common Procedure Coding System
HHS	U.S. Department of Health and Human Services
IDR	Integrated Data Repository
MACRA	Medicare Access and CHIP Reauthorization Act of 2015
NPI	National Provider Identifier
PE	practice expense
RBRVS	resource-based relative value system
RUC	RVS Update Committee
RVS	relative value scale
RVU	relative value unit

1. Introduction

Medicare payment for many health care procedures covers not just the procedure itself but also most post-operative care provided by the same practice that billed for the procedure over a fixed period of time (the "global period"). The Centers for Medicare & Medicaid Services (CMS) sets payment rates assuming that a certain number and type of post-operative visits specific to each procedure typically occur. In other research (Kranz et al., 2019), we found that the number of visits actually performed is far below the assumptions used. This report describes how CMS might use data on the number of post-operative visits actually provided to adjust valuation for procedures with 10- and 90-day global periods. The idiosyncrasies of the resource-based relative value scale system (RBRVS) used to determine payment for Medicare services result in some ambiguity about how procedures should be revalued to reflect reductions in post-operative visits. Further, under RBRVS, changes in the valuation of procedures with global periods has important spillover effects on other health care services. We intend the results presented in the report to be a starting point for further policy development for revaluation.

Overview of Global Services

Medicare and most other health insurers pay for surgical procedures at a bundled rate that covers the procedure itself and related visits and other services from the same practice and specialty within a fixed period of time around the procedure. The duration of this "global period" varies depending on the intensity of the procedure. Medicare uses three global period lengths:

- 0-day global periods include the procedure service date only;[1]
- 10-day global periods include the procedure service date and the ten subsequent days;
- 90-day global periods include the day prior to the procedure, the day of the procedure, and the subsequent 90 days.

[1] Procedures with 0-day global periods do not have bundled post-operative visits, although 0-day global periods do cover additional services and procedures related to the initial procedure on the day of the procedure—for example, services related to complications from the initial procedure that do not require a return to the operating room. CMS generally does not allow providers to bill a separate evaluation and management (E&M) visit on the same date of service that a procedure is furnished to a beneficiary. As is the case for procedures with 10- and 90-day global periods, when a visit is appropriate and separately billable during a global period, the provider must use one of several payment modifiers to acknowledge that the visit is during a global service (on the same day, in the case of procedures with 0-day global periods).

Most surgical procedures covered by Medicare are assigned to one of these three global periods.[2]

Medicare's global service policy covers services provided by the practitioner furnishing the initial procedure and services provided by other practitioners in the same practice and specialty as the practitioner furnishing the initial procedure. Practitioners meeting these criteria cannot bill for post-operative care related to the procedure with a global period—for example, post-operative visits and care resulting from complications.[3] They can, however, bill for services unrelated to the procedure by using a payment modifier to indicate that the service is unrelated. CMS also allows for a formal transfer of care using modifiers (54 and 55) in which a practitioner bills for the surgical procedure only and another practitioner bills for post-operative care only.[4] These modifiers are not required when there is no formal transfer of care.

When determining payment rates for procedures, CMS assumes that the global period for nearly all procedures with 10- or 90-day global periods includes one or more post-operative visits.[5] The number of visits that CMS assumes typically occur is informed by data collected through practitioner surveys administered by the American Medical Association/Specialty Society Relative Value Scale Update Committee (the RUC) and its individual specialty society members (the "RUC surveys"). The primary purpose of the RUC surveys is to collect survey data to estimate the physician *time* and *work* associated with procedures and other health care services (i.e., based on Healthcare Common Procedure Coding System [HCPCS] codes). The importance of time and work for valuation is described in the following section.

When a procedure has a 10- or 90-day global period, the RUC surveys ask practitioners to report the number and type of post-operative visits that typically occur during the global period. Respondents use evaluation and management (E&M) visit HCPCS codes, including codes for office and inpatient visits of different levels, discharge visits, and critical care visits, to describe the number and level of these post-operative visits. CMS, when determining the valuation for the procedure, may adjust the visit counts recommended by the RUC through notice and comment rulemaking. The final number of visits are published by E&M HCPCS code in the Physician

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[2] Surgical procedures usually fall within Healthcare Common Procedure Coding System (HCPCS) code range 10000–69999. Surgical procedures accounted for 3,739 of the 8,763 HCPCS codes on the 2016 Physician Fee Schedule. Surgical procedures accounted for $20.0 billion, or 18.4 percent, of Medicare payments under the 2016 Physician Fee Schedule. Most of that spending (92.5 percent) was for a surgical procedure code with a 0-, 10-, or 90-day global period. Other health care services are not surgical procedures, including E&M office visits, pathology and laboratory services, and imaging services.

[3] One exception is when the follow-up care results in a return to the operating room. In this case, the practitioner can bill for the follow-up procedure and a new global period is initiated.

[4] Based on our analyses of claims data, practitioners rarely bill using modifiers 54 and 55.

[5] Medicare administrative contractors have some flexibility to define global periods for certain procedures.

Time File ("Time File") which is posted annually with the Medicare Physician Fee Schedule. The Time File also publishes an estimate of the physician time spent on post-operative visits.[6]

There are several links between the number and level of bundled post-operative visits that are assumed to happen and the valuation of procedures with global periods. These links are described in detail in the following section. Conceptually, the more post-operative visits that are assumed to happen during the global period, the higher the valuation for the procedure and therefore the higher the payment rate for the procedure.[7]

Medicare fee-for-service spending on procedures with 10- or 90-day global periods was $9.9 billion in 2016, or 10.2 percent of total Medicare payments under the Physician Fee Schedule. Our prior research suggests that post-operative visits account for approximately a quarter of these payments (Mulcahy et al., 2015).[8] Historically, CMS has not collected data on how many post-operative visits are actually performed. Prior medical chart reviews by the Department of Health and Human Services (HHS) Office of Inspector General indicated that the number of post-operative visits used for valuation overestimates the number of post-operative visits actually provided in clinical practice for select surgical procedures with global periods (HHS, 2007, 2012a, 2012b). Because post-operative visits make up a large fraction of the valuation of surgical global packages, incorrect or inaccurate inputs related to global services may result in misvalued surgical procedures and over- or underpayment—on average—to providers for specific services. It may also lead to, essentially, double paying for post-operative services to the extent that at least some of these services are provided by another provider, such as a hospitalist, who can bill for them even though there is an implicit payment for them made to the provider of the index service.

Due to concerns that the number of bundled post-operative visits considered when setting payment rates may not reflect the number of visits provided in clinical practice, CMS finalized policy that would unbundle post-operative visits from payment for procedures. However, Congress, as part of the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), prohibited CMS from proceeding with this plan. Congress mandated that CMS collect the data

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[6] The Time File includes estimates of (a) physician time for the entire global service, including post-operative visits, and (b) physician time for all components of the global service *except* post-operative visits. The difference between these times is the time associated with post-operative visits, which is also mathematically the sum of physician time for each E&M HCPCS code assumed to occur during the global period.

[7] We identified 11 global procedures that were revalued (defined as ≥ 10-percent change in work RVUs) between 2017 and 2018. For seven out of the 11 procedures the revaluation was associated with a change in post-operative visits, and in a few select cases the change in number or level of visits was quite large. For example, HCPCS 52601 (Prostatectomy) had a reduction in work RVUs from 15.26 to 13.16, RVUs and the total number of expected post-operative visits fell from seven to 2.5 visits.

[8] Our prior study examined the share of physician work that was associated with post-operative visits. As described below, total Medicare payment for procedures with 10- and 90-day global period involves practice expense (PE) and malpractice components as well as physician work. As a result, the result cited in this sentence should be viewed as a rough estimate.

needed to revalue procedures with 10- and 90-day global periods, including the *number* and *level* of post-operative visits provided in global periods, and to use these data along with other available data to improve the accuracy of valuation of surgical services under the Medicare Physician Fee Schedule.

To gather data on the *number* of post-operative visits, CMS required physicians with ten or more practitioners in their practice in nine states to report post-operative visits using no-pay HCPCS code 99024 (CMS, 2017). CMS contracted with RAND to analyze the data on the number of post-operative visits reported. These results are presented in a previous report (Kranz et al., 2019) and are summarized in Chapter 2.

To gather information on the *level* of post-operative visits, CMS used two additional channels of data collection: (1) a survey of a representative sample of practitioners about post-operative visits furnished during the global periods and (2) direct observation of post-operative care. The survey was fielded by RAND for CMS during 2018 to collect information on the activities, time, staff, and work involved in delivering post-operative care during the global period for three procedures. The direct observation task involved ten surgeons at eight sites across six different surgical specialties and documented workflow processes and tasks completed during post-operative visits. Results from RAND's analysis of the practitioner survey and direct observation are described in another report (Gidengil et al., 2019).

Congress asked CMS to use these data to assess the accuracy of payment and potentially revalue misvalued procedure codes (CMS, 2014b). In this report, we describe an approach that could be used to revalue procedure codes that are potentially misvalued due to the difference between the post-operative visits that CMS assumes happen and the visits that actually occur.

The Resource-Based Relative Value Scale System

CMS uses the RBRVS system to value health care services[9] in terms of the relative resources required to provide the service. Each service is valued under RBRVS in terms of a number of relative value units (RVUs), a "common denominator" used to estimate the resources involved in furnishing a service. The *total* RVUs for each service is determined by a sum of RVUs in three separate components:

1. physician work, which reflects both physician time and the effort, skill, and stress involved in work per unit time;
2. practice expense (PE), including direct PE costs associated with specific labor and supplies used in furnishing the service and indirect PE costs for rent, utilities, and other costs involved in running a physician practice; and
3. malpractice expense.

[9] We use "services" to mean health care services broadly, including procedures and other services (such as office visits). Procedures are a subset of services.

The number of post-operative visits that CMS assumes is part of the global period for a given procedure impacts the valuation of each of these three components. Conceptually, as the number of post-operative visits that is assumed to typically occur during the global period increases, total physician *work* should also increase. Additional bundled post-operative visits also presumably increase CMS's estimate of the total physician *time* involved in the global period, and they certainly affect the direct practice expenses associated with the service. Through higher work and direct costs, the share of a total pool of PE RVUs allocated to the procedure will increase. Through higher time, the share of a total pool of PE RVUs allocated to the specialties that furnish that service will increase. Similarly, higher work RVUs from bundled post-operative visits can result in a larger share of a total pool of malpractice RVUs allocated to the procedure. The specific links between the number of assumed post-operative visits and RVUs in each component are described in the following sections.

Physician Work

Defining Physician Work

In RBRVS, physician work is the product of *physician time* and *intensity per unit time*, where intensity captures the technical skill, mental effort, and psychological stress in furnishing the service. Two procedures with the same typical physician time can therefore have different work RVUs if intensity is different. MedPAC (2018) found that physician time predicts between 77 percent and 79 percent of the variation in total work across procedures in different categories.

RUC Surveys

CMS uses survey data from the RUC as an initial input when establishing new or revised work RVUs for a service.[10] The RUC surveys are typically completed by practitioners in the specialties that perform the services. These surveys (and the valuation process more generally) focus on the "typical" case for a given service and are organized to collect information on physician time for specific activities, including preservice activities, "skin-to-skin" intraservice activities (i.e., actually performing the procedure), and activities immediately after the service.

As noted above, for post-operative visits, the survey asks the practitioner the typical number of post-operative visits performed in both the hospital and office settings following the day of surgery. The survey uses HCPCS codes for E&M visits to collect the post-operative visit information. Typical face-to-face times associated with each E&M visit code for hospital visits (noncritical care inpatient visits, subsequent observation care visits, discharge day management) and office/clinic visits are provided in the survey.

[10] There is no fixed time frame for revaluating work RVUs; some low-volume services are rarely revalued (or have never been revalued since the inception of the RBRVS) while higher-volume and higher-payment services are revised more often.

The RUC surveys collect information on nearly all of the individual "building blocks" needed to calculate total work mechanically. The most notable missing component is intraservice work—the work involved in performing the procedure itself. For many procedures, intraservice time (which is collected) is a significant share of total time (Wynn et al., 2015), which suggests that intraservice work should also account for a significant share of total work.

The surveys also elicit information on the *total work* for the entire service, including post-operative visits in the global period, via a process called "magnitude estimation." This process requires the respondent to select an already-valued service that they feel is most similar to the service that is being assessed. The respondent is then asked to compare the survey service and reference service on different domains of intensity (mental effort and judgment, technical skill/physical effort, and psychological stress) using a scale of 1 to 5 for preservice, intraservice, and immediate post-operative services; a similar ranking is not requested for the post-operative visits.[11] The final survey question asks the respondent to estimate total work RVUs for the service using magnitude estimation and the work value for the reference service.

Work RVU Valuation Process

The RUC meets three times per year to establish work, time, and direct costs for new and revised Current Procedural Terminology (CPT) codes and potentially misvalued services that were identified either through its Relativity Assessment Workgroup or by CMS. The RUC is supported by an Advisory Committee of 123 specialty societies that collect data and make recommendations on the work RVUs, physician time, and direct practice expenses for the codes that the RUC has referred to them via the surveys described above. CMS may adjust the total work, time, or number of post-operative visit recommendations from the RUC. CMS reports the number and type (e.g., inpatient, discharge, outpatient) of post-operative visits that it considered in its valuation of each surgical procedure in the Time File posted with the Physician Fee Schedule each year.

The Relationship Between Post-Operative Visits and Work RVUs

Importantly, the number and level of post-operative visits are not used by the RUC or CMS to directly determine work RVUs. Instead, they are used to inform the discussion. Even though the survey covers each "building block" of work that conceptually should sum to the total, CMS primarily relies on magnitude estimation (i.e., estimates of the *total* work for the services being valued to comparator services).[12] CMS does not necessarily adjust total work when it also adjusts

[11] In RBRVS, physician work is the product of time and intensity where intensity is measured in terms of work per unit time.

[12] For a discussion on the challenges with the reverse building block and magnitude estimation approaches, see Barbara O. Wynn, Lane F. Burgette, Andrew W. Mulcahy, Edward N. Okeke, Ian Brantley, Neema Iyer, Teague Ruder, and Ateev Mehrotra, *Development of a Model for the Validation of Work Relative Value Units for the Medicare Physician Fee Schedule*, Santa Monica, Calif.: RAND Corporation, RR-662-CMS, 2015.

one of the building block components. For example, if CMS adjusts the number of bundled post-operative visits down by one, it does not necessarily have to reduce total work RVUs.

Practice Expense

PE RVUs are designed to capture relative direct and indirect practice costs associated with Physician Fee Schedule services. Data on direct costs—including clinical labor, medical equipment, and medical supplies—have been developed for each service, while indirect expenses are allocated based primarily on physician work, direct expenses, and specialty-specific practice expenses per hour.[13] For all procedures with 10- and 90-day global periods, the direct costs associated with the number and mix of post-operative visits assumed to occur during the global period are included in the service's direct costs. Physician work and time values, which also reflect these post-operative services, affect several aspects of the PE allocation process, primarily the allocation of indirect costs across services. Changes in physician work also result in proportional changes to the size of the overall pool of PE RVUs that is allocated to individual services, while changes in time affects the division of this pool into separate direct and indirect pools.

For new, revised, or misvalued codes, the RUC PE subcommittee reviews estimates put forth by the specialty societies of the direct PE inputs for clinical staff, medical equipment, and supplies associated with each post-operative office visit for a given procedure. For example, the equipment estimate might include a cast cutter and the supplies estimate might include bandages and dressings. CMS reviews the RUC recommendations, develops refined direct cost inputs, and attaches prices to each input (e.g., by attaching current hourly rates to the estimated time for a nurse). For surgical procedures performed in an office setting, a similar step is taken for the direct PE inputs for the intraservice time. No direct costs are associated with intraservice time for procedures performed in a facility setting or hospital inpatient post-operative visits because the facility assumes those costs.

Indirect PE costs are allocated to services based on the direct PE costs specifically associated with a code and with work RVUs. In general, the direct PE costs for post-operative visits are small in comparison to the indirect PE costs associated with the visit.

Post-operative visits therefore contribute to PE RVUs through four channels:

1. to the extent that changes in post-operative visits contribute to changes in work RVUs (as described above), they influence the size of the overall pool of PE RVUs;

[13] For a detailed overview of practice expense methodology, see Stephen Zuckerman, Katie Merrell, Robert A. Berenson, Nicole Cafarella Lallemand, and Jonathan Sunshine, *Realign Physician Payment Incentives in Medicare to Achieve Payment Equity Among Specialties, Expand the Supply of Primary Care Physicians, and Improve the Value of Care for Beneficiaries*, Washington, D.C.: The Urban Institute, January 5, 2015; and Lane F. Burgette, Jodi L. Liu, Benjamin M. Miller, Barbara O. Wynn, Stephanie Dellva, Rosalie Malsberger, Katie Merrell, PhuongGiang Nguyen, Xiaoyu Nie, Joseph D. Pane, Nabeel Shariq Qureshi, Teague Ruder, Lan Zhao, and Peter S. Hussey, *Practice Expense Methodology and Data Collection Research and Analysis*, Santa Monica, Calif.: RAND Corporation, RR-2166-CMS, 2018.

2. they contribute to direct costs for the service, which affect PE RVUs directly and via the indirect cost allocation;
3. they contribute to physician time that determines the relative magnitudes of the direct and indirect PE pools that are allocated across services; and
4. they contribute to work RVUs that are used as part of the basis of allocating indirect PE RVUs to individual services.

Malpractice Expense

Work RVUs, along with premium risk factors and volume shares by specialty, are used to allocate malpractice RVUs to each service. Post-operative visits contribute to higher work RVUs and therefore result in higher allocated malpractice RVUs. As with PE, changes in work RVUs (due to changes in post-operative visits and other factors) result in proportional changes in the size of the malpractice RVU pool that is allocated across services.

Links Between the Number of Post-Operative Visits and Valuation

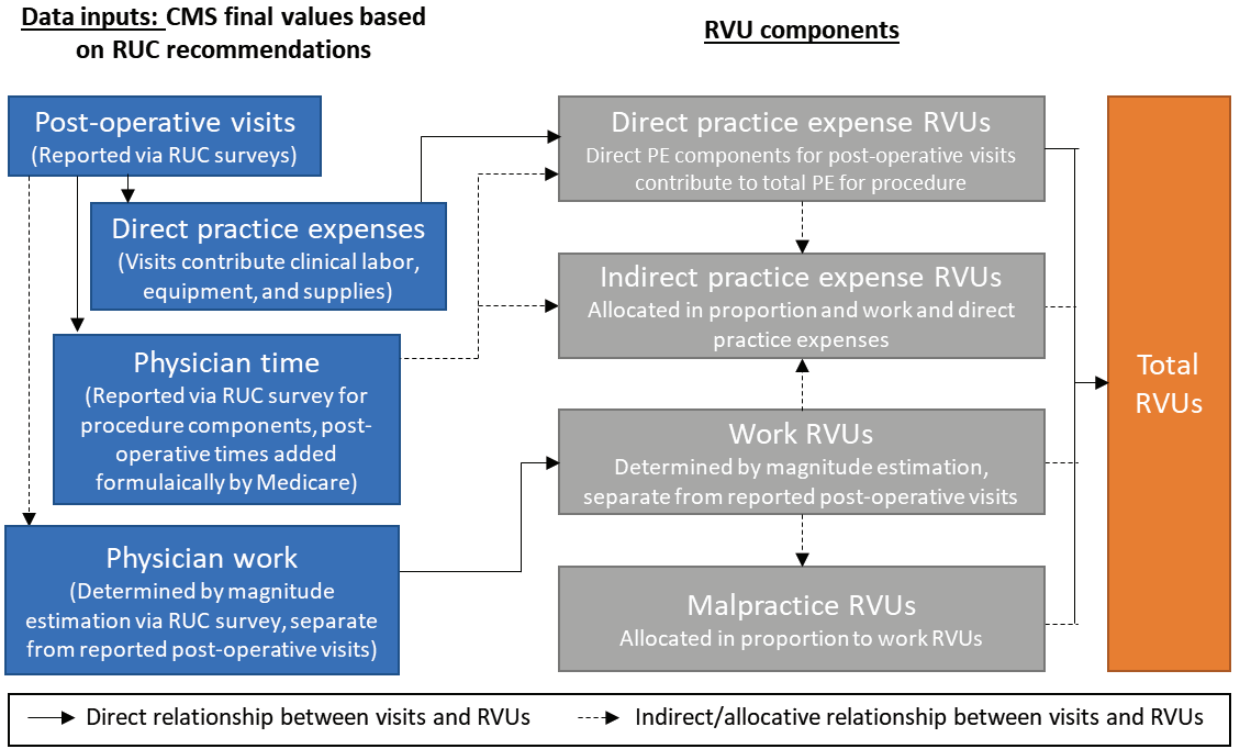
As described above, there are several links between the number of post-operative visits and Physician Fee Schedule valuation. In the current valuation system, the link between these visits and work RVUs is indirect; reducing the number of bundled post-operative visits does not automatically result in a reduction in work RVUs because physician work RVUs are estimated using magnitude estimation rather than a building block approach, and while respondents to RUC surveys report the number and level of bundled post-operative visits, it is not clear whether they fully incorporate the post-operative visits in their estimate of total work. It is also not clear how CMS's final decisions regarding valuation reflect the number of post-operative visits that are assumed to typically occur. In contrast, there is a direct link between post-operative visits and direct PE inputs and physician time. Physician work, physician time, and direct PE inputs have important impacts in the allocation of indirect PE and malpractice RVUs.

Figure 1.1 provides an overview of these relationships. In sum, the number of post-operative visits that CMS assumes occur influences all three components; there is a direct effect on direct PE RVU through the labor, equipment, and supply costs contributed by post-operative visits and indirect influences on work, indirect and total PE, and malpractice RVUs.

From Valuation to Payment Rates

Before they are combined to create a payment rate, each of the three components is adjusted for geographic variation in prices. A separate geographic practice cost index (GPCI) is applied for each of the three relative value scales defined in each of the Physician Fee Schedule payment areas. Work, PE, and malpractice RVUs are each multiplied by their respective GPCIs, and these three products are summed to create a total RVU in each payment area for each service. These geographically adjusted total RVUs are multiplied by the national conversation factor ($36.04 in 2019) to determine the actual payment rates in each locality.

Figure 1.1. Overview of Post-Operative Visits' Role in Medicare Valuation for Global Services



Changes to the Physician Fee Schedule are required by law to be budget neutral. CMS achieves budget neutrality by defining the conversion factor as the set amount available to pay for all Physician Fee Schedule services each year divided by the sum of total RVUs across all Physician Fee Schedule services. The only way that the number of total RVUs across all Physician Fee Schedule services can change over time is through changes in work RVUs (which are not constrained to a fixed pool) or in the volume and mix of services. The direction and magnitude of changes to work RVUs for a specific service do not directly translate into changes in payment because the conversion factor is updated simultaneously.[14]

Organization of This Report

In Chapter 2, we describe our findings from the claims-based data collection and the survey data collection and the implications for revaluing global procedures. In Chapter 3, we describe the data and methods we use for our analysis. Chapter 4 reports on variation in the number of reported post-operative visits for procedures with 10- and 90-day global periods compared

[14] It is possible for a slight increase or decrease in work RVUs to lead to a payment change in the opposite direction due to simultaneous changes in the conversion factor.

with the expected number of visits, by specialty, and explores sources of the variation. Chapter 5 presents potential changes to work, PE, and total RVUs for procedures with 10- and 90-day global periods based on the observed number of visits. In Chapter 6, we present potential next steps for CMS to consider. Details of the data and methods we used are included in Appendix A.

2. Summary of Recent Work on Number and Level of Visits and Revaluation Approach

The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) required CMS to collect information on the number and level of post-operative visits actually provided and to use the collected data and other information to revalue procedures. As noted above, CMS took several approaches to collect these data and the results have been published in other reports. In this chapter, we summarize the findings of those reports and the implications of the results for revaluation.

Claims-Based Data Collection Findings

To support CMS in exploring the global surgery costs, we analyzed Medicare fee-for-service claims data from practitioners who billed Medicare for select procedure codes between July 1, 2017, and June 30, 2018, in the nine states where practitioners were required to report post-operative visits using the no-pay code. Reporting was required on procedure codes that had a 10- or 90-day global period, were performed by more than 100 practitioners, and were either performed more than 10,000 times or had allowed charges greater than $10 million (CMS, 2018). The selected codes accounted for 96.5 percent of all the procedures furnished with 10-day global periods and 85.3 percent of all procedures with 90-day global periods in 2017 (Kranz et al., 2019). In order to correctly link a given procedure and post-operative visit(s), we limited our analysis to procedures that did not overlap with the 10- or 90-day global period for any of a beneficiary's other procedures ("clean" procedures). We linked 1.4 million procedures to 931,640 post-operative visits.

When examining clean procedures, we found that 3.7 percent of the 961,006 procedures with 10-day global periods had any type of post-operative visits reported. Of the 457,256 procedures with 90-day global periods, 70.9 percent had one or more associated post-operative visits reported.

We compared the number of post-operative visits for each procedure reported in the claims data with the number of expected post-operative visits (e.g., the number in the Time File) for each procedure (Table 2.1). Overall, the ratio of observed to expected post-operative visits provided was 0.04 for procedures with 10-day global periods and 0.39 for procedures with 90-day global periods, with little variation across practice size.

Table 2.1. Ratios of Observed to Expected Post-Operative Visits Provided

	Procedures with 10-Day Global Periods			Procedures with 90-Day Global Periods		
	Total Expected Post-Operative Visits	Total Reported Post-Operative Visits	Ratio of Observed to Expected Visits	Total Expected Post-Operative Visits	Total Reported Post-Operative Visits	Ratio of Observed to Expected Visits
Total	1,004,516	43,542	0.04	2,253,661	888,098	0.39
Practice size						
10–24 practitioners	348,897	12,807	0.04	588,044	222,078	0.38
25–99 practitioners	330,557	14,079	0.04	710,573	284,997	0.40
100 or more practitioners	325,063	16,656	0.05	955,044	381,023	0.40

SOURCE: Integrated Data Repository (IDR), CMS (12/13/2018). The 99024 claims listed in this table were linked to procedures that were furnished between July 1, 2017, and (including) June 30, 2018.
NOTES: Procedure counts included in the table are limited to the procedure codes for "clean" procedures that were linked to post-operative visits for practitioners in practices with ten or more practitioners in the nine states where reporting of post-operative visits was required. Expected counts of post-operative visits are from the Time File.

Underreporting of post-operative visits may be driving these low rates. However, in sensitivity analyses limited to practitioners who were actively reporting their post-operative visits, the ratio of observed to expected post-operative visits increased only slightly and did not change our main conclusion. Another potential way to explain the low rates of post-operative visits was that post-operative care is occurring during E&M visits or included with appointments for subsequent procedures. In a second set of sensitivity analyses, we used a more expansive definition of post-operative care that also included (1) E&M visits during the global period by the same practitioner who performed the original procedure, (2) E&M visits and procedures by the same practitioner who performed the original procedure, and (3) E&M visits and procedures furnished by anyone in the practice with the same specialty as the practitioner who performed the original procedure. These changes increased the ratio of observed to expected post-operative visits only modestly and did not change our main conclusion. Collectively, these findings suggest that a large share of expected post-operative visits is not delivered and that underreporting is unlikely to fully explain the low ratio of expected post-operative visits provided.

Survey-Based Data Collection Findings

MACRA also required CMS to collect information on the *level* of post-operative visits bundled in global periods. Given the difficulty in fielding the survey to a wide range of specialties and procedures, we focused on three high-volume procedures with global periods that were common enough to likely result in a robust sample size: (1) cataract surgery, (2) hip arthroplasty, and (3) complex wound repair. To support CMS in collecting these data, we developed and fielded a survey during 2018 to collect information on the activities, time, staff, and work involved in delivering post-operative care during the global period (Gidengil et al., 2019).

We sampled 1,555 physicians in each procedure. A total of 725 physicians billing frequently for cataract surgery, hip arthroplasty, and complex wound repair reported on the time, activities, and staff involved in 3,469 visits. Our findings on physician time and work from the survey were broadly similar to what we expected based on the Time File for cataract surgery and hip replacement and somewhat different for complex wound repair.

We found that the time associated with each post-operative visit for cataract surgery and hip arthroplasty was about the same or slightly less than the corresponding E&M visits currently in the bundle. For complex wound repair, the time was slightly more than expected (Table 2.2).

Table 2.2. Comparison of Observed to Expected Practitioner Time Spent on the Visit

	Cataract Surgery	Hip Arthroplasty	Complex Wound Repair
Practitioner time spent on day of visit in minutes as reported in survey	16.5 (15.4–17.5)	22.9 (21.6–24.2)	21.8 (19.2–24.5)
Practitioner time spent on day of visit in minutes as reported in the Time File	19.4	29.6	16.0
p-value	< 0.001	< 0.001	< 0.001

SOURCE: RAND analysis of survey data.
NOTE: Physician time in minutes from the Time File was calculated by summing the minutes associated with each of the E&M visits in the bundle and dividing by the total number of visits.

Respondents reported that the work involved in cataract surgery and hip replacement post-operative visits was slightly less than the work implied by the E&M visits considered during the valuation of these procedures (i.e., the visits listed on the Time File). Respondents reported that the work involved in complex wound repair visits was significantly more than expected based on Time File values. The complex wound repair result could reflect a higher share of visits that involved complications or additional procedures on the wound.

Table 2.3. Comparison of Observed to Expected RVUs

	Cataract Surgery	Hip Arthroplasty	Complex Wound Repair
Average perceived RVUs per visit as reported in survey	0.87 (0.84–0.91)	1.01 (0.98–1.04)	0.78 (0.74–0.82)
Expected RVUs per visit as based on the Time File	0.71 with half discharge visit, 0.89 without	1.10	0.48
Observed to expected ratio	97.8%	91.8%	162.5%

SOURCE: RAND analysis of survey data.
NOTES: Average RVUs per visits as reported in the survey were calculated by multiplying the average work as a percentage of the reference code (99213 or 99232) by the RVUs assigned to the reference code (0.97 or 1.39 RVUs). For visits reported relative to 99232, we converted the reported work to be comparable to 99213 by multiplying by the ratio of work RVUs for 99232 to 99213 (1.39/0.97). Expected RVUs were the number of RVUs assigned to each visit in the Time File that were then summed and divided by the total number of visits in the Time File.

Implications of Claims Data and Survey Findings for Revaluation

RAND's analysis of the *number* of visits reported using HCPCS code 99024 found that fewer visits were provided than are assumed by Medicare during the valuation process. These findings suggest that the total work RVUs and direct PE RVUs for procedures with 10- and 90-day global periods are too high. As described above, inflated work RVUs can also translate into inflated shares of indirect PE and malpractice RVUs. Overvaluation of procedures with 10- and 90-day global periods leads to overpayment for procedures, distorted incentives for practitioners to overprovide these services, and inflated beneficiary cost-sharing burden for these services.

There are also important distributional implications because the conversion factor applied to all services is determined by the ratio of total funding to the sum of work RVUs across all services. The denominator in this calculation is inflated to the extent that work RVUs are inflated for procedures with 10- and 90-day global periods. The resulting conversion factor applied to all Physician Fee Schedule services is smaller than it would be with accurate valuation of procedures with 10- and 90-day global periods, leading to smaller payments to specialties that do not provide a large volume of procedures with 10- and 90-day global periods (such as family practice physicians).

RAND's analysis of information on the *level* of visits submitted via a survey also has implications for revaluation, although to a lesser extent given the narrower scope for the survey-based data collection. The ratios in Table 2.3 suggest that the work and time involved in post-operative visits for the three procedures differs—slightly less in the case of cataract surgery and more for complex wound repair—from the E&M code analogues reported in the Time File.

The survey findings are limited to just three procedures for which data were collected. With more comprehensive survey-based information (e.g., covering more high-volume procedures or a broader set of specialties), post-operative visit work estimates could be developed directly and used in revaluation. For the purposes of our revaluation analysis, we proceed primarily with data collected related to the *number* rather than *level* of visits. We present some exploratory results using data collected on both the number and level of visits for the three procedures where both types of data are available.

3. Revaluation Approach Overview

Our revaluation approach focuses on the difference between the number of observed post-operative visits via claims-based reporting and the expected number of post-operative visits used during valuation. The approach has been called the "reverse building block approach."

As described above, there are links between the number of bundled post-operative visits and physician work, direct PE, indirect PE, and malpractice RVUs. There is some ambiguity regarding how a change in post-operative visits translates into a change in total work RVUs depending on the decision to rely on the reverse building block or magnitude estimation approach. In contrast, a change in post-operative visits clearly affects physician time and direct PE inputs. As described in Chapter 1, changes in work RVUs, physician time, and direct PE inputs will in turn affect the allocation of indirect PE and malpractice RVUs to all services, regardless of whether the service has a 10- and 90-day global period.

In order to provide CMS and a broader policy audience with estimates to frame a discussion, we revalued procedures by adjusting work RVUs, physician time, and direct PE inputs based on the difference between the number of post-operative visits observed via claims-based reporting and the expected number of post-operative visits used during valuation. There are three steps in our reverse building block approach:

1. *Calculate updated work RVUs* and physician time values by adjusting (that is, in all cases in our report, subtracting) work RVUs and minutes to reflect the number of observed rather than assumed post-operative visits.
2. *Calculate updated PE RVUs* by adjusting (again, in all cases in our report, subtracting) direct PE (clinical labor, equipment, and supply) inputs to reflect the number of observed rather than assumed post-operative visits and subsequently allocating indirect PE. Note that updated work RVUs do not contribute to the results from this step.
3. *Calculate updated total RVUs*, including allocated PE and malpractice RVUs, using updated physician work RVUs and physician time from the first step and updated direct PE inputs from the second step.

Details of the data and methods we utilized for each step are included in Appendix A.

We modeled changes to work RVUs and changes to PE RVUs due to reductions in direct PE inputs separately for two reasons. First, CMS may be interested in making more targeted changes to valuation using just one of these components. For example, CMS may opt to revalue direct PE RVUs only based on post-operative visits that do not occur because there is a very direct link between the number of assumed visits and direct PE inputs (in contrast to work where the link is more ambiguous). Second, we report work results separately because work RVUs, unlike PE and malpractice RVUs, are assumed to be exogenous in the RBRVS system—that is, they enter into valuation directly based on RUC recommendations and CMS decisions rather than being calculated or allocated by the RBRVS machinery. Assessing changes to work RVUs alone also

avoids spillover effects from adjusted to unadjusted services under RBRVS (such as the allocation of PE and malpractice RVUs across services) that can obfuscate the effect of our modeled changes.

Adjusting Work RVUs Only

We first calculated the average work RVU for the number and mix of visits assumed to occur during the global period. The reverse building block involves calculating new work RVU values that remove the work associated with this average visit work for the number of visits that do not appear to be provided, based on the difference between the number of assumed and observed post-operative visits:

$$WorkRVU_{new} = WorkRVU_{pfs} - \overline{VisitRVU_{tf}}\,(VisitCount_{tf} = VisitCount_{claims})$$

In the equation above, $WorkRVU_{pfs}$ is the status quo work RVUs from the Physician Fee Schedule; the mean of $VisitRVUs_{tf}$ is the mean of status quo E&M visit work RVUs listed in the Time File; $VisitCount_{tf}$ is the count of assumed visits in the Time File; and $VisitCount_{claims}$ is a count of visits reported via claims. We use several different values of $VisitCount_{claims}$, including using the median, 75th percentile, mean, and mode of observed visits. We then present the net results in terms of changes in total RVUs (including work, PE, and malpractice RVUs) after applying both steps. The next chapter describes our methods in more detail.

The revaluation approach for work RVUs outlined above relies on empirical estimates of the *number* of post-operative visits from claims-based analyses but *not* information on the *level* of visits, which is collected via the survey. Appendix B describes methods and results from exploratory analyses where we used information on both (a) the number of post-operative visits and (b) the level of post-operative visits collected survey data for three procedures—cataract surgery, hip arthroplasty, and complex wound repair.

Adjusting Direct PE Inputs Only

In contrast to physician work, there is an unambiguous link between the number of bundled post-operative visits and direct PE inputs for procedures with 10- and 90-day global periods. Our broad approach is to remove the share of clinical time, equipment, and supplies associated with post-operative visits that were not delivered, as determined by the difference between assumed and the median observed visits. We calculated changes to PE RVUs making only this change—and not changes to work RVUs. The resulting changes to PE RVUs could be implemented by CMS without adjusting work RVUs at all.

Adjusting Work, PE, and Malpractice RVUs Together

As a final step, we updated physician work using the reverse building block approach described above; adjusted direct PE inputs as described above; allocated PE RVUs using updated direct PE inputs, physician time, and physician work; and finally, allocated MP RVUs using updated physician work. We used the median observed visits to make adjustments to physician work RVUs, physician time, and direct PE inputs. This final step describes the fullest extent to which CMS could use the newly collected data to revalue procedures with 10- and 90-day global periods to reflect the number of delivered visits.

Revaluation Approach Assumptions

Our revaluation approach makes four key assumptions. First, it assumes that the bundled post-operative visits that were not observed did not occur. As described above, the findings from sensitivity analyses in RAND's prior study on claims-based reporting of post-operative visits suggest that underreporting of post-operative visits was not a major driver of the small share of expected visits that were reported to CMS.

Second, it assumes that the amount of physician work included in the total value for post-operative visits aligns with the average work for corresponding E&M visits as indicated in the Time File.

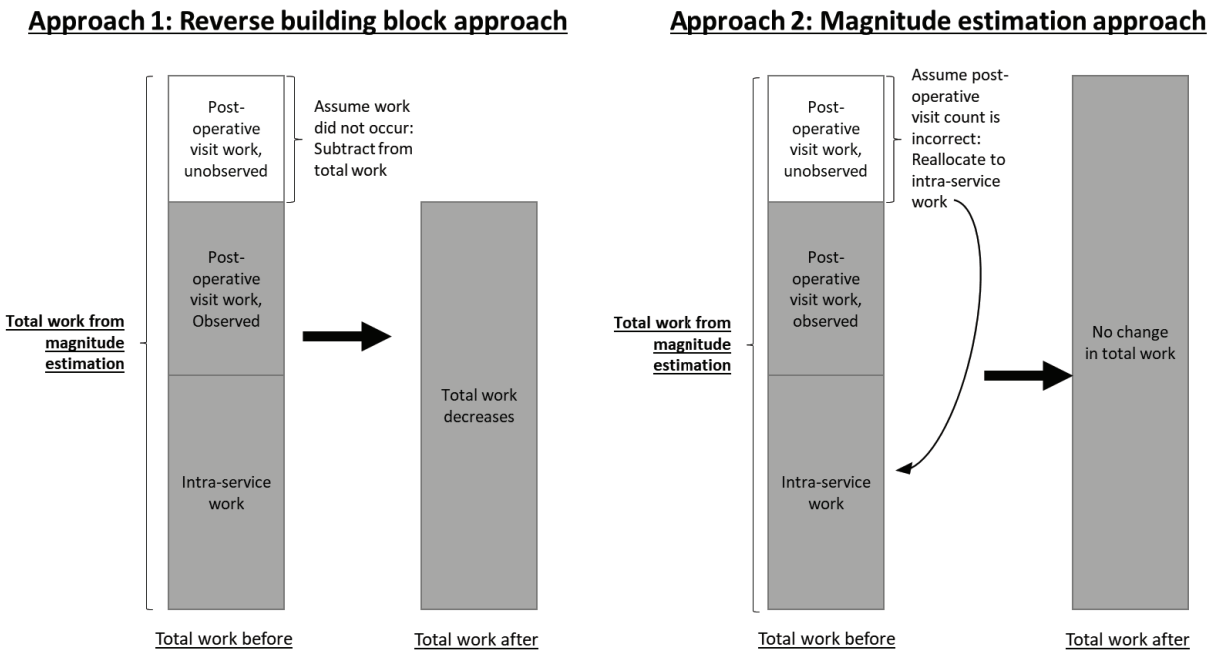
Third, we chose between a number of metrics to capture the "typical" number of post-operative visits actually provided. We used the median observed visits as a primary approach because medians are used elsewhere in the valuation process—for example, as the approach to estimate typical physician time. We considered other estimates of the number of visits when updating work RVUs, including the modal and mean reported visits as other potential approaches to define the "typical" case that is relevant for valuation and the 75th percentile which may be of interest to CMS as a policy alternative.

Fourth, and most importantly, our approach removes all of the work RVUs associated with visits that did not occur. There is an underlying tension between two approaches to calculating the total work associated with a procedure. The reverse building block approach that we used assumes total work is the sum of work contributed by different components of the procedure and global package (including post-operative visits). The approach that is the most different from the one that we used would be to assume that the total work from magnitude estimation is accurate and to not adjust work RVUs at all. See Figure 3.1 for a comparison of the reverse building block and magnitude estimation approaches. It is impossible to know whether RUC survey respondents and the RUC itself arrived at their estimates of total work via magnitude estimation considering an accurate or inflated number of post-operative visits. Likewise, it is impossible to know whether CMS's final valuation decisions reflect the number of assumed or actual post-operative visits. Again, we do know that the assumptions regarding the number of visits are generally

available to the RUC when it determines its final recommendations, as well as to CMS when it proposes and finalizes values through notice and comment rulemaking.

While our current analyses cannot provide insight on how the RUC and CMS incorporated these data, hybrids of the reverse building block and magnitude estimation approaches are feasible. Under a hybrid approach, observing fewer than expected post-operative visits could result in a smaller reduction to total work compared with the reduction under the reverse building block approach result (i.e., the result in terms of total work would be in between the two extremes depicted in Figure 3.1). We discuss possible hybrid models in the final chapter of the report.

Figure 3.1: Reverse Building Block Versus Magnitude Estimation Approach



4. Variation in Reported Post-Operative Visits

CMS's valuation of surgical procedures and other services under the Physician Fee Schedule focuses on the "typical" patient and clinical context. There is some room for interpretation in deciding what constitutes a "typical" course of post-operative visits. Our previous study reports the *mean* number of post-operative visits reported using HCPCS code 99024 for each of the procedures for which claims-based reporting was required (see Kranz et al., 2019). If the distribution of post-operative visits per global period is skewed to the right—that is, if a relatively small number of procedures have many visits while most have relatively few—then the mean number of visits will be higher than the *median* or *modal* (i.e., most common) number of visits, which are two other statistics that CMS could use to describe the "typical" number of post-operative visits. CMS could also decide to use another summary statistic—for example, the 75th percentile—as a way to gradually implement reductions in post-operative visits or to ameliorate the magnitude of the reduction.

We explored the distribution of the number of reported post-operative visits for each of the 296 procedure codes for which reporting is required with the goal of informing subsequent decisions on which summary statistics should be considered for use in valuation. We calculated the median, 75th percentile, mean, and mode of the distribution of the count of post-operative visits reported using HCPCS code 99024 for each of the HCPCS codes where reporting was required.

Figures 4.1 and 4.2 illustrate the distribution of reported post-operative visits for two high-volume procedure codes for cataract surgery (HCPCS code 66984) and hip arthroplasty (HCPCS

Figure 4.1. Distribution of Reported Post-Operative Visits, HCPCS Code 66984 (Cataract Surgery)

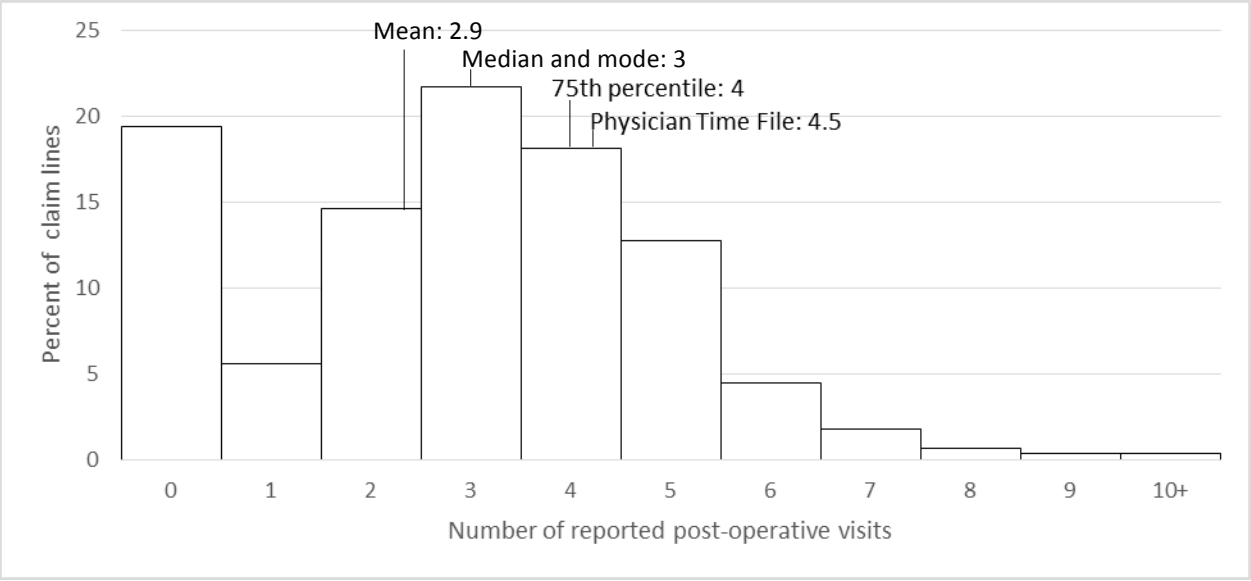
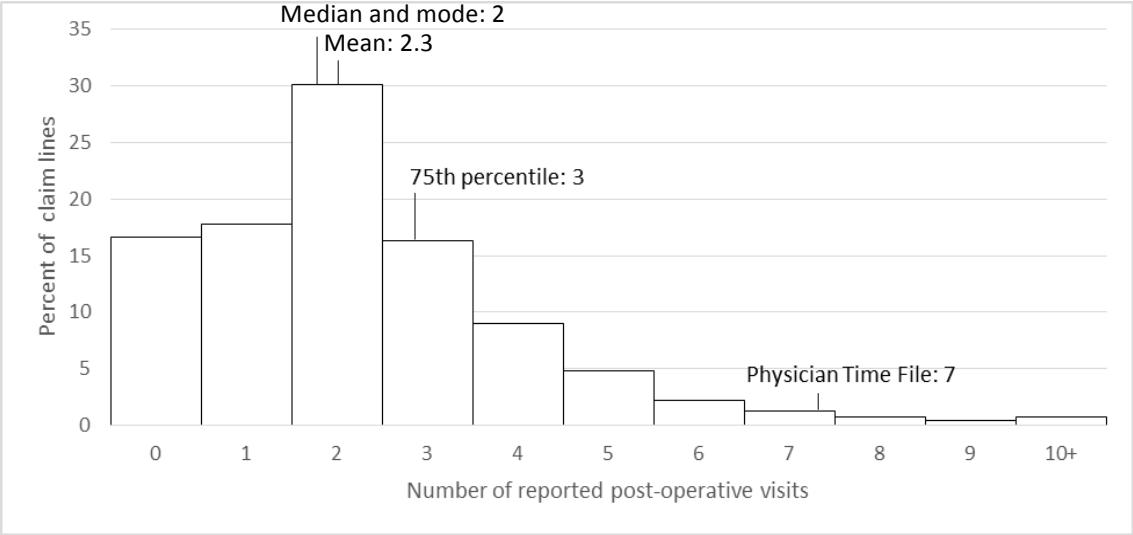


Figure 4.2. Distribution of Reported Post-Operative Visits, HCPCS Code 27130 (Hip Arthroplasty)



code 27130). In both cases, the Time File count of visits was higher than the observed mean, median, 75th percentile, and mode. We report summary statistics describing the distribution of the count of reported post-operative visits for the top ten procedures with 90-day global periods (Table 4.1) and procedures with 10-day global periods (Table 4.2) by Medicare volume. Results for all codes for which reporting was required are in Table B.1 in Appendix B.

Table 4.1. Reported Post-Operative Visit Counts for the Top Ten Procedures with 90-Day Global Periods by Volume

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	Medicare Volume
66984	Cataract surg w/iol 1 stage	4.5	3	4	2.89	3	1,680,887
66821	After cataract laser surgery	2	1	1	0.76	1	637,157
27447	Total knee arthroplasty	7	2	3	2.46	2	319,995
27130	Total hip arthroplasty	7	2	3	2.28	2	163,089
66982	Cataract surgery complex	4.5	3	4	2.74	0	162,580
47562	Laparoscopic cholecystectomy	2.5	1	1	1.18	1	109,328
64721	Carpal tunnel surgery	3.5	1	2	1.36	1	104,552
33208	Insrt heart pm atrial & vent	3	1	2	1.08	0	99,957
29827	Arthroscop rotator cuff repr	5.5	2	3	2.26	3	94,671
63047	Remove spine lamina 1 lmbr	6	2	3	1.96	2	89,093

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018). Medicare volume is 2018 discounted units of service from aggregate Medicare utilization data.
NOTES: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods. Medicare volume reflects total Medicare program volume adjusted for payment modifiers. The CPT short descriptors are those available in the Physician Fee Schedule.

Table 4.2. Reported Post-Operative Visit Counts for the Top Ten Procedures with 10-Day Global Periods by Volume

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	Medicare Volume
17000	Destruct premalg lesion	1	0	0	0.01	0	4,588,227
17110	Destruct b9 lesion 1–14	1	0	0	0.01	0	2,049,227
17004	Destroy premal lesions 15/ >	1	0	0	0.01	0	861,245
10060	Drainage of skin abscess	1	0	0	0.15	0	413,247
68761	Close tear duct opening	1	0	0	0.03	0	341,423
64635	Destroy lumb/sac facet jnt	1.5	0	0	0.02	0	252,467
17262	Destruction of skin lesions	1	0	0	0.03	0	239,408
12032	Intmd rpr s/a/t/ext 2.6–7.5	1	0	0	0.11	0	224,558
11750	Removal of nail bed	1	0	0	0.10	0	194,732
13132	Cmplx rpr f/c/c/m/n/ax/g/h/f	1	0	1	0.33	0	173,065

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018). Medicare volume is 2018 discounted units of service from aggregate Medicare utilization data.
NOTES: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods. Medicare volume reflects total Medicare program volume adjusted for payment modifiers. The CPT short descriptors are those available in the Physician Fee Schedule.

There were some similarities across all procedures with 90-day global periods. First, the means and medians were relatively similar. While there was a small number of each procedure with many visits (i.e., a long right tail to the distribution of visits), there was also often a share of procedures without any reported post-operative visits. This resulted in roughly aligned means and medians. The mean was greater than the median by more than a single visit for only 15 percent of 90-day procedures for which reporting was required. Second, the median, mean, and modal reported visits were never greater than expected visits from the Time File. The 75th percentile of reported visits was greater than expected visits from the Time File for only three procedure codes.[1]

There were also commonalities across procedures with 10-day global periods. Nearly all 10-day global procedures had median, 75th percentile, and mode reported visits of zero and mean reported visits very close to zero. Only one procedure of the 111 for which reporting was required—HCPCS code 64555, "implant neuroelectrodes"—had a median of one visit (the

[1] HCPCS codes 15731, "Forehead flap w/vasc pedicle"; 28308, "Incision of metatarsal"; and 64581, "Implant neuroelectrodes."

same procedure also had a mode of one). Sixteen procedures had a 75th percentile of one visit. Three-quarters of procedures had a mean of less than 0.25 visits and only two had a mean above 0.5 visits.[2] Overall, post-operative visits for most procedures with 10-day global periods rarely occurred.

We calculated the share of visits that would have been expected for each specialty if the number of visits on the Time File was replaced with the observed median, 75th percentile, mean, and mode (Table 4.3). The first four columns of Tables 4.3–4.5 replicate results from our earlier report (Kranz et al., 2019). As we described in that report, the ratio of observed to expected post-operative visits is generally low across specialties, particularly for specialties performing procedures with primarily 10-day global periods and for specialties furnishing relatively few procedures where reporting was required on a per-practitioner basis (such as neurology and cardiology). In the latter case, practitioners in these specialties may have been less aware of the reporting requirement.

The other columns in the tables indicate the reduction in the number of visits aggregated at the specialty level if CMS were to switch to our visit estimates based on claims data. Across all specialties, using median reported visit counts would result in a 77-percent reduction in the number of visits compared with the visit counts currently listed on the Time File, while using average reported visits would yield a 72-percent reduction. At the specialty level, new visit counts based on the median of reported post-operative visits is generally lower than those based on the mean of reported post-operative visits, although for ophthalmology the median is slightly higher. We report separate by-specialty results for procedures with 10-day and 90-day global periods in Table B.2.

[2] HCPCS codes 10180, "Complex drainage wound," and 64555, "Implant neuroelectrodes."

Table 4.3. Observed and New Visit Counts by Specialty, All Procedures

Specialty	No. of Procedures	Expected No. of Visits	Share of Expected Visits Observed Within Specialty (Percent)	Reduction in Visit Counts When Using Median Observed Visit Counts (Percent)	Reduction in Visit Counts When Using 75th Pctl. Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Average Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Modal Observed Visit Counts (Percent)
Cardiac surgery	6,033	48,331	46	–78	–37	–59	–96
Cardiology	11,735	28,357	35	–85	–43	–64	–100
Colorectal surgery	6,566	23,069	27	–81	–57	–68	–94
Dermatology	475,913	529,389	6	–97	–90	–94	–100
Diagnostic radiology	23,141	33,369	3	–100	–100	–94	–100
General surgery	77,022	250,257	40	–75	–56	–62	–84
Hand surgery	10,823	44,051	39	–68	–43	–62	–77
Interventional radiology	8,191	11,821	3	–100	–99	–94	–100
Neurology	3,341	4,573	14	–93	–88	–91	–94
Neurosurgery	16,900	103,676	30	–76	–58	–70	–80
Nurse practitioner/physician asst.	227,169	242,598	4	–98	–96	–96	–100
Ophthalmology	145,461	470,052	53	–45	–28	–47	–51
Orthopedic surgery	151,485	971,550	34	–71	–54	–66	–78
Other specialty	93,326	165,680	18	–91	–73	–81	–98
Otolaryngology	12,964	23,795	25	–84	–73	–78	–96
Plastic and reconstructive surgery	8,346	23,446	32	–78	–58	–70	–92
Podiatry	27,126	40,866	26	–84	–69	–74	–99
Primary care	46,324	51,757	9	–97	–94	–91	–99
Surgical oncology	2,445	7,802	33	–76	–57	–65	–85
Thoracic surgery	8,390	65,357	40	–76	–37	–58	–96
Urology	19,290	82,091	27	–79	–66	–73	–98
Vascular surgery	16,325	56,641	32	–80	–57	–67	–90
Total	1,398,316	3,278,525	28	–77	–62	–72	–84

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018).
NOTES: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods. "Pctl." is percentile.

Table 4.4. Observed and New Visit Counts by Specialty, Procedures with 90-Day Global Periods

Specialty	No. of Procedures	Expected No. of Visits	Share of Expected Visits Observed Within Specialty (Percent)	Reduction in Visit Counts When Using Median Observed Visit Counts (Percent)	Reduction in Visit Counts When Using 75th Pctl. Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Average Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Modal Observed Visit Counts (Percent)
Cardiac surgery	5,765	47,963	46	–77	–37	–58	–96
Cardiology	11,216	27,786	36	–84	–41	–64	–100
Colorectal surgery	2,649	18,949	32	–77	–48	–62	–92
Dermatology	16,280	69,712	22	–77	–68	–75	–100
Diagnostic radiology	101	286	4	–95	–61	–70	–96
General surgery	53,254	219,048	42	–71	–50	–59	–82
Hand surgery	10,564	43,761	39	–67	–43	–62	–77
Interventional radiology	88	249	18	–96	–60	–69	–97
Neurology	159	1,089	51	–75	–57	–70	–80
Neurosurgery	14,476	100,070	30	–75	–57	–70	–79
Nurse practitioner/physician asst.	3,634	14,313	39	–64	–42	–61	–100
Ophthalmology	112,482	433,329	57	–40	–22	–43	–46
Orthopedic surgery	147,845	966,590	34	–71	–54	–66	–78
Other specialty	27,801	75,846	36	–79	–44	–63	–95
Otolaryngology	3,556	14,252	34	–74	–59	–69	–93
Plastic and reconstructive surgery	4,656	19,701	33	–74	–57	–69	–91
Podiatry	4,394	16,926	56	–61	–25	–46	–97
Primary care	1,412	5,312	40	–75	–46	–61	–92
Surgical oncology	1,542	6,567	38	–71	–50	–61	–82
Thoracic surgery	7,897	64,679	40	–76	–36	–58	–96
Urology	16,799	79,514	27	–79	–66	–73	–98
Vascular surgery	10,686	48,613	36	–77	–50	–63	–88
Total	457,256	2,274,550	39	–67	–46	–61	–76

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018).
NOTE: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods.

Table 4.5. Observed and New Visit Counts by Specialty, Procedures with 10-Day Global Periods

Specialty	No. of Procedures	Expected No. of Visits	Share of Expected Visits Observed Within Specialty (Percent)	Reduction in Visit Counts When Using Median Observed Visit Counts (Percent)	Reduction in Visit Counts When Using 75th Pctl. Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Average Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Modal Observed Visit Counts (Percent)
Cardiac surgery	268	368	34	–100	–88	–86	–100
Cardiology	519	571	5	–100	–100	–95	–100
Colorectal surgery	3,917	4,121	4	–100	–99	–96	–100
Dermatology	459,633	459,677	4	–100	–94	–96	–100
Diagnostic radiology	23,040	33,084	3	–100	–100	–94	–100
General surgery	23,768	31,209	20	–100	–97	–90	–100
Hand surgery	259	290	46	–100	–90	–85	–100
Interventional radiology	8,103	11,573	3	–100	–100	–95	–100
Neurology	3,182	3,485	2	–99	–98	–98	–99
Neurosurgery	2,424	3,606	20	–100	–98	–87	–100
Nurse practitioner/physician asst.	223,535	228,285	2	–100	–99	–98	–100
Ophthalmology	32,979	36,723	8	–100	–100	–92	–100
Orthopedic surgery	3,640	4,961	18	–100	–97	–88	–100
Other specialty	65,525	89,835	3	–100	–97	–95	–100
Otolaryngology	9,408	9,543	12	–100	–93	–92	–100
Plastic and reconstructive surgery	3,690	3,745	27	–100	–61	–78	–100
Podiatry	22,732	23,940	5	–100	–100	–93	–100
Primary care	44,912	46,445	5	–100	–99	–95	–100
Surgical oncology	903	1,236	8	–100	–94	–91	–100
Thoracic surgery	493	679	24	–100	–94	–91	–100
Urology	2,491	2,577	29	–100	–64	–71	–100
Vascular surgery	5,639	8,028	9	–100	–99	–93	–100
Total	941,060	1,003,975	4	–100	–96	–96	–100

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018).
NOTE: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods.

5. Revaluation Results

We present results in three sections:

1. updated work RVUs based on the observed number of post-operative visits measured four ways (median, 75th percentile, mean, and modal observed visits);
2. allocated PE RVUs reflecting direct PE inputs updated to reflect the median number of reported post-operative visits; and
3. modeled total RVUs reflecting (a) updated work RVUs, (b) updated physician time, and (c) updated direct PE inputs and including allocated PE and malpractice RVUs. We updated work RVUs, physician time, and direct PE inputs using the median number of reported post-operative visits.

Updated Work RVUs

Figures 5.1–5.3 report physician work RVUs after removing work RVUs associated with the difference between expected and observed post-operative visits for three high-volume procedures: cataract surgery (HCPCS code 66984, 90-day global period), hip arthroplasty (HCPCS code 27130, 90-day global period), and destruction of premalignant lesion (HCPCS code 17000, 10-day global period). The reduction in work RVUs compared with the status quo is most apparent for HCPCS 17000 where (a) visits very rarely occur, and (b) the work RVUs associated with the single bundled visit are large in comparison to the status quo total work RVUs.

Figure 5.1. Updated Work RVUs Using Different Visit Metrics, Cataract Surgery (HCPCS 66984)

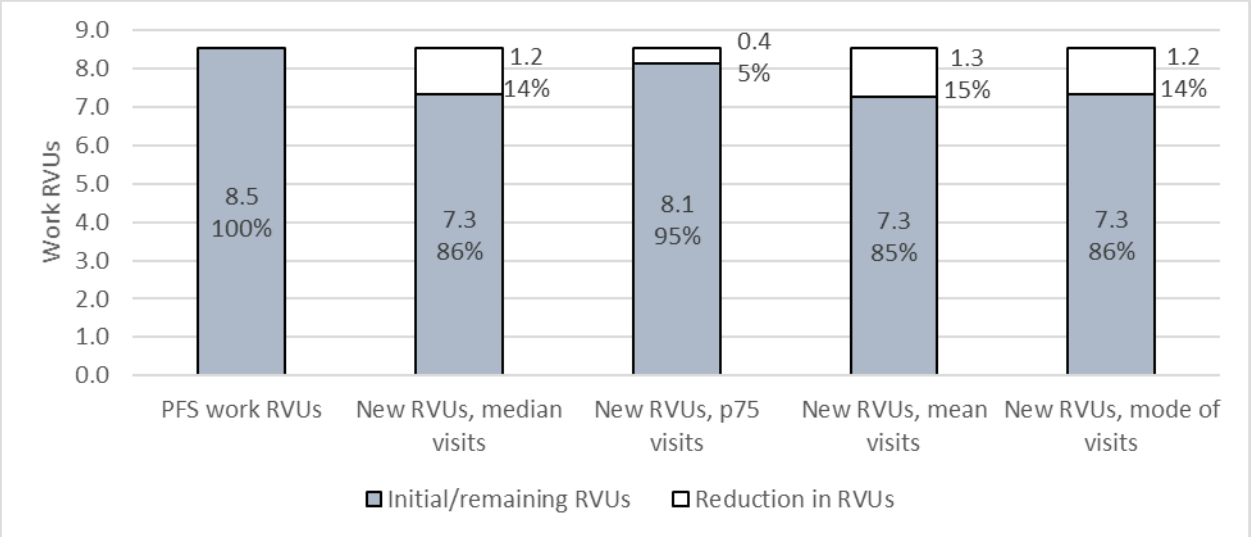


Figure 5.2. Updated Work RVUs Using Different Visit Metrics, Hip Arthroplasty (HCPCS 27130)

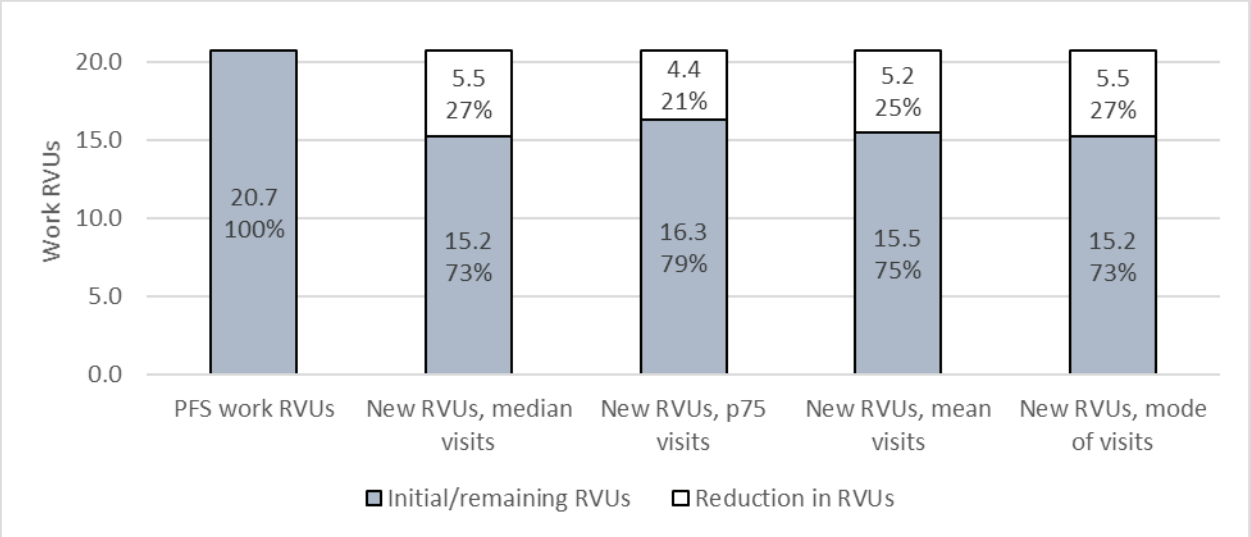


Figure 5.3. Updated Work RVUs Using Different Visit Metrics, Remove Premalignant Lesion (HCPCS 17000)

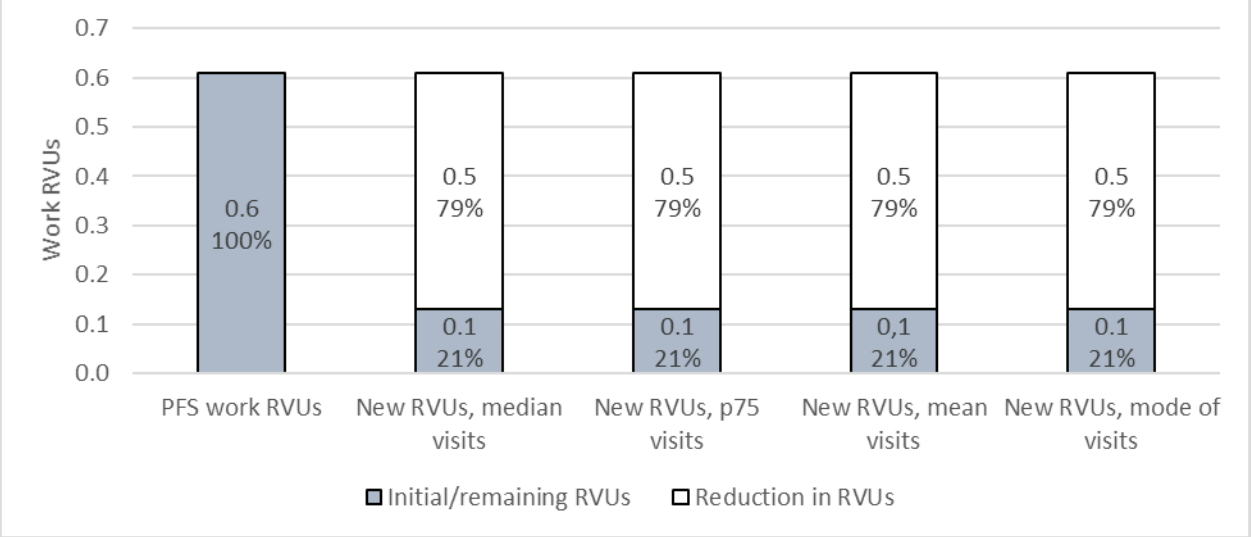
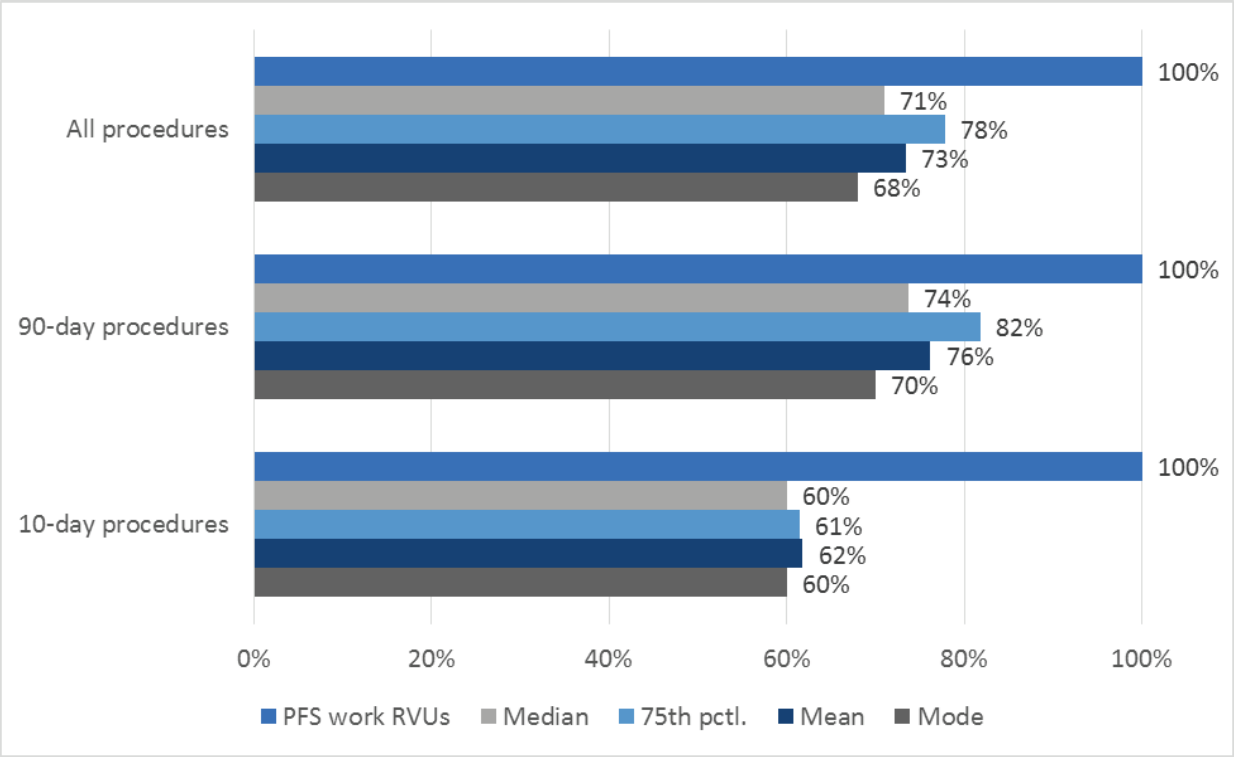


Figure 5.4 reports updated work RVUs after removing work RVUs associated with post-operative visits that were not provided, first aggregated in proportion to Medicare volume across all 296 procedures for which data was available and then separately by global period. Depending on which observed visit metric is used as an input in revaluation, the updated work RVUs are between 18 percent and 30 percent lower for procedures with 90-day global periods and between

Figure 5.4. Share of Work RVUs Remaining After Revaluation Using Different Post-Operative Visit Metrics, 296 Procedures Where Reporting Was Required



SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: Results reflect the 2018 Medicare volume mix across the 296 procedures where reporting of post-operative visits was required. "PFS" is Physician Fee Schedule. "Pctl." is percentile.

38 percent and 40 percent lower for procedures with 10-day global periods compared with current work valuations. The choice of using the median, 75th percentile, mean, or modal count of post-operative visits has more of an impact for procedures with 90-day global periods where there is more variation within each procedure code in terms of the number of observed visits. This choice has less of an impact for procedures with 10-day global periods where visits rarely occur.
Tables 5.1 and 5.2 report status quo work RVUs and the proportional change in work RVUs for the top ten procedures with 10-day and 90-day global periods by volume, respectively. Work RVU results for all 296 procedure codes for which reporting of post-operative visits is required are in Table B.3.

Table 5.1. Change in Work RVUs from Different Revaluation Approaches, Top Ten Procedures with 10-Day Global Periods by 2018 Medicare Volume

HCPCS Code	CPT Short Descriptors	PFS Work RVUs	Reduction in Work RVUs, Median Visits	Reduction in Work RVUs, 75th Pctl. Visits	Reduction in Work RVUs, Mean Visits	Reduction in Work RVUs, Mode of Visits	Medicare Volume
17000	Destruct premalg lesion	0.61	–78.7%	–78.7%	–78.7%	–78.7%	4,588,227
17110	Destruct b9 lesion 1–14	0.70	–68.6%	–68.6%	–68.6%	–68.6%	2,049,227
17004	Destroy premal lesions 15/ >	1.37	–35.0%	–35.0%	–35.0%	–35.0%	861,245
10060	Drainage of skin abscess	1.22	–39.3%	–39.3%	–33.6%	–39.3%	413,247
68761	Close tear duct opening	1.41	–34.0%	–34.0%	–33.3%	–34.0%	341,423
64635	Destroy lumb/sac facet jnt	3.78	–42.6%	–42.6%	–42.1%	–42.6%	252,467
17262	Destruction of skin lesions	1.63	–29.4%	–29.4%	–28.8%	–29.4%	239,408
12032	Intmd rpr s/a/t/ext 2.6–7.5	2.52	–19.0%	–19.0%	–17.1%	–19.0%	224,558
11750	Removal of nail bed	1.58	–30.4%	–30.4%	–27.2%	–30.4%	194,732
13132	Cmplx rpr f/c/c/m/n/ax/g/h/f	4.78	–10.0%	0.0%	–6.7%	–10.0%	173,065

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule.

Table 5.2. Change in Work RVUs from Different Revaluation Approaches, Top Ten Procedures with 90-Day Global Periods by 2018 Medicare Volume

HCPCS Code	CPT Short Descriptors	PFS Work RVUs	Reduction in Work RVUs, Median Visits	Reduction in Work RVUs, 75th Pctl. Visits	Reduction in Work RVUs, Mean Visits	Reduction in Work RVUs, Mode of Visits	Medicare Volume
66984	Cataract surg w/iol 1 stage	8.52	–13.8%	–4.6%	–14.8%	–13.8%	1,680,887
66821	After cataract laser surgery	3.42	–28.4%	–28.4%	–35.1%	–28.4%	637,157
27447	Total knee arthroplasty	20.72	–26.6%	–21.3%	–24.2%	–26.6%	319,995
27130	Total hip arthroplasty	20.72	–26.6%	–21.3%	–25.1%	–26.6%	163,089
66982	Cataract surgery complex	11.08	–10.6%	–3.5%	–12.5%	–31.9%	162,580
47562	Laparoscopic cholecystectomy	10.47	–11.9%	–11.9%	–10.5%	–11.9%	109,328
64721	Carpal tunnel surgery	4.97	–44.1%	–26.4%	–37.6%	–44.1%	104,552
33208	Insrt heart pm atrial & vent	8.52	–28.5%	–14.2%	–27.3%	–42.7%	99,957
29827	Arthroscop rotator cuff repr	15.59	–12.4%	–8.9%	–11.5%	–8.9%	94,671
63047	Remove spine lamina 1 lmbr	15.37	–27.5%	–20.6%	–27.8%	–27.5%	89,093

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule.

Table 5.3 reports the change in work RVUs for the 296 codes where reporting of post-operative visits was required overall and by specialty (i.e., based on the volume-weighted mix of services furnished by each specialty listed in Table 5.3). Tables B.4a and B.4b report results by

Table 5.3. Percent Change from Status Quo to Updated Work RVUs, 296 Procedures Where Reporting Was Required

Specialty	Median of Reported Visits (Percent)	75th Percentile of Reported Visits (Percent)	Mean of Reported Visits (Percent)	Modal Reported Visits (Percent)
Total	–29	–22	–27	–32
Cardiac surgery	–34	–16	–26	–43
Cardiology	–29	–14	–22	–35
Colorectal surgery	–28	–19	–24	–33
Dermatology	–41	–38	–39	–43
Diagnostic radiology	–24	–24	–23	–24
General surgery	–23	–16	–19	–26
Hand surgery	–37	–24	–34	–41
Interventional radiology	–24	–24	–22	–24
Neurology	–33	–30	–32	–33
Neurosurgery	–27	–20	–25	–28
Nurse practitioner/physician asst.	–54	–53	–53	–55
Ophthalmology	–18	–11	–19	–20
Orthopedic surgery	–29	–22	–27	–31
Other specialty	–32	–25	–28	–34
Otolaryngology	–29	–25	–27	–33
Plastic and reconstructive surgery	–28	–21	–25	–33
Podiatry	–40	–31	–34	–49
Primary care	–46	–43	–42	–47
Surgical oncology	–23	–17	–20	–26
Thoracic surgery	–34	–16	–25	–42
Urology	–27	–22	–25	–33
Vascular surgery	–24	–17	–20	–26

specialty separately for procedures with 10- and 90-day global periods. We observed three general patterns:

1. *Specialties focusing on procedures with highly variable visits per procedure*: Reductions tended to be significantly smaller when using the 75th percentile compared with the median or mean for specialties such as cardiac surgery, cardiology, neurosurgery, and thoracic surgery that focus on procedures with a higher variance regarding number of visits per procedure.
2. *Specialties with large across-the-board reductions*: Dermatology, primary care, and nurse practitioner/physician assistant specialties had the largest reductions for the procedures that they perform across the board. These specialties perform very few procedures with 90-day global periods. The large reductions are not surprising given the very few post-operative visits observed following procedures with 10-day global periods.
3. *All other specialties*: Most other specialties had reductions in the 20–30 percent range with broadly similar reductions regardless of whether the median, 75th percentile, mean, or mode of observed visit was used as the basis for revaluation.

We next broadened the scope of the analysis beyond the 296 procedures for which reporting was required to include all procedures with 10- and 90-day global periods, including lower-volume procedures for which claims-based reporting was not required. As described in Appendix A, we imputed changes in post-operative visits for these other procedures and calculated new work RVUs in the same way as we did for procedures where reporting was required.

The first two columns of Table 5.4 compare specialty-level aggregate changes in work RVUs relative to status quo Physician Fee Schedule work RVUs for the 296 procedures for which

Table 5.4. Change in Aggregate Work RVUs from Different Revaluation Approaches by Specialty, All Procedures

Specialty	Reduction in Work RVUs for 296 Codes Where Reporting Is Required (Percent)	Reduction in Work RVUs for All Procedures with 10- and 90-Day Global Periods (Percent)	Reduction in Work RVUs from All Procedures with 10- and 90-Day Global Periods Relative to Work RVUs for All Physician Fee Schedule Services* (Percent)
Total	–29	–28	–3
Cardiac surgery	–34	–33	–22
Cardiology	–29	–28	≤1
Colorectal surgery	–28	–33	–17
Dermatology	–41	–40	–14
Diagnostic radiology	–24	–24	≤1
General surgery	–23	–28	–14
Hand surgery	–37	–31	–16
Interventional radiology	–24	–24	–3
Neurology	–33	–29	≤1
Neurosurgery	–27	–27	–14
Nurse practitioner/physician asst.	–54	–32	–2
Ophthalmology	–18	–18	–7
Orthopedic surgery	–29	–27	–15
Other specialty	–32	–29	≤1
Otolaryngology	–29	–28	–5
Plastic and reconstructive surgery	–28	–27	–18
Podiatry	–40	–33	–4
Primary care	–46	–42	≤1
Surgical oncology	–23	–31	–20
Thoracic surgery	–34	–32	–21
Urology	–27	–21	–4
Vascular surgery	–24	–25	–10

SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: All updated work RVUs were calculated using the median of observed post-operative visits. Primary care includes family practice, general practice, and internal medicine.
*The "All HCPCS Codes" results update work RVUs only for procedures with 10- and 90-day global periods and express the reduction in work RVUs relative to work RVUs for all services under the Physician Fee Schedule.

reporting was required and for all procedures with 10- and 90-day global periods. We used the median count of reported visits to calculate updated work RVUs for both sets of results.

We expected that results for all procedures with 10- and 90-day global periods would be broadly similar to results for just the 296 codes for which reporting was required for two reasons. First, the 296 codes account for a large share of total Medicare and by-specialty volume and payments among procedures with 10- and 90-day global periods.[1] Second, our methods used observed relationships between procedure characteristics and the share of visits that were observed for the 296 codes to impute values for codes for which reporting was not required. Overall, we found a 29-percent reduction for procedures for which reporting was required versus a 28-percent reduction for all procedures with 10- and 90-day global periods. Results for individual specialties were generally close, although there was a difference for nurse practitioners/physician assistants.

The rightmost column in Table 5.4 expresses the reduction in work RVUs from all procedures with 10- and 90-day global periods relative to the work RVUs for all Physician Fee Schedule services, including procedures with 0-day global periods and all other services such as E&M visits without any global period.[2] The net change in work RVUs is very small for specialties for which the work associated with procedures with 10- and 90-day global periods is small relative to total work (e.g., cardiology, diagnostic radiology, interventional radiology, neurology, nurse practitioner/physician assistant, podiatry, primary care, and urology). The net change in work RVUs remains substantial (greater than a 10-percent reduction in work RVUs) for procedure-focused specialties (e.g., cardiac surgery, colorectal surgery, dermatology, general surgery, hand surgery, neurosurgery, orthopedic surgery, plastic and reconstructive surgery, surgical oncology, thoracic surgery, and vascular surgery). These results reflect changes *only* to work RVUs. Changes in work RVUs would directly change PE and malpractice RVUs, so the change in total RVUs by specialty would differ from that reported in Table S.1. The PFS conversion factor would increase to offset any overall change in total RVUs so that total spending would remain unchanged and payments would change differently from RVUs. The impacts of changes to work and other inputs on total RVUs are explored in later analyses.

Effect on PE RVUs of Updated Direct Practice Costs

Tables 5.5 and 5.6 report procedure-level changes resulting from updated direct PE inputs for the top ten procedures with 10- and 90-day global periods by Medicare volume. The proportional

[1] As noted above, the selected HCPCS codes accounted for 96.5 percent of all the procedures furnished with 10-day global periods and 85.3 percent of all procedures with 90-day global periods in 2017.

[2] Our revaluation approach did not adjust the number of work RVUs for any services on the Physician Fee Schedule that did *not* have a 10- or 90-day global period.

Table 5.5. Change in Work RVUs from Different Revaluation Approaches, Top Ten Procedures with 90-Day Global Periods by 2018 Medicare Volume

HCPCS Code	CPT Short Descriptors	PFS PE RVUs	Updated PE RVUs	Percent Change, PE RVUs	PFS Total RVUs	Updated Total RVUs	Percent Change, Total RVUs
66984	Cataract surg w/iol 1 stage	9.10	8.37	–8.0	18.22	17.50	–4.0
66821*	After cataract laser surgery	5.22	4.32	–17.2	8.89	7.99	–10.1
27447	Total knee arthroplasty	14.42	13.19	–8.5	39.17	37.95	–3.1
27130	Total hip arthroplasty	14.44	13.21	–8.5	39.19	37.97	–3.1
66982	Cataract surgery complex	10.77	10.08	–6.4	22.64	21.96	–3.0
47562	Laparoscopic cholecystectomy	6.18	5.43	–12.1	19.11	18.37	–3.9
64721*	Carpal tunnel surgery	6.40	4.86	–24.1	12.37	10.83	–12.4
33208	Insrt heart pm atrial & vent	4.69	4.32	–7.9	15.18	14.82	–2.4
29827	Arthroscop rotator cuff repr	12.33	10.75	–12.8	30.45	28.87	–5.2
63047	Remove spine lamina 1 lmbr	12.02	10.57	–12.1	32.06	30.63	–4.5

NOTES: *Procedure code has both facility and nonfacility valuation. The table reports facility valuation only. The CPT short descriptors are those available in the Physician Fee Schedule.

Table 5.6. Change in Work RVUs from Different Revaluation Approaches, Top Ten Procedures with 10-Day Global Periods by 2018 Medicare Volume, Facility Valuation

HCPCS Code	CPT Short Descriptors	PFS PE RVUs	Updated PE RVUs	Percent Change, PE RVUs	PFS Total RVUs	Updated Total RVUs	Percent Change, Total RVUs
17000	Destruct premalg lesion	0.85	0.37	–56.5	1.54	1.06	–31.2
17110	Destruct b9 lesion 1–14	1.18	0.80	–32.2	1.97	1.59	–19.3
17004	Destroy premal lesions 15/ >	1.30	0.84	–35.4	2.86	2.40	–16.1
10060	Drainage of skin abscess	1.47	0.96	–34.7	2.82	2.31	–18.1
68761	Close tear duct opening	1.87	1.34	–28.3	3.37	2.84	–15.7
64635	Destroy lumb/sac facet jnt	2.28	1.78	–21.9	6.36	5.85	–8.0
17262	Destruction of skin lesions	1.45	1.10	–24.1	3.31	2.96	–10.6
12032	Intmd rpr s/a/t/ext 2.6–7.5	2.70	2.05	–24.1	5.60	4.94	–11.8
11750	Removal of nail bed	1.23	0.64	–48.0	2.93	2.34	–20.1
13132	Cmplx rpr f/c/c/m/n/ax/g/h/f	3.57	2.94	–17.6	9.06	8.44	–6.8

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule.

reductions in PE and total RVUs are generally larger for the facility valuations for 10-day procedures (across all codes, not just high-volume codes) compared with nonfacility 90-day procedures. We found that changes to direct PE inputs led to relatively modest changes in allocated PE RVUs (Table 5.7) by specialty. Reductions in direct PE inputs resulted in a 14-percent reduction in PE RVUs and a 6-percent reduction in total RVUs for procedures with

10- and 90-day global periods. Due to a fixed pool of PE RVUs being allocated across all services under the Physician Fee Schedule, the reductions in PE RVUs for procedures with 10- and 90-day global periods were offset by *increases* in PE RVUs for other Physician Fee Schedule services for a net change of 0 percent for all services by design.[3] The net impacts by specialty were modest when considering all services, ranging from 4-percent reductions in

Table 5.7. Change in PE RVUs Due to Updated Direct PE Inputs, by Specialty

	Procedures with 10- and 90-Day Global Periods			All Services		
Specialty	Status Quo PE RVUs from 10-/90-Day Procedures as a Share of Total RVUs	%Δ, PE RVUs	%Δ, Total RVUs	Status Quo PE RVUs from 10-/90-Day Procedures as a Share of Total RVUs	%Δ, PE RVUs	%Δ, Total RVUs
Total	45%	–14%	–6%	5%	0%	0%
Cardiac surgery	24%	–8%	–2%	14%	–3%	–1%
Cardiology	30%	–13%	–4%	0%	1%	1%
Colorectal surgery	36%	–17%	–6%	18%	–6%	–2%
Dermatology	62%	–17%	–10%	21%	–3%	–2%
Diagnostic radiology	45%	–11%	–5%	1%	1%	0%
General surgery	33%	–13%	–4%	16%	–4%	–2%
Hand surgery	51%	–19%	–9%	26%	–8%	–4%
Interventional radiology	49%	–8%	–4%	4%	1%	1%
Neurology	49%	–18%	–9%	0%	1%	0%
Neurosurgery	36%	–10%	–3%	20%	–4%	–1%
Nurse practitioner/physician asst.	49%	–17%	–8%	4%	0%	0%
Ophthalmology	52%	–12%	–6%	19%	–2%	–1%
Orthopedic surgery	40%	–12%	–5%	21%	–4%	–2%
Other specialty	49%	–11%	–5%	1%	1%	0%
Otolaryngology	48%	–24%	–11%	8%	–1%	–1%
Plastic and reconstructive surgery	48%	–14%	–7%	33%	–9%	–4%
Podiatry	54%	–19%	–10%	7%	0%	0%
Primary care	58%	–20%	–12%	0%	1%	0%
Surgical oncology	33%	–14%	–4%	21%	–7%	–2%
Thoracic surgery	24%	–8%	–2%	15%	–3%	–1%
Urology	35%	–12%	–4%	5%	0%	0%
Vascular surgery	26%	–12%	–3%	5%	1%	1%

SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "%Δ, PE RVUs" is the percent change from status quo PE RVU valuations to updated PE RVU valuations. "%Δ, Total RVUs" is the percent change from status quo total RVU valuations to updated total RVU valuations when adjusting only PE RVUs. Primary care includes family practice, general practice, and internal medicine.

[3] Because we did not use updated work RVUs, the total pool of PE RVUs remains the same as the status quo pool.

total RVUs for hand surgery and plastic and reconstructive surgery to 1-percent increases for cardiology, interventional radiology, and vascular surgery.

Total RVUs Based on Updated Work, Time, and Direct Practice Costs

Table 5.8 reports volume-weighted changes in work, PE, malpractice, and total RVUs overall and at the specialty level when work, time, and direct costs are all reduced for global services. The table includes results for (1) procedures with 10- and 90-day global periods and (2) all services. All estimates use the median observed count of post-operative visits. Our adjustments to work RVUs, physician time, and direct PE inputs resulted in a 28.7-percent reduction in total RVUs for procedures with 10- and 90-day global periods and a slight increase (0.4 percent, not reported) for all other Physician Fee Schedule services. The net reduction was 2.7 percent across all Physician Fee Schedule services or $2.6 billion at the 2019 conversion factor.[4,5] The impact on procedure-focused specialties was larger, with the largest being a 20.6-percent reduction in total RVUs for cardiac surgery. The small increases in RVUs for primary care, neurology, cardiology, and diagnostic radiology are due to increases in allocated PE and malpractice RVUs for services without 10- and 90-day global periods. The net impact for specialties that bill primarily for services without 10- and 90-day global periods (e.g., cardiology) was positive.

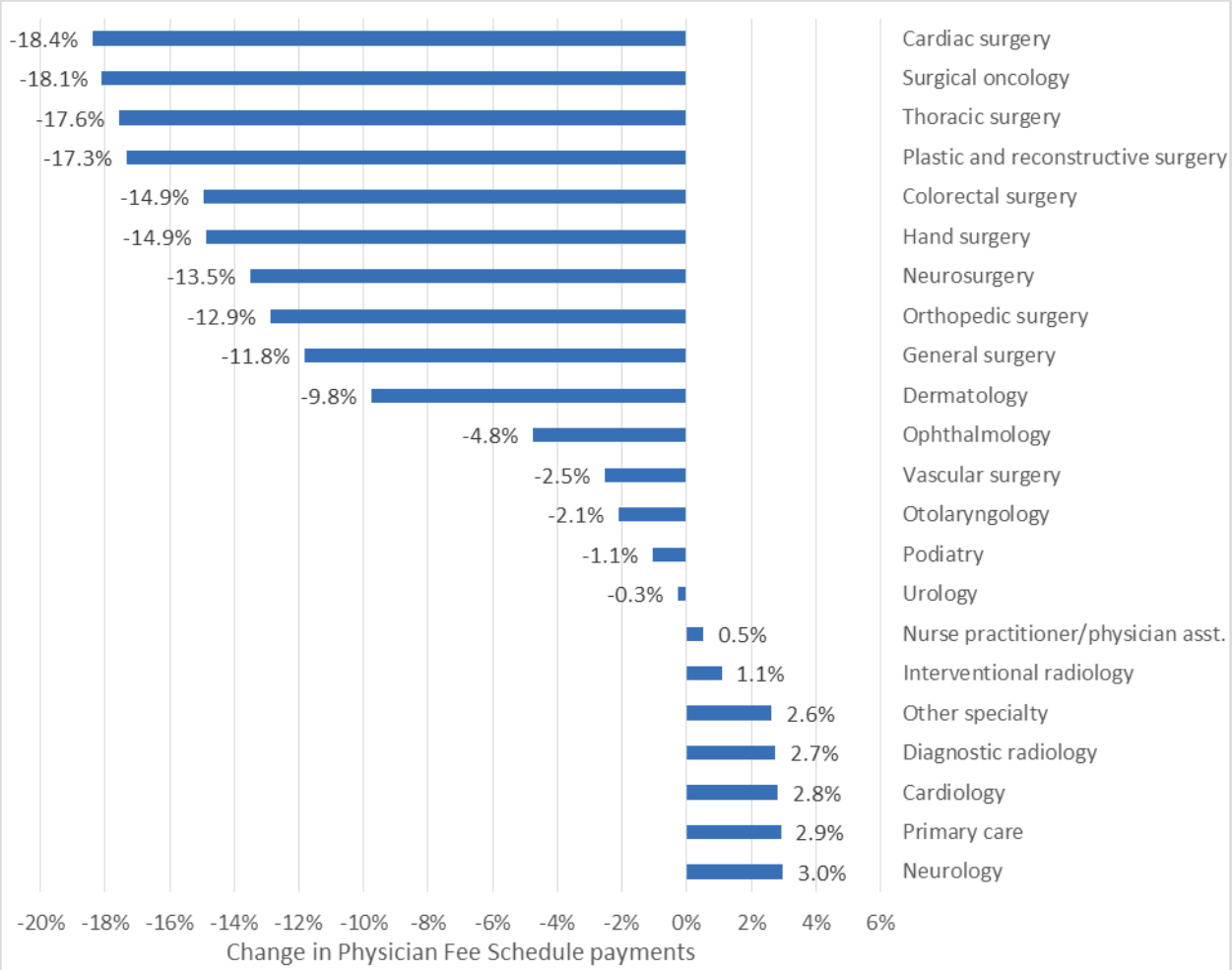
As a final step, we estimated the change in Medicare payments under the Physician Fee Schedule by calculating an updated conversion factor to preserve budget neutrality.[6] Because the overall number of RVUs decreased, the conversion factor (defined as funds available to pay for Physician Fee Schedule services divided by the sum of RVUs) increased. As a result, the reductions in total RVUs for surgical specialties like cardiac surgery, surgical oncology, and thoracic surgery yielded slightly smaller reductions in payments (Figure 5.5). For some specialties (e.g., interventional radiology), a small reduction in total RVUs was offset by a higher conversion factor to yield a small increase in payments. Modest increases in total RVUs for other specialties (e.g., cardiology, neurology, and the specialties that report collectively as primary care) yielded a larger (but still modest) increase in payments.

[4] We present results regarding payments using an updated conversion factor below.

[5] PE and malpractice RVUs declined by the same proportion as work RVUs by design. The reductions were not exactly the same due to rounding and floors on allocated malpractice RVUs.

[6] We did not model CMS's transition policy or Outpatient Prospective Payment System caps when estimating changes in payments. The actual changes in payments—both decreases in increases—would be moderated by these policies if CMS were to use this approach to revalue global services.

Figure 5.5. Percent Change in Physician Fee Schedule Payments After Revaluation, by Specialty



SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "Percent change in Physician Fee Schedule payments" is the percent change from status quo total RVU valuations to updated total RVU valuations. Primary care includes family practice, general practice, and internal medicine.

Table 5.8. Change in Work, Practice Expense, and Malpractice Payments, Median Observed Post-Operative Visits, by Specialty

Specialty	Share of Current RVUs from 10-/90-Day Global Periods	%Δ Work RVUs, All Services	%Δ Work RVUs, Services with 10-/90-Day GP	%Δ PE RVUs, All Services	%Δ PE RVUs, Services with 10-/90-Day GP	%Δ Malpractice RVUs, All Services	%Δ Malpractice RVUs, Services with 10-/90-Day GP	%Δ Total RVUs, All Services	%Δ Total RVUs, Services with 10/90-Day GP
Total	10.4	–2.6	–27.5	–2.7	–30.4	–2.6	–25.8	–2.7	–28.7
Cardiac surgery	60.4	–21.5	–33.0	–18.2	–38.5	–22.0	–31.3	–20.6	–34.1
Cardiology	1.4	–0.5	–27.7	0.3	–32.7	3.7	–25.1	0.1	–28.9
Colorectal surgery	50.5	–17.1	–32.6	–16.9	–38.4	–19.4	–30.6	–17.2	–34.5
Dermatology	34.0	–13.0	–40.1	–11.6	–32.9	–13.0	–35.8	–12.2	–35.4
Diagnostic radiology	1.5	–0.3	–23.8	0.3	–21.4	1.9	–20.4	0.0	–22.5
General surgery	48.2	–14.1	–28.0	–13.7	–34.4	–16.8	–25.5	–14.2	–29.8
Hand surgery	51.6	–15.6	–30.8	–18.2	–36.4	–18.6	–28.6	–17.1	–33.4
Interventional radiology	8.9	–2.7	–23.7	–1.1	–17.3	–0.3	–20.7	–1.6	–20.4
Neurology	0.9	–0.2	–29.4	0.5	–32.1	3.3	–26.9	0.3	–30.5
Neurosurgery	55.8	–14.3	–27.1	–18.0	–32.0	–15.5	–25.6	–15.8	–28.6
Nurse practitioner/physician asst.	7.3	–1.9	–32.8	–2.5	–35.1	–2.1	–28.4	–2.1	–33.6
Ophthalmology	35.7	–6.9	–18.4	–7.6	–23.6	–6.3	–15.6	–7.3	–21.0
Orthopedic surgery	51.7	–14.9	–27.3	–15.3	–33.6	–16.3	–25.0	–15.2	–29.6
Other specialty	1.8	–0.4	–29.2	0.1	–24.1	2.2	–25.5	–0.1	–26.5
Otolaryngology	15.6	–5.0	–27.8	–4.5	–37.9	–4.4	–25.3	–4.7	–32.5
Plastic and reconstructive surgery	67.2	–17.5	–27.1	–21.7	–31.8	–17.6	–24.7	–19.5	–29.2
Podiatry	12.3	–4.1	–33.4	–3.4	–30.6	–3.4	–32.6	–3.7	–31.8
Primary care	0.7	–0.2	–41.9	0.4	–36.0	2.6	–37.8	0.2	–38.2
Surgical oncology	62.2	–19.7	–31.0	–20.5	–37.3	–22.4	–29.0	–20.3	–32.8
Thoracic surgery	60.1	–20.5	–32.0	–17.9	–37.1	–21.4	–30.1	–19.8	–33.0
Urology	14.9	–3.9	–20.5	–2.2	–24.5	–0.9	–17.9	–2.9	–21.7
Vascular surgery	19.7	–9.5	–25.1	–2.5	–31.9	–9.9	–22.4	–5.1	–26.5

SOURCE: RAND analysis of 2016–2017 claims data for reported post-operative visits and the Medicare CY 2018 Physician Fee Schedule and Time File.
NOTES: "%Δ, PE RVUs" is the percent change from status quo PE RVU valuations to updated PE RVU valuations. "%Δ, Total RVUs" is the percent change from status quo total RVU valuations to updated total RVU valuations when adjusting only PE RVUs. Primary care includes family practice, general practice, and internal medicine.

6. Discussion

In this report, we describe how CMS could use the reverse building block approach to adjust the valuation of procedures with 10- and 90-day global periods using new claims-based data on the number of post-operative visits performed. We describe the impact on work RVUs, PE RVUs, and total RVUs. Depending on which statistic describing the number of observed visits we used (e.g., mean, median), we found that the approach reduced work RVUs by 18–30 percent for procedures with 90-day global periods and by 38–40 percent for procedures with 10-day global periods.[1] Adjusting direct PE inputs alone resulted in relatively modest reductions in PE and total RVUs for most proceduralist specialties and slight increases for other specialties. In terms of total RVUs, the approach resulted in large reductions among proceduralist specialties (e.g., 20.6 percent for cardiac surgery) and small increases for some other specialties (e.g., cardiology). In general, and not surprisingly, the greatest reductions in payment would be to specialties that perform a large number of procedures with 10- and 90-day global periods.

Tensions Between the Reverse Building Block Approach and Magnitude Estimation

In the Introduction, we highlighted the tension between the reverse building block approach and magnitude estimation in RBRVS. The revaluation approach that we modeled in this report relies on the reverse building block framework to remove work RVUs from total work to reflect visits that are not delivered to patients.

There are potential concerns with this approach. For some procedures, the sum of building block components does not align with total work from magnitude estimation. At the extreme, for a small number of procedures, the total work associated with the sum of post-operative visits is actually greater than the total work for the procedure, and in other cases post-operative visits account for such a large share of total work that an impossibly small amount of physician work is left to account for the procedure itself (Wynn et al., 2015). In these cases, it may be that the number of post-operative visits (or the work per post-operative visit) being inflated does not necessarily indicate that the total work estimate is similarly inflated. It is equally plausible that RUC survey respondents, the RUC, and CMS generally consider the full number of post-operative visits listed in the Time File when estimating total work and that it is appropriate to remove the corresponding work RVUs from the valuation for the procedure if the post-operative visits are not typically provided.

[1] The revised work RVUs would lead to changes in PE and malpractice RVUs, so the effect on total RVUs would be different than this effect would be on work only.

While we recognize this tension, the reverse building block approach provides an important starting point for further policy development around revaluation. One advantage of the reverse building block approach is that it is possible to model reductions in post-operative visits without surveying practitioners. Another advantage of the reverse building block approach is that it uses claims-based data rather than survey-based assumptions on the number of post-operative visits in the global period. In general, using these new claims-based data for the purposes of revaluation should improve transparency, objectivity, and accuracy.

Hybrids of the reverse building block and magnitude estimation approaches are feasible. Under a hybrid approach, observing fewer than expected post-operative visits could result in a smaller reduction to total work compared with the reduction under the reverse building block approach. For example, if a procedure's work RVU valuation were reduced by 20 percent due to post-operative visits that did not occur under the reverse building block approach, a 75-percent/25-percent hybrid approach would reduce work RVUs by 15 percent (i.e., by 75 percent of the full reverse building block reduction). Hybrid revaluation approaches of this type recognize that it is unlikely that either extreme is correct. It is perhaps more likely that post-operative visit counts listed on the Time File are inflated to some extent relative to what was actually considered under the magnitude estimation approach to work RVU valuation, *and* to some extent, magnitude estimation results in total work RVU valuations that are too high given the number of post-operative visits actually provided.

Looking Ahead

There are several potential paths forward for revaluation. PE RVUs could be adjusted as outlined in this report based only on updated direct practice expenses and time. This approach is motivated by the direct link between the number of assumed post-operative visits and direct PE RVUs. Given that a large share of assumed visits is not actually provided, physician time and direct practice expenses should be lower. These reductions have implications for PE RVUs allocated to procedures with 10- and 90-day global periods and, due to the allocation of a fixed pool of PE RVUs across all Physician Fee Schedule services, for all Physician Fee Schedule services.

The other revaluation approach would update work, practice expense, and malpractice RVUs based on changes to work RVUs, physician time, and direct practice expenses to reflect the actual number of post-operative visits and use the reverse building block method or a hybrid approach as described above. The RUC could revalue procedures for which the change or resulting work RVUs appear incorrect. We expect that, given the opportunity, the RUC would revisit the valuation for some procedures with inappropriately large reductions in work RVUs.

CMS may decide to revisit its earlier proposal to convert some or all services with 10- and 90-day global periods to 0-day global periods. The revaluation approach laid out in this report provides CMS with a road map to develop new work RVUs in this scenario. The resulting

reductions in work RVUs will be similar to those modeled in this report given that procedures with 10-day global periods had so few reported post-operative visits. Work RVU reductions would be more substantial than the estimates in this report for procedures with 90-day global periods if CMS were to remove all work RVUs associated with post-operative visits. In our earlier study (Kranz et al., 2019), we found that 39 percent of expected post-operative visits were provided.

We did not model other global-period–related policies that CMS might consider in the future. These include, for example, changing the duration of global periods, transitioning to more standardized post-operative visit "packages" that may or may not be billable separately from the procedure, or narrowing the scope of bundled services. Simplifying, narrowing, or shortening global packages may aid in future revaluation and may help protect patients from essentially making two copayments when post-operative services bundled into global payment are provided by practitioners who did not provide the index procedure. Overall, our broader project to support CMS, through analysis of post-operative visits reported via claims, a survey to collect information on the level of visits, and the revaluation results presented in this report, provide a framework for modeling these other broader changes to Medicare global services.

Appendix A. Data and Methods

Overview

We combined Medicare claims data and the Time File posted with the CY 2018 Medicare Physician Fee Schedule to calculate the share of post-operative visits that were reported for each of the 296 procedures where reporting was required. The data and methods related to our analysis of post-operative visits reported via claims is discussed in a prior report (Kranz et al., 2019). We used regression models to impute the share of reported relative to assumed post-operative visits for procedures with 10- and 90-day global periods where reporting was not required.

For revaluation, our starting point was work, PE, and malpractice RVUs for procedures with 10- and 90-day global periods listed in the CY 2018 Medicare Physician Fee Schedule. The baseline CY 2018 valuations were associated with an assumed number of post-operative visits included in the global period as listed on the Time File.

We first calculated updated physician work RVUs by subtracting RVUs equal to the product of the difference between assumed and reported visits and a procedure-specific average work RVU per visit. We used four different observed post-operative visit metrics: the median, 75th percentile, mean, and modal count of observed visits. Next, we calculated updated PE RVUs after reducing direct PE inputs to reflect assumed visits that were not provided. Finally, we used updated estimates of physician work, physician time, and direct PE inputs to estimate the impacts of reductions in post-operative visits on work, allocated PE, and allocated malpractice RVUs together.

We report the impacts of revaluation, first on work RVUs alone, next on PE RVUs after modifying direct PE inputs only, and finally for total RVUs, by applying the old and new valuations to CY 2018 fee-for-service Medicare volume of procedures with 10- and 90-day global periods. We report updated work RVU estimates for each of the 296 procedure codes for which reporting was required as well as results by specialty reflecting the relative volume of services across all services billed by the specialty. We report PE and total RVU results overall and by specialty.

Data Sources

Medicare Physician Fee Schedule and Time File Data

Baseline valuations for procedures with 10- and 90-day global periods are from the CY 2018 Medicare Physician Fee Schedule Final Rule (CMS, 2017). The fee schedule lists the number of work, PE, and malpractice RVUs for each HCPCS code. We restricted our analysis to HCPCS

codes with 10- and 90-day global periods as indicated in Addendum B to the fee schedule final rule. The baseline number of post-operative visits and physician time for each procedure are from the Time File posted with the CY 2018 Final Rule, which lists the number of visits assumed to be provided to the typical patient for each HCPCS code. Visits are reported on the Time File according to E&M code analogues (Table A.1).

Table A.1. Time File E&M Visit Codes

HCPCS	Description	Physician Time	Work RVUs
99204	Office/outpatient visit new, level 4	45	2.43
99211	Office/outpatient visit est., level 1	7	0.18
99212	Office/outpatient visit est., level 2	16	0.48
99213	Office/outpatient visit est., level 3	23	0.97
99214	Office/outpatient visit est., level 4	40	1.50
99215	Office/outpatient visit est., level 5	55	2.11
99231	Subsequent hospital care, level 1	20	0.76
99232	Subsequent hospital care, level 2	40	1.39
99233	Subsequent hospital care, level 3	55	2.00
99238	Hospital discharge day	38	1.28
99239	Hospital discharge day	55	1.90
99291	Critical care first hour	70	4.50
99292	Critical care addl. 30 min	30	2.25

The Time File usually lists integer counts of visits. It occasionally includes half visits, especially for discharge visits, when the procedure typically occurs in an outpatient facility setting. The half visit in this case represents some, but potentially less, work compared with a discharge visit in an inpatient facility setting.

The Time File also lists the total physician time for the global period, including the time associated with post-operative visits. Physician time for post-operative visits is not reported separately, but the difference between total time and other reported times (preservice, intraservice, and immediate post-service) is equal to the sum of minutes across post-operative visits listed on the Time File by E&M code.

Aggregate Medicare Utilization Data

Aggregated Medicare CY 2018 procedure volume is from the utilization crosswalk file posted with the CY 2016 Physician Fee Schedule. These data include the total count of services by combination of HCPCS code, modifier, facility, and specialty.

Claims Data

We used the same analytic file based on fee-for-service Medicare claims accessed via CMS's Integrated Data Repository (IDR) described in our prior report (Kranz et al., 2019). The file was

at the claim-line level and included a single record for each "clean" procedure with 10- or 90-day global periods for which claims-based reporting was required, specifically when

- the HCPCS code was one of 296 for which claims-based reporting was required;[1]
- the rendering practitioner was in one of nine states where claims-based reporting was required (Florida, Kentucky, Louisiana, Nevada, New Jersey, North Dakota, Ohio, Oregon, and Rhode Island); and
- the rendering provider was associated with at least one practice (defined by tax identification number) with more than ten practitioners (defined by rendering National Provider Identifiers [NPIs]) in 2017.

We further limited the file to final action claims and to dates of service between July 1, 2017, and June 30, 2018. We excluded claims with the modifiers listed in Table A.2 because post-operative visits were not expected in these cases.

Table A.2. Excluded Modifiers

ASC facility charges	HCPCS_x_MDFR_CD not = 'SG' and CLM_RNDRG_FED_PRVDR_SPCLTY_CD not = '49'
Demonstration claim (DM)	HCPCS_x_MDFR_CD not = 'DM'
Clinical research trial (00,01)	HCPCS_x_MDFR_CD not = '00', '01'
Assisted at surgery (AS,80,81,82)	HCPCS_x_MDFR_CD not = 'AS', '80', '81', '82'
Unrelated E&M (24,25)	HCPCS_x_MDFR_CD not = '24', '25'
Discontinued procedure (53)	HCPCS_x_MDFR_CD not = '53'
Surgery only (54)	HCPCS_x_MDFR_CD not = '54'
Post-operative only (55)	HCPCS_x_MDFR_CD not = '55'
Pre-operative only (56)	HCPCS_x_MDFR_CD not = '56'
Decision for surgery (57)	HCPCS_x_MDFR_CD not = '57'

Finally, claims were limited to "clean" procedures that do not overlap with the global period for any other of the beneficiary's procedures. The resulting 1.4 million clean procedures reported by practitioners who were expected to report given their practice size were then linked to any 99024 procedures that occurred during the global period for the same beneficiary. From this file, for each of the 1.4 million clean procedures, we used the HCPCS code and the total number of reported post-operative visits.

[1] While reporting was required for 299 procedure codes in 2018, we excluded three codes without any post-operative visits listed on the Time File for a total of 296.

Methods

Calculating Average Work RVUs and Average Physician Time per Time File Visit

Claims-based reporting of post-operative visits used a single HCPCS code (99024), while the visits listed on the Time File are differentiated by E&M HCPCS codes, each of which is associated with different physician work and time values. Because the place of service is reported on HCPCS code 99024 claim lines, it is possible to categorize reported visits as ambulatory or inpatient. However, beyond this distinction, it is impossible to infer which level of visit was provided when 99024 is reported.[2]

We calculated the weighted average work RVUs and average minutes per Time File visit using the work RVU and minutes listed in Table A.1 and the number of Time File visits for each E&M code. For example, if two visits were listed for a procedure, one 99212 with 0.48 RVUs and one 99213 with 0.97 RVUs, we calculated a mean of 0.73 RVUs and used this mean for revaluation. A half visit contributed half as many RVUs and a half visit to the numerator and denominator, respectively, when calculating the mean across visits.

Adjusting Work RVUs for Procedures with Required Claims-Based Reporting

We calculated the difference between the number of Time File visits and the median number of visits reported using HCPCS code 99024 for the 296 procedures for which claims-based reporting was required in CY 2018. The median reported number of visits was less than or equal to the number of Time File visits for each of the 296 procedures.

To calculate new work RVU values, we

1. calculated the differences between the Time File and median, 75th percentile, mean, and modal reported visit counts;
2. multiplied these differences by the procedure-specific average work RVUs per post-operative visit described above; and
3. subtracted the results from baseline CY 2018 work RVUs.

We report new work RVU values using each of the four observed visit metrics (median, 75th percentile, mean, and mode) to describe the typical number of post-operative visits.

[2] We ultimately did not use place of service reported on 99024 claim lines due to challenges in measuring the "typical" inpatient and ambulatory number of visits. It was common for the median and modal count of inpatient and ambulatory visits to be lower than the median and modal count of total visits (e.g., a procedure could have medians of zero inpatient visits, zero ambulatory visits, and one total visit). The resulting revaluations resulted in even larger reductions in RVUs than we report here.

Adjusting Physician Time for Procedures with Required Claims-Based Reporting

Implementing PE RVU allocation requires updated physician times as well as work RVUs. We used the following steps to calculate updated physician times:

1. computed the total post-operative visit time by subtracting pre- and intraservice time from the total physician time;
2. calculated the ratio of the median number of reported visits over the expected number of visits according to the Time File;
3. multiplied the ratio with the total post-operative visit time; and
4. subtracted the result in Step (3) above from the total baseline physician time.

Imputing Post-Operative Visits and Physician Time for Other 10- or 90-Day Global Procedures Without Claims-Based Reporting

The reverse building block approach can be used to adjust work RVUs for individual procedure codes without spillover effects on the work RVUs for other procedures. PE and malpractice RVUs are allocated based on work RVUs for an individual procedure code relative to *all* work RVUs. As a result, adjusting work RVUs downward for only those procedures where reporting of post-operative visits was required would result in the allocation of more PE and malpractice RVUs to the procedure codes where reporting was not required, including procedures with 10- and 90-day global periods but where reporting was not required. The net effect of revaluation on a specialty might be mitigated because while most high-volume procedures would face RVU reductions, other lower-volume procedures might experience PE increases.

To ensure appropriate revaluation of global services, we imputed the number of post-operative visits for global procedure codes without claims-based reporting. To do so, we first conducted a regression analysis using the 296 procedures where reporting was required.[3] After excluding three codes with zero expected number of post-operative visits and three codes that had since transitioned to 0-day global periods, the final analytic sample included 290 procedures codes with a 10- or 90-day global period. We modeled the ratio of the median number of reported 99024 visits over the expected number of visits in the Time File at the procedure code level. The regression takes the form of a fractional logit model with a log link function and a binomial family to account for the fact that the dependent variable is a percentage (Papke and Wooldridge, 1993). Specifically,

$$g(\mu_i) = \alpha + \beta_1 * Global90_i + \beta_2 * IntraTime_i + \beta_3 * PostTime_i + \beta_4 * FacilityShare_i + \beta_5 * SpecialtyShare_i$$

[3] These procedures accounted for 96.5 percent of all the procedures furnished with 10-day global periods and 85.3 percent of all procedures with 90-day global periods in 2017.

where $g(.)$ is a log link function; μ_i is the ratio of the median number of reported visits over the expected number of post-operative visits for procedure code i; *Global90* is an indicator for a 90-day global period; *IntraTime* represents the intraprocedure time in minutes (e.g., the summation of pre-position time, preservice scrub dressing and waiting time, median intraservice time, and immediate postservice time); *PostTime* is the total postservice visit time in minutes; *FacilityShare* represents the share of procedures performed in a facility setting; and *SpecialtyShare* is a vector that contains the share of procedures performed by each of 25 different specialties. We included the total postservice visit time to reflect the expected intensity of post-operative care. To ensure that there were ten or more observations in the regression for each specialty category, we included only those specialties for which the number of procedures with reporting performed by a provider from the specialty accounted for at least 0.5 percent of all procedures with reporting.

We then used the estimated coefficients to predict the number of post-operative visits for the 3,913 procedures with 10- and 90-day global periods where reporting was not required.[4] The predicted ratios for the 3,913 procedures with 10- or 90-day global periods where reporting was not required were then used to adjust work RVUs and physician time. As a sensitivity analysis, we conducted an alternative regression using a ratio of the mean number of reported visits over the expected number of post-operative visits as the dependent variable.

Adjusting Direct PE Inputs

We adjusted PE RVUs by proportionally reducing certain direct PE costs in the facility setting for each procedure code by the ratio of the median observed to expected post-operative visits. Because facilities bill separately for procedures (e.g., under the Outpatient Prospective Payment System fee schedule), the only direct PE costs that contribute to facility payment rates under the Physician Fee Schedule are for pre- and post-operative services. We used CMS's Direct PE Inputs workbook posted with the Physician Fee Schedule as a starting point and adjusted postservice labor, supply, and equipment downward to calculate updated direct PE RVUs in the facility setting.[5] We applied the same reductions (in terms of the magnitude of the RVU reduction) to the nonfacility direct PE RVUs for each procedure.

Estimating Changes to PE and Malpractice RVUs

As described above, both physician work and service time values affect PE RVUs in several ways, and physician work is one of the main inputs to calculating malpractice RVUs. Therefore, we recalculated PE and malpractice RVUs based on updated physician work, updated physician time, and updated direct PE inputs for procedures with 10- and 90-day global periods to estimate the direct effect of these changes on PE and malpractice RVUs. The resulting RVU estimates are

[4] We did not impute post-operative visits for 31 procedures with zero post-operative visits on the Time File.

[5] We assumed that all listed postservice labor, supplies, and equipment were associated with post-operative visits.

based on the process CMS uses for annual Physician Fee Schedule rate setting and reflect the same direct cost and other inputs used to create the Physician Fee Schedule RVUs that we use as a baseline for describing the changes due to revaluation; only work and service time values were modified. For this analysis, we have not applied the transition policy that limits the total drop in total RVUs to 20 percent in a year, which is reflected in the Addendum B values published by CMS with each Physician Fee Schedule rule; nor have we applied the Outpatient Prospective Payment System caps that are reflected in the specialty impact table that accompanies each rule since we want to analyze the effect on the RVUs derived directly from the PE and malpractice algorithms and not these ancillary policies.

Reporting Results

We report the impacts of revaluation, first on work RVUs alone, next on PE RVUs after modifying direct PE inputs only, and finally for total RVUs, by applying the old and new valuations to CY 2018 fee-for-service Medicare volume of procedures with 10- and 90-day global periods. We report updated work RVU estimates for each of the 296 procedure codes where reporting was required as well as results by specialty reflecting the relative volume of services across all services billed by the specialty. We report PE and total RVU results overall and by specialty.

Appendix B. Detailed Results Tables

Table B.1a. Distributional Statistics, Reported Visits, 90-Day Global Periods

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
13160	Late closure of wound	7.5	0	1	3	2.45	0	14,889
14020	Tis trnfr s/a/l 10 sq cm/ <	4	0	0	1	0.95	0	18,388
14021	Tis trnfr s/a/l 10.1–30 sq cm	4	0	1	1	0.95	0	17,797
14040	Tis trnfr f/c/c/m/n/a/g/h/f	4	0	1	1	0.84	0	65,508
14041	Tis trnfr f/c/c/m/n/a/g/h/f	4	0	1	1	0.89	0	42,255
14060	Tis trnfr e/n/e/l 10 sq cm/ <	4	0	1	1	0.95	0	88,731
14061	Tis trnfr e/n/e/l10.1–30 sq cm	4.5	0	1	2	1.13	0	28,338
14301	Tis trnfr any 30.1–60 sq cm	4.5	0	1	2	1.39	0	30,102
15100	Skin splt grft trnk/arm/leg	6	1	2.5	5	3.13	0	13,760
15120	Skn splt a-grft fac/nck/hf/g	3.5	0	1	3	1.99	0	8,850
15240	Skin full grft face/genit/hf	6.5	0	1	2	1.55	0	12,374
15260	Skin full graft een & lips	5	0	1	2	1.37	0	54,521
15730	Mdfc flap w/prsrv vasc pedcl	4.5	0	1	3	2.20	0	9,069
15731	Forehead flap w/vasc pedicle	5.5	2	4	6	4.03	0	2,162
15734	Muscle-skin graft trunk	9	1	3	6	3.44	0	20,170
15823	Revision of upper eyelid	4.5	1	1	2	1.50	1	68,767
19120	Removal of breast lesion	2	0	1	1	1.19	1	11,181
19125	Excision breast lesion	2	1	1	1	1.24	1	15,892
19301	Partial mastectomy	3.5	0	1	2	1.28	1	53,842
19303	Mast simple complete	5	1	2	4	2.56	0	21,078
19307	Mast mod rad	10.5	1	2	4	2.79	0	7,895
19357	Breast reconstruction	12	0	4	6	3.97	0	6,131
20680	Removal of support implant	2.5	0	1	2	1.72	1	47,605
20926	Removal of tissue for graft	5	0	1	2	1.57	0	10,658
22551	Neck spine fuse&remov bel c2	5	1	2	3	2.01	2	41,660
22558	Lumbar spine fusion	8	1	2	4	3.00	2	16,484
22600	Neck spine fusion	11	1	2	4	2.49	0	8,606
22612	Lumbar spine fusion	7	1	2	4	2.79	1	47,864
22630	Lumbar spine fusion	8	1	2.5	4	2.79	2	7,079
22633	Lumbar spine fusion combined	7	1	2	4	2.67	2	38,790
22830	Exploration of spinal fusion	6	0	1	2	1.27	1	5,337
23120	Partial removal collar bone	4.5	1	2	3	1.71	2	5,369
23412	Repair rotator cuff chronic	4.5	1	2	3	2.29	2	15,753
23430	Repair biceps tendon	4.5	2	2	3	2.08	2	12,093
23472	Reconstruct shoulder joint	8	2	3	4	2.69	2	53,040

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
23500	Treat clavicle fracture	2.5	0	1	2	1.28	0	12,367
23600	Treat humerus fracture	4	0	2	3	2.00	0	32,563
23615	Treat humerus fracture	6	1	3	4	2.89	3	8,133
23650	Treat shoulder dislocation	3	0	0	0	0.55	0	12,075
25447	Repair wrist joints	5.5	1	3	3	2.50	3	18,066
25600	Treat fracture radius/ulna	5	0	2	3	2.06	0	41,444
25605	Treat fracture radius/ulna	5.5	0	2	4	2.61	0	18,058
25607	Treat fx rad extra-articul	5.5	1	3	3	2.60	3	9,013
25609	Treat fx radial 3+ frag	6.5	1	3	4	2.55	3	16,238
26055	Incise finger tendon sheath	3.5	0	1	2	1.21	1	71,862
26160	Remove tendon sheath lesion	3.5	0	1	2	1.30	1	13,825
26600	Treat metacarpal fracture	4	0	1	2	1.42	0	14,903
26720	Treat finger fracture each	2	0	1	2	1.24	0	9,979
27125	Partial hip replacement	11.5	0	1	3	1.92	0	10,074
27130	Total hip arthroplasty	7	1	2	3	2.28	2	163,089
27132	Total hip arthroplasty	14.5	1	2	4	2.74	2	6,517
27134	Revise hip joint replacement	11	1	2	4	2.75	2	11,066
27235	Treat thigh fracture	10.5	0	2	4	2.50	0	15,954
27236	Treat thigh fracture	8	0	2	3	2.24	0	61,128
27244	Treat thigh fracture	9	0	1	3	2.19	0	10,680
27245	Treat thigh fracture	9	0	2	4	2.34	0	83,528
27446	Revision of knee joint	6	1	2	3	2.13	2	18,088
27447	Total knee arthroplasty	7	1	2	3	2.46	2	319,995
27486	Revise/replace knee joint	10	1	2	4	2.68	2	10,293
27487	Revise/replace knee joint	10	1	2	4	2.78	2	15,955
27506	Treatment of thigh fracture	12	0	2	4	2.60	0	7,696
27590	Amputate leg at thigh	15.5	0	1	4	2.70	0	12,566
27786	Treatment of ankle fracture	3.5	0	2	3	1.82	0	23,093
27814	Treatment of ankle fracture	6	1	3	5	3.66	3	11,557
27880	Amputation of lower leg	10	0	2	5	3.38	0	14,483
28122	Partial removal of foot bone	5	0	2	4	3.07	0	11,198
28124	Partial removal of toe	4	0	2	3	2.03	0	9,066
28232	Incision of toe tendon	2.5	0	1	2	1.21	1	12,387
28270	Release of foot contracture	3.5	0	0	0	0.50	0	15,524
28285	Repair of hammertoe	4.5	0	2	4	2.51	0	53,295
28296	Correction hallux valgus	5.5	1	3	5	3.15	0	12,399
28308	Incision of metatarsal	4	0	3	5	2.81	0	9,757
28470	Treat metatarsal fracture	3	0	1	2	1.34	0	31,309
28510	Treatment of toe fracture	1.5	0	0	1	0.66	0	13,373
28810	Amputation toe & metatarsal	7	0	2	4	3.06	0	15,623
28820	Amputation of toe	4.5	0	2	4	2.96	0	24,207
28825	Partial amputation of toe	4.5	0	2	3	2.58	0	11,452

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
29822	Shoulder arthroscopy/surgery	4	1	2	3	1.82	2	13,601
29823	Shoulder arthroscopy/surgery	4.5	1	2	3	1.81	2	32,736
29824	Shoulder arthroscopy/surgery	4.5	1	2	3	1.81	2	40,433
29827	Arthroscop rotator cuff repr	5.5	1	2	3	2.26	3	94,671
29828	Arthroscopy biceps tenodesis	4.5	1	2	3	1.80	2	14,752
29848	Wrist endoscopy/surgery	3	1	1	2	1.25	1	28,133
29876	Knee arthroscopy/surgery	3.5	0	1	2	1.65	0	11,307
29879	Knee arthroscopy/surgery	3.5	0	2	2	1.60	0	9,859
29880	Knee arthroscopy/surgery	3.5	1	2	2	1.66	2	44,401
29881	Knee arthroscopy/surgery	3.5	1	1	2	1.56	2	58,701
30520	Repair of nasal septum	4.5	0	1	2	1.33	0	21,245
32480	Partial removal of lung	10	1	2	6	3.84	1	6,871
32663	Thoracoscopy w/lobectomy	7	1	3	5	3.54	1	7,859
33207	Insert heart pm ventricular	3	0	0	1	1.05	0	15,633
33208	Insrt heart pm atrial & vent	3	0	1	2	1.08	0	99,957
33228	Remv&replc pm gen dual lead	1.5	0	0	1	0.61	0	37,772
33249	Insj/rplcmt defib w/lead(s)	3	0	0	1	0.97	0	48,716
33263	Rmvl & rplcmt dfb gen 2 lead	1.5	0	0	1	0.59	0	11,338
33264	Rmvl & rplcmt dfb gen mlt ld	1.5	0	0	1	0.77	0	17,760
33282	Implant pat-active ht record	1.5	0	0	1	0.52	0	34,732
33405	Replacement aortic valve opn	10	1	2	6	3.78	1	24,793
33426	Repair of mitral valve	10	1	2	6	3.76	1	3,726
33430	Replacement of mitral valve	12	1	3	7	5.10	0	9,051
33533	Cabg arterial single	9	1	2	6	3.87	0	63,196
33860	Ascending aortic graft	11	0	3	6	4.89	0	4,140
34705	Evac rpr a-biiliac ndgft	5	0	1	2	1.74	1	20,368
34706	Evasc rpr a-biiliac rpt	10	0	1	1	2.32	0	3,594
34710	Dlyd plmt xtn prosth 1st vsl	5	0	1	2	1.20	1	2,229
35301	Rechanneling of artery	5	1	1	2	1.57	1	43,395
36819	Av fuse uppr arm basilic	2.5	0	1	2	1.55	1	9,414
36821	Av fusion direct any site	2.5	0	1	2	1.47	0	32,757
36830	Artery-vein nonautograft	2.5	0	1	2	1.45	1	22,535
36832	Av fistula revision open	3.5	0	1	2	1.33	1	22,081
37607	Ligation of a-v fistula	2	0	1	1	1.14	0	8,672
37765	Stab phleb veins xtr 10–20	2.5	0	0	1	0.75	0	12,808
37766	Phleb veins—extrem 20+	2.5	0	0	1	0.71	0	10,491
38525	Biopsy/removal lymph nodes	2.5	0	1	1	1.12	0	32,650
38724	Removal of lymph nodes neck	8	1	2	3	2.10	0	7,981
43281	Lap paraesophag hern repair	5	0	1	3	2.06	0	10,722
43644	Lap gastric bypass/roux-en-y	7	1	2	3	2.38	0	5,032
44005	Freeing of bowel adhesion	9	0	2	6	3.76	0	10,438
44120	Removal of small intestine	12	0	2	6	4.29	0	23,524

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
44140	Partial removal of colon	10	0	2	5	3.59	0	15,610
44143	Partial removal of colon	11	0	2	7	4.24	0	10,944
44145	Partial removal of colon	10	1	2	6	3.90	0	6,696
44160	Removal of colon	10	1	2	6	4.19	0	12,583
44204	Laparo partial colectomy	8	0	2	4	2.92	0	12,829
44205	Lap colectomy part w/ileum	9	1	2	4	2.92	1	11,867
44207	L colectomy/coloproctostomy	8	1	2	4	3.05	1	9,308
44970	Laparoscopy appendectomy	4	0	1	2	1.53	1	20,762
46930	Destroy internal hemorrhoids	1	0	0	0	0.34	0	8,939
47562	Laparoscopic cholecystectomy	2.5	0	1	1	1.18	1	109,328
47563	Laparo cholecystectomy/graph	2.5	0	1	1	1.23	1	44,752
47600	Removal of gallbladder	8	0	2	5	3.28	0	9,465
49505	Prp i/hern init reduc > 5 yr	2.5	0	1	1	1.08	1	62,691
49507	Prp i/hern init block > 5 yr	2.5	0	1	2	1.44	1	11,160
49560	Rpr ventral hern init reduc	2.5	0	1	2	1.86	1	24,325
49561	Rpr ventral hern init block	6	0	1	3	2.10	1	13,619
49585	Rpr umbil hern reduc > 5 yr	2.5	0	1	1	1.22	1	17,668
49650	Lap ing hernia repair init	2	0	1	1	1.09	1	36,097
50360	Transplantation of kidney	10	0	0	1	1.24	0	11,223
50590	Fragmenting of kidney stone	3.5	0	1	1	0.86	0	57,987
52601	Prostatectomy (turp)	7	0	1	2	1.61	0	46,288
52648	Laser surgery of prostate	3	0	1	2	1.42	0	21,550
53850	Prostatic microwave thermotx	4	0	0	1	0.70	0	5,706
55866	Laparo radical prostatectomy	5	1	2	3	2.09	2	17,025
57240	Anterior colporrhaphy	6	0	1	2	1.31	0	7,073
57288	Repair bladder defect	4.5	0	1	2	1.31	1	20,063
58571	Tlh w/t/o 250 g or less	2.5	0	1	2	1.32	0	17,322
58575	Laps tot hyst resj mal	5	1	1	2	1.45	1	857
60240	Removal of thyroid	2.5	0	1	2	1.34	1	9,127
60500	Explore parathyroid glands	3.5	0	1	1	1.06	1	16,494
61312	Open skull for drainage	14	0	1	4	2.81	0	9,683
61510	Removal of brain lesion	11	0	2	3	2.41	0	8,160
63030	Low back disk surgery	6	1	1	2	1.65	1	31,933
63042	Laminotomy single lumbar	7	1	2	2	1.77	1	12,666
63045	Remove spine lamina 1 crvl	6	0	2	3	1.89	0	9,465
63047	Remove spine lamina 1 lmbr	6	1	2	3	1.96	2	89,093
63056	Decompress spinal cord lmbr	9.5	1	1	2	1.64	1	6,253
63081	Remove vert body dcmprn crvl	12	1	2	3	2.20	2	6,451
64581	Implant neuroelectrodes	1.5	0	1	2	1.32	0	10,397
64718	Revise ulnar nerve at elbow	4.5	0	1	2	1.48	1	22,118
64721	Carpal tunnel surgery	3.5	0	1	2	1.36	1	104,552

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
65756	Corneal trnspl endothelial	6.5	3	4	5	3.94	3	13,667
66170	Glaucoma surgery	9.5	4	6	8	5.83	6	10,446
66179	Aqueous shunt eye w/o graft	8.5	4	5	6	5.58	5	880
66180	Aqueous shunt eye w/graft	8.5	3	5	6	4.69	5	11,980
66711	Ciliary endoscopic ablation	5.5	0	0	1	0.79	0	10,203
66821	After cataract laser surgery	2	0	1	1	0.76	1	637,157
66982	Cataract surgery complex	4.5	1	3	4	2.74	0	162,580
66984	Cataract surg w/iol 1 stage	4.5	1	3	4	2.89	3	1,680,887
67036	Removal of inner eye fluid	5.5	1	3	4	2.86	3	15,115
67040	Laser treatment of retina	5.5	1	3	4	2.66	3	9,497
67041	Vit for macular pucker	5.5	2	3	3	2.66	3	13,822
67042	Vit for macular hole	5.5	2	3	4	2.87	3	26,245
67108	Repair detached retina	5.5	2	4	5	3.60	4	15,946
67113	Repair retinal detach cplx	6.5	2	3	5	3.44	3	12,727
67145	Treatment of retina	3	0	1	2	1.22	0	26,205
67210	Treatment of retinal lesion	3	0	0	0	0.40	0	66,469
67255	Reinforce/graft eye wall	6.5	0	1	2	1.40	0	899
67900	Repair brow defect	3	1	2	2	1.66	2	9,335
67904	Repair eyelid defect	4.5	1	1	2	1.61	1	40,375
67917	Repair eyelid defect	3.5	1	1	2	1.55	1	18,222
67924	Repair eyelid defect	3.5	1	1	2	1.52	1	9,580

NOTES: Mode is populated with the maximum value in three cases (HCPCS 23120, 36832, and 66180). The CPT short descriptors are those available in the Physician Fee Schedule. The HCPCS codes included in this table are based on the subset of HCPCS codes included in our earlier analysis (Kranz et al., 2019) that were active and retained a 90-day global period in 2018.

Table B.1b. Distributional Statistics, Reported Visits, 10-Day Global Periods

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
10040	Acne surgery	0.5	0	0	0	0.02	0	30,342
10060	Drainage of skin abscess	1	0	0	0	0.15	0	413,247
10061	Drainage of skin abscess	2	0	0	0	0.21	0	154,272
10120	Remove foreign body	1	0	0	0	0.04	0	42,785
10140	Drainage of hematoma/fluid	1	0	0	0	0.32	0	57,576
10160	Puncture drainage of lesion	1	0	0	0	0.10	0	60,332
10180	Complex drainage wound	1	0	0	1	0.78	0	10,405
11200	Removal of skin tags < w/15	1	0	0	0	0.01	0	82,964
11400	Exc tr-ext b9+marg 0.5 cm <	1	0	0	0	0.10	0	26,675
11401	Exc tr-ext b9+marg 0.6–1 cm	1	0	0	0	0.12	0	56,457
11402	Exc tr-ext b9+marg 1.1–2 cm	1	0	0	0	0.15	0	78,114

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
11403	Exc tr-ext b9+marg 2.1–3 cm	1	0	0	0	0.19	0	33,831
11404	Exc tr-ext b9+marg 3.1–4 cm	1	0	0	0	0.21	0	13,311
11406	Exc tr-ext b9+marg > 4.0 cm	1	0	0	0	0.33	0	15,154
11420	Exc h-f-nk-sp b9+marg 0.5/ <	1	0	0	0	0.12	0	17,892
11421	Exc h-f-nk-sp b9+marg 0.6–1	1	0	0	0	0.16	0	25,764
11422	Exc h-f-nk-sp b9+marg 1.1–2	1	0	0	0	0.20	0	28,898
11423	Exc h-f-nk-sp b9+marg 2.1–3	1	0	0	0	0.21	0	12,509
11440	Exc face-mm b9+marg 0.5 cm/ <	1	0	0	0	0.14	0	28,749
11441	Exc face-mm b9+marg 0.6–1 cm	1	0	0	0	0.21	0	29,574
11442	Exc face-mm b9+marg 1.1–2 cm	1	0	0	1	0.26	0	25,786
11443	Exc face-mm b9+marg 2.1–3 cm	1	0	0	0	0.21	0	7,524
11601	Exc tr-ext mal+marg 0.6–1 cm	1	0	0	0	0.10	0	21,952
11602	Exc tr-ext mal+marg 1.1–2 cm	1	0	0	0	0.12	0	126,304
11603	Exc tr-ext mal+marg 2.1–3 cm	1	0	0	0	0.15	0	68,762
11604	Exc tr-ext mal+marg 3.1–4 cm	1	0	0	0	0.23	0	27,874
11606	Exc tr-ext mal+marg > 4 cm	1	0	0	0	0.26	0	28,712
11621	Exc s/n/h/f/g mal+mrg 0.6–1	1	0	0	0	0.20	0	9,863
11622	Exc s/n/h/f/g mal+mrg 1.1–2	1	0	0	0	0.16	0	39,789
11623	Exc s/n/h/f/g mal+mrg 2.1–3	1	0	0	0	0.21	0	20,118
11640	Exc f/e/e/n/l mal+mrg 0.5 cm <	1	0	0	0.5	0.28	0	8,393
11641	Exc f/e/e/n/l mal+mrg 0.6–1	1	0	0	0	0.24	0	30,348
11642	Exc f/e/e/n/l mal+mrg 1.1–2	1	0	0	0	0.26	0	72,790
11643	Exc f/e/e/n/l mal+mrg 2.1–3	1	0	0	1	0.34	0	29,155
11644	Exc f/e/e/n/l mal+mrg 3.1–4	1	0	0	1	0.35	0	9,905
11646	Exc f/e/e/n/l mal+mrg > 4 cm	1	0	0	1	0.41	0	8,066
11750	Removal of nail bed	1	0	0	0	0.10	0	194,732
11765	Excision of nail fold toe	1	0	0	0	0.02	0	44,899
12031	Intmd rpr s/a/t/ext 2.5 cm/ <	1	0	0	0	0.09	0	49,892
12032	Intmd rpr s/a/t/ext 2.6–7.5	1	0	0	0	0.11	0	224,558
12034	Intmd rpr s/tr/ext 7.6–12.5	1	0	0	0	0.09	0	18,288
12041	Intmd rpr n-hf/genit 2.5cm/ <	1	0	0	0	0.11	0	15,803
12042	Intmd rpr n-hf/genit2.6–7.5	1	0	0	0	0.14	0	39,010
12051	Intmd rpr face/mm 2.5 cm/ <	1	0	0	1	0.28	0	42,023
12052	Intmd rpr face/mm 2.6–5.0 cm	1	0	0	1	0.27	0	59,173
13101	Cmplx rpr trunk 2.6–7.5 cm	1	0	0	0	0.16	0	75,178
13121	Cmplx rpr s/a/l 2.6–7.5 cm	1	0	0	0	0.19	0	128,380
13131	Cmplx rpr f/c/c/m/n/ax/g/h/f	1	0	0	1	0.37	0	26,329
13132	Cmplx rpr f/c/c/m/n/ax/g/h/f	1	0	0	1	0.33	0	173,065
13151	Cmplx rpr e/n/e/l 1.1–2.5 cm	1	0	0	1	0.40	0	22,307
13152	Cmplx rpr e/n/e/l 2.6–7.5 cm	1	0	0	1	0.38	0	33,770

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
17000	Destruct premalg lesion	1	0	0	0	0.01	0	4,588,227
17004	Destroy premal lesions 15/ >	1	0	0	0	0.01	0	861,245
17110	Destruct b9 lesion 1–14	1	0	0	0	0.01	0	2,049,227
17111	Destruct lesion 15 or more	1	0	0	0	0.01	0	105,055
17260	Destruction of skin lesions	1	0	0	0	0.02	0	14,457
17261	Destruction of skin lesions	1	0	0	0	0.02	0	121,528
17262	Destruction of skin lesions	1	0	0	0	0.03	0	239,408
17263	Destruction of skin lesions	1	0	0	0	0.04	0	43,931
17270	Destruction of skin lesions	1	0	0	0	0.01	0	8,806
17271	Destruction of skin lesions	1	0	0	0	0.02	0	46,243
17272	Destruction of skin lesions	1	0	0	0	0.02	0	74,213
17273	Destruction of skin lesions	1	0	0	0	0.03	0	13,853
17280	Destruction of skin lesions	1	0	0	0	0.01	0	26,776
17281	Destruction of skin lesions	1	0	0	0	0.02	0	97,241
17282	Destruction of skin lesions	1	0	0	0	0.02	0	89,820
17283	Destruction of skin lesions	1	0	0	0	0.03	0	13,619
20670	Removal of support implant	1	0	0	1	0.31	0	7,925
22513	Perq vertebral augmentation	1.5	0	0	0	0.19	0	23,139
22514	Perq vertebral augmentation	1.5	0	0	0	0.16	0	25,044
36558	Insert tunneled cv cath	1.5	0	0	0	0.08	0	122,510
36561	Insert tunneled cv cath	1.5	0	0	0	0.07	0	128,750
36581	Replace tunneled cv cath	1.5	0	0	0	0.06	0	35,432
36589	Removal tunneled cv cath	1.5	0	0	0	0.06	0	88,824
36590	Removal tunneled cv cath	1.5	0	0	0	0.10	0	50,893
37609	Temporal artery procedure	1.5	0	0	0	0.27	0	13,943
38500	Biopsy/removal lymph nodes	1.5	0	0	1	0.37	0	8,502
38571	Laparoscopy lymphadenectomy	3	0	0	0	0.41	0	11,611
40808	Biopsy of mouth lesion	1	0	0	0	0.12	0	11,998
46221	Ligation of hemorrhoid(s)	1	0	0	0	0.02	0	70,956
46500	Injection into hemorrhoid(s)	1	0	0	0	0.02	0	12,294
49422	Remove tunneled ip cath	3	0	0	0	0.24	0	10,165
49440	Place gastrostomy tube perc	1	0	0	0	0.05	0	18,920
54161	Circum 28 days or older	1	0	0	0	0.20	0	8,999
58661	Laparoscopy remove adnexa	1.5	0	0	0	0.25	0	12,987
62264	Epidural lysis on single day	0.5	0	0	0	0.01	0	9,020
63650	Implant neuroelectrodes	1.5	0	0	1	0.42	0	54,809
63685	Insrt/redo spine n generator	1.5	0	0	0	0.29	0	12,528
64555	Implant neuroelectrodes	1.5	0	1	1	0.59	1	7,444
64561	Implant neuroelectrodes	1	0	0	1	0.48	0	11,588
64590	Insrt/redo pn/gastr stimul	1	0	0	0	0.15	0	8,585

HCPCS Code	CPT Short Descriptors	Time File Visits	Reported Visits, 25th Pctl.	Reported Visits, Median	Reported Visits, 75th Pctl.	Reported Visits, Mean	Reported Visits, Mode	2018 Medicare Volume
64612	Destroy nerve face muscle	1	0	0	0	0.01	0	94,140
64632	N block inj common digit	1	0	0	0	0.02	0	21,353
64633	Destroy cerv/thor facet jnt	1.5	0	0	0	0.02	0	61,379
64635	Destroy lumb/sac facet jnt	1.5	0	0	0	0.02	0	252,467
64640	Injection treatment of nerve	1	0	0	0	0.01	0	90,882
65855	Trabeculoplasty laser surg	1	0	0	0	0.11	0	151,350
66761	Revision of iris	2	0	0	0	0.27	0	76,347
67228	Treatment x10sv retinopathy	1	0	0	0	0.03	0	76,671
67800	Remove eyelid lesion	0.5	0	0	0	0.06	0	19,825
67840	Remove eyelid lesion	1	0	0	0	0.09	0	45,961
68760	Close tear duct opening	1	0	0	0	0.06	0	9,678
68761	Close tear duct opening	1	0	0	0	0.03	0	341,423
68801	Dilate tear duct opening	1	0	0	0	0.03	0	31,685
68810	Probe nasolacrimal duct	1	0	0	0	0.12	0	24,497
68840	Explore/irrigate tear ducts	1	0	0	0	0.01	0	39,647
69420	Incision of eardrum	1	0	0	0	0.03	0	13,418
69433	Create eardrum opening	1	0	0	0	0.03	0	42,244
69436	Create eardrum opening	1	0	0	0	0.09	0	11,887

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule. The HCPCS codes included in this table are based on the subset of HCPCS codes included in our earlier analysis (Kranz et al., 2019) that were active and retained a 10-day global period in 2018.

Table B.2a. Observed and New Visit Counts by Specialty, Procedures with 90-Day Global Periods

Specialty	No. of Procedures	Expected No. of Visits	Share Observed Within Specialty	Reduction in Visit Counts When Using Median Observed Visit Counts (Percent)	Reduction in Visit Counts When Using 75th Pctl. Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Average Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Modal Observed Visit Counts (Percent)
Cardiac surgery	5,765	47,963	46	–77	–37	–58	–96
Cardiology	11,216	27,786	36	–84	–41	–64	–100
Colorectal surgery	2,649	18,949	32	–77	–48	–62	–92
Dermatology	16,280	69,712	22	–77	–68	–75	–100
Diagnostic radiology	101	286	4	–95	–61	–70	–96
General surgery	53,254	219,048	42	–71	–50	–59	–82
Hand surgery	10,564	43,761	39	–67	–43	–62	–77
Interventional radiology	88	249	18	–96	–60	–69	–97
Neurology	159	1,089	51	–75	–57	–70	–80
Neurosurgery	14,476	100,070	30	–75	–57	–70	–79
Nurse practitioner/physician asst.	3,634	14,313	39	–64	–42	–61	–100
Ophthalmology	112,482	433,329	57	–40	–22	–43	–46
Orthopedic surgery	147,845	966,590	34	–71	–54	–66	–78
Other specialty	27,801	75,846	36	–79	–44	–63	–95
Otolaryngology	3,556	14,252	34	–74	–59	–69	–93
Plastic and reconstructive surgery	4,656	19,701	33	–74	–57	–69	–91
Podiatry	4,394	16,926	56	–61	–25	–46	–97
Primary care	1,412	5,312	40	–75	–46	–61	–92
Surgical oncology	1,542	6,567	38	–71	–50	–61	–82
Thoracic surgery	7,897	64,679	40	–76	–36	–58	–96
Urology	16,799	79,514	27	–79	–66	–73	–98
Vascular surgery	10,686	48,613	36	–77	–50	–63	–88
Total	457,256	2,274,550	39	–67	–46	–61	–76

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018).
NOTE: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods.

Table B.2b. Observed and New Visit Counts by Specialty, Procedures with 10-Day Global Periods

Specialty	No. of Procedures	Expected No. of Visits	Share Observed Within Specialty (Percent)	Reduction in Visit Counts When Using Median Observed Visit Counts (Percent)	Reduction in Visit Counts When Using 75th Pctl. Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Average Observed Visit Counts (Percent)	Reduction in Visit Counts When Using Modal Observed Visit Counts (Percent)
Cardiac surgery	268	368	34	–100	–88	–86	–100
Cardiology	519	571	5	–100	–100	–95	–100
Colorectal surgery	3,917	4,121	4	–100	–99	–96	–100
Dermatology	459,633	459,677	4	–100	–94	–96	–100
Diagnostic radiology	23,040	33,084	3	–100	–100	–94	–100
General surgery	23,768	31,209	20	–100	–97	–90	–100
Hand surgery	259	290	46	–100	–90	–85	–100
Interventional radiology	8,103	11,573	3	–100	–100	–95	–100
Neurology	3,182	3,485	2	–99	–98	–98	–99
Neurosurgery	2,424	3,606	20	–100	–98	–87	–100
Nurse practitioner/physician asst.	223,535	228,285	2	–100	–99	–98	–100
Ophthalmology	32,979	36,723	8	–100	–100	–92	–100
Orthopedic surgery	3,640	4,961	18	–100	–97	–88	–100
Other specialty	65,525	89,835	3	–100	–97	–95	–100
Otolaryngology	9,408	9,543	12	–100	–93	–92	–100
Plastic and reconstructive surgery	3,690	3,745	27	–100	–61	–78	–100
Podiatry	22,732	23,940	5	–100	–100	–93	–100
Primary care	44,912	46,445	5	–100	–99	–95	–100
Surgical oncology	903	1,236	8	–100	–94	–91	–100
Thoracic surgery	493	679	24	–100	–94	–91	–100
Urology	2,491	2,577	29	–100	–64	–71	–100
Vascular surgery	5,639	8,028	9	–100	–99	–93	–100
Total	941,060	1,003,975	4	–100	–96	–96	–100

SOURCE: Time File visits are from the CY 2017 and CY 2018 Time Files posted with Medicare's Physician Fee Schedule. Reported visits are from RAND analysis of Medicare fee-for-service claims data accessed via the IDR (run date, 12/13/2018).
NOTE: Descriptive statistics for reported post-operative visits are from claims data collected from practitioners expected to report and for procedures without overlapping global periods.

Table B.3a. Updated Work RVUs, Procedures with 90-Day Global Periods

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
13160	Late closure of wound	14,889	12.04	4.98	5.92	7.80	7.29	4.98
14020	Tis trnfr s/a/l 10 sq cm/<	18,388	7.22	3.34	3.34	4.31	4.26	3.34
14021	Tis trnfr s/a/l 10.1–30 sq cm	17,797	9.72	5.84	6.81	6.81	6.77	5.84
14040	Tis trnfr f/c/c/m/n/a/g/h/f	65,508	8.60	5.70	6.43	6.43	6.31	5.70
14041	Tis trnfr f/c/c/m/n/a/g/h/f	42,255	10.83	6.95	7.92	7.92	7.81	6.95
14060	Tis trnfr e/n/e/l 10 sq cm/<	88,731	9.23	6.33	7.05	7.05	7.02	6.33
14061	Tis trnfr e/n/e/l10.1–30 sq cm	28,338	11.48	7.12	8.09	9.05	8.22	7.12
14301	Tis trnfr any 30.1–60 sq cm	30,102	12.65	8.62	9.52	10.41	9.86	8.62
15100	Skin splt grft trnk/arm/leg	13,760	9.90	5.78	7.02	9.08	7.54	4.96
15120	Skn splt a-grft fac/nck/hf/g	8,850	10.15	7.09	7.96	9.71	8.83	7.09
15240	Skin full grft face/genit/hf	12,374	10.41	4.93	5.77	6.62	6.24	4.93
15260	Skin full graft een & lips	54,521	11.64	6.79	7.76	8.73	8.12	6.79
15730	Mdfc flap w/prsrv vasc pedcl	9,069	13.50	10.45	11.13	12.48	11.94	10.45
15731	Forehead flap w/vasc pedicle	2,162	14.38	10.86	12.87	14.88	12.90	8.85
15734	Muscle-skin graft trunk	20,170	19.86	11.12	13.31	16.58	13.79	10.03
15823	Revision of upper eyelid	68,767	6.81	4.44	4.44	5.12	4.78	4.44
19120	Removal of breast lesion	11,181	5.92	4.47	5.20	5.20	5.33	5.20
19125	Excision breast lesion	15,892	6.69	5.72	5.72	5.72	5.96	5.72
19301	Partial mastectomy	53,842	10.13	7.07	7.94	8.82	8.19	7.94
19303	Mast simple complete	21,078	15.85	11.47	12.56	14.75	13.18	10.37
19307	Mast mod rad	7,895	18.23	9.49	10.41	12.25	11.14	8.58
19357	Breast reconstruction	6,131	18.50	8.19	11.63	13.35	11.60	8.19
20680	Removal of support implant	47,605	5.96	4.36	5.00	5.64	5.46	5.00
20926	Removal of tissue for graft	10,658	5.79	2.31	3.01	3.70	3.40	2.31
22551	Neck spine fuse&remov bel c2	41,660	25.00	20.54	21.65	22.77	21.66	21.65
22558	Lumbar spine fusion	16,484	23.53	13.75	15.15	17.94	16.54	15.15
22600	Neck spine fusion	8,606	17.40	8.56	9.45	11.21	9.88	7.68
22612	Lumbar spine fusion	47,864	23.53	16.90	18.01	20.22	18.88	16.90
22630	Lumbar spine fusion	7,079	22.09	15.58	16.98	18.37	17.24	16.51
22633	Lumbar spine fusion combined	38,790	27.75	19.54	20.91	23.64	21.83	20.91
22830	Exploration of spinal fusion	5,337	11.22	6.98	7.69	8.39	7.88	7.69
23120	Partial removal collar bone	5,369	7.39	4.64	5.42	6.21	5.19	5.42
23412	Repair rotator cuff chronic	15,753	11.93	9.18	9.96	10.75	10.19	9.96
23430	Repair biceps tendon	12,093	10.17	8.20	8.20	8.99	8.26	8.20
23472	Reconstruct shoulder joint	53,040	22.13	16.45	17.39	18.34	17.10	16.45
23500	Treat clavicle fracture	12,367	2.21	1.01	1.49	1.97	1.62	1.01
23600	Treat humerus fracture	32,563	3.00	0.59	1.80	2.40	1.79	0.59
23615	Treat humerus fracture	8,133	12.30	7.78	9.59	10.49	9.48	9.59
23650	Treat shoulder dislocation	12,075	3.53	2.09	2.09	2.09	2.35	2.09

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
25447	Repair wrist joints	18,066	11.14	7.85	9.31	9.31	8.95	9.31
25600	Treat fracture radius/ulna	41,444	2.78	0.38	1.34	1.82	1.37	0.38
25605	Treat fracture radius/ulna	18,058	6.25	2.72	4.00	5.29	4.40	2.72
25607	Treat fx rad extra-articul	9,013	9.56	5.87	7.51	7.51	7.18	7.51
25609	Treat fx radial 3+ frag	16,238	14.38	9.74	11.43	12.27	11.05	11.43
26055	Incise finger tendon sheath	71,862	3.11	0.54	1.27	2.01	1.43	1.27
26160	Remove tendon sheath lesion	13,825	3.57	1.00	1.73	2.47	1.95	1.73
26600	Treat metacarpal fracture	14,903	2.60	0.68	1.16	1.64	1.36	0.68
26720	Treat finger fracture each	9,979	1.76	0.80	1.28	1.76	1.40	0.80
27125	Partial hip replacement	10,074	16.64	6.65	7.51	9.25	8.31	6.65
27130	Total hip arthroplasty	163,089	20.72	14.09	15.20	16.30	15.51	15.20
27132	Total hip arthroplasty	6,517	25.69	14.16	15.02	16.73	15.65	15.02
27134	Revise hip joint replacement	11,066	30.28	21.63	22.50	24.23	23.15	22.50
27235	Treat thigh fracture	15,954	13.00	5.62	7.03	8.43	7.38	5.62
27236	Treat thigh fracture	61,128	17.61	9.40	11.45	12.48	11.70	9.40
27244	Treat thigh fracture	10,680	18.18	9.21	10.21	12.20	11.39	9.21
27245	Treat thigh fracture	83,528	18.18	9.21	11.20	13.20	11.55	9.21
27446	Revision of knee joint	18,088	17.48	12.61	13.58	14.56	13.70	13.58
27447	Total knee arthroplasty	319,995	20.72	14.09	15.20	16.30	15.71	15.20
27486	Revise/replace knee joint	10,293	21.12	13.06	13.95	15.74	14.56	13.95
27487	Revise/replace knee joint	15,955	27.11	19.05	19.94	21.73	20.64	19.94
27506	Treatment of thigh fracture	7,696	19.65	9.07	10.83	12.59	11.36	9.07
27590	Amputate leg at thigh	12,566	13.47	2.29	3.01	5.18	4.24	2.29
27786	Treatment of ankle fracture	23,093	3.02	1.34	2.30	2.78	2.21	1.34
27814	Treatment of ankle fracture	11,557	10.62	5.98	7.84	9.69	8.45	7.84
27880	Amputation of lower leg	14,483	15.37	6.48	8.26	10.93	9.48	6.48
28122	Partial removal of foot bone	11,198	6.76	2.58	4.25	5.92	5.14	2.58
28124	Partial removal of toe	9,066	5.00	3.08	4.04	4.52	4.05	3.08
28232	Incision of toe tendon	12,387	3.51	2.31	2.79	3.27	2.89	2.79
28270	Release of foot contracture	15,524	4.93	3.25	3.25	3.25	3.49	3.25
28285	Repair of hammertoe	53,295	5.62	2.08	3.65	5.23	4.06	2.08
28296	Correction hallux valgus	12,399	8.25	4.96	6.42	7.88	6.53	4.23
28308	Incision of metatarsal	9,757	5.48	3.56	5.00	5.96	4.91	3.56
28470	Treat metatarsal fracture	31,309	2.03	0.59	1.07	1.55	1.23	0.59
28510	Treatment of toe fracture	13,373	1.17	0.45	0.45	0.93	0.77	0.45
28810	Amputation toe & metatarsal	15,623	6.64	1.92	3.27	4.62	3.98	1.92
28820	Amputation of toe	24,207	5.82	2.28	3.85	5.43	4.61	2.28
28825	Partial amputation of toe	11,452	5.37	1.83	3.40	4.19	3.86	1.83
29822	Shoulder arthroscopy/surgery	13,601	7.60	5.86	6.44	7.02	6.34	6.44
29823	Shoulder arthroscopy/surgery	32,736	8.36	6.37	6.94	7.51	6.83	6.94
29824	Shoulder arthroscopy/surgery	40,433	8.98	6.23	7.01	7.80	6.87	7.01

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
29827	Arthroscop rotator cuff repr	94,671	15.59	13.10	13.66	14.21	13.80	14.21
29828	Arthroscopy biceps tenodesis	14,752	13.16	10.41	11.19	11.98	11.04	11.19
29848	Wrist endoscopy/surgery	28,133	6.39	4.45	4.45	5.42	4.69	4.45
29876	Knee arthroscopy/surgery	11,307	8.87	5.32	6.33	7.35	7.00	5.32
29879	Knee arthroscopy/surgery	9,859	8.99	5.44	7.47	7.47	7.06	5.44
29880	Knee arthroscopy/surgery	44,401	7.39	5.20	6.08	6.08	5.78	6.08
29881	Knee arthroscopy/surgery	58,701	7.03	4.84	4.84	5.72	5.34	5.72
30520	Repair of nasal septum	21,245	7.01	3.47	4.26	5.04	4.52	3.47
32480	Partial removal of lung	6,871	25.82	13.78	15.12	20.47	17.58	13.78
32663	Thoracoscopy w/lobectomy	7,859	24.64	17.03	19.57	22.10	20.25	17.03
33207	Insert heart pm ventricular	15,633	7.80	4.16	4.16	5.37	5.43	4.16
33208	Insrt heart pm atrial & vent	99,957	8.52	4.88	6.09	7.31	6.19	4.88
33228	Remv&replc pm gen dual lead	37,772	5.52	3.91	3.91	4.98	4.56	3.91
33249	Insj/rplcmt defib w/lead(s)	48,716	14.92	12.01	12.01	12.98	12.95	12.01
33263	Rmvl & rplcmt dfb gen 2 lead	11,338	6.08	4.47	4.47	5.54	5.10	4.47
33264	Rmvl & rplcmt dfb gen mlt ld	17,760	6.35	4.74	4.74	5.81	5.57	4.74
33282	Implant pat-active ht record	34,732	3.25	1.64	1.64	2.71	2.19	1.64
33405	Replacement aortic valve opn	24,793	41.32	25.31	27.09	34.20	30.26	25.31
33426	Repair of mitral valve	3,726	43.28	27.27	29.05	36.16	32.19	27.27
33430	Replacement of mitral valve	9,051	50.93	29.04	33.02	40.98	37.20	27.05
33533	Cabg arterial single	63,196	33.75	19.61	21.38	28.45	24.68	17.84
33860	Ascending aortic graft	4,140	59.46	37.17	43.25	49.33	47.08	37.17
34705	Evac rpr a-biiliac ndgft	20,368	29.58	23.46	24.68	25.91	25.59	24.68
34706	Evasc rpr a-biiliac rpt	3,594	45.00	28.73	30.36	30.36	32.51	28.73
34710	Dlyd plmt xtn prosth 1st vsl	2,229	15.00	10.12	11.10	12.07	11.29	11.10
35301	Rechanneling of artery	43,395	21.16	15.87	15.87	17.19	16.63	15.87
36819	Av fuse uppr arm basilic	9,414	13.29	11.20	12.04	12.87	12.50	12.04
36821	Av fusion direct any site	32,757	11.90	9.81	10.65	11.48	11.04	9.81
36830	Artery-vein nonautograft	22,535	12.03	9.94	10.78	11.61	11.15	10.78
36832	Av fistula revision open	22,081	13.50	10.44	11.31	12.19	11.60	11.31
37607	Ligation of a-v fistula	8,672	6.25	5.29	5.77	5.77	5.84	5.29
37765	Stab phleb veins xtr 10–20	12,808	7.71	5.62	5.62	6.46	6.24	5.62
37766	Phleb veins—extrem 20+	10,491	9.66	7.57	7.57	8.41	8.16	7.57
38525	Biopsy/removal lymph nodes	32,650	6.43	4.34	5.18	5.18	5.27	4.34
38724	Removal of lymph nodes neck	7,981	23.95	16.43	17.50	18.58	17.61	15.35
43281	Lap paraesophag hern repair	10,722	26.60	21.23	22.30	24.45	23.44	21.23
43644	Lap gastric bypass/roux-en-y	5,032	29.40	22.74	23.85	24.96	24.27	21.63
44005	Freeing of bowel adhesion	10,438	18.46	7.43	9.88	14.78	12.04	7.43
44120	Removal of small intestine	23,524	20.82	6.88	9.20	13.85	11.86	6.88
44140	Partial removal of colon	15,610	22.59	13.70	15.48	18.15	16.90	13.70
44143	Partial removal of colon	10,944	27.79	14.50	16.92	22.96	19.62	14.50

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44145	Partial removal of colon	6,696	28.58	18.90	19.97	24.28	22.01	17.82
44160	Removal of colon	12,583	20.89	10.53	11.68	16.29	14.21	9.38
44204	Laparo partial colectomy	12,829	26.42	19.05	20.89	22.74	21.74	19.05
44205	Lap colectomy part w/ileum	11,867	22.95	17.15	17.88	19.33	18.55	17.15
44207	L colectomy/coloproctostomy	9,308	31.92	23.84	24.99	27.30	26.20	23.84
44970	Laparoscopy appendectomy	20,762	9.45	5.47	6.47	7.46	6.99	6.47
46930	Destroy internal hemorrhoids	8,939	1.61	0.64	0.64	0.64	0.97	0.64
47562	Laparoscopic cholecystectomy	109,328	10.47	8.38	9.22	9.22	9.37	9.22
47563	Laparo cholecystectomy/graph	44,752	11.47	9.38	10.22	10.22	10.41	10.22
47600	Removal of gallbladder	9,465	17.48	8.24	10.55	14.02	12.02	8.24
49505	Prp i/hern init reduc > 5 yr	62,691	7.96	5.87	6.71	6.71	6.78	6.71
49507	Prp i/hern init block > 5 yr	11,160	9.09	7.00	7.84	8.67	8.20	7.84
49560	Rpr ventral hern init reduc	24,325	11.92	9.83	10.67	11.50	11.38	10.67
49561	Rpr ventral hern init block	13,619	15.38	9.11	10.16	12.25	11.31	10.16
49585	Rpr umbil hern reduc > 5 yr	17,668	6.59	4.50	5.34	5.34	5.52	5.34
49650	Lap ing hernia repair init	36,097	6.36	5.40	5.88	5.88	5.92	5.88
50360	Transplantation of kidney	11,223	39.88	24.98	24.98	26.47	26.83	24.98
50590	Fragmenting of kidney stone	57,987	9.77	6.71	7.58	7.58	7.46	6.71
52601	Prostatectomy (turp)	46,288	15.26	8.65	9.59	10.54	10.17	8.65
52648	Laser surgery of prostate	21,550	12.15	9.24	10.21	11.18	10.61	9.24
53850	Prostatic microwave thermotx	5,706	10.08	6.16	6.16	7.14	6.84	6.16
55866	Laparo radical prostatectomy	17,025	26.80	21.91	23.13	24.36	23.25	23.13
57240	Anterior colporrhaphy	7,073	11.50	5.86	6.80	7.74	7.09	5.86
57288	Repair bladder defect	20,063	12.13	8.10	9.00	9.89	9.28	9.00
58571	Tlh w/t/o 250 g or less	17,322	15.00	12.42	13.45	14.48	13.78	12.42
58575	Laps tot hyst resj mal	857	32.60	27.71	27.71	28.93	28.26	27.71
60240	Removal of thyroid	9,127	15.04	12.46	13.49	14.52	13.84	13.49
60500	Explore parathyroid glands	16,494	15.60	12.54	13.41	13.41	13.46	13.41
61312	Open skull for drainage	9,683	30.17	14.83	15.93	19.21	17.91	14.83
61510	Removal of brain lesion	8,160	30.83	19.85	21.85	22.84	22.26	19.85
63030	Low back disk surgery	31,933	13.18	8.42	8.42	9.37	9.04	8.42
63042	Laminotomy single lumbar	12,666	18.76	13.21	14.14	14.14	13.93	13.21
63045	Remove spine lamina 1 crvl	9,465	17.95	11.61	13.72	14.78	13.60	11.61
63047	Remove spine lamina 1 lmbr	89,093	15.37	10.09	11.14	12.20	11.10	11.14
63056	Decompress spinal cord lmbr	6,253	21.86	14.47	14.47	15.34	15.02	14.47
63081	Remove vert body dcmprn crvl	6,451	26.10	11.64	12.95	14.27	13.22	12.95
64581	Implant neuroelectrodes	10,397	12.20	10.06	11.49	12.91	11.94	10.06
64718	Revise ulnar nerve at elbow	22,118	7.26	2.74	3.74	4.75	4.23	3.74
64721	Carpal tunnel surgery	104,552	4.97	1.91	2.78	3.66	3.10	2.78
65756	Corneal trnspl endothelial	13,667	16.84	14.15	14.92	15.69	14.87	14.15
66170	Glaucoma surgery	10,446	13.94	9.65	11.21	12.77	11.08	11.21

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
66179	Aqueous shunt eye w/o graft	880	14.00	10.33	11.15	11.96	11.62	11.15
66180	Aqueous shunt eye w/graft	11,980	15.00	10.52	12.15	12.96	11.89	12.15
66711	Ciliary endoscopic ablation	10,203	7.93	2.93	2.93	3.84	3.65	2.93
66821	After cataract laser surgery	637,157	3.42	1.48	2.45	2.45	2.22	2.45
66982	Cataract surgery complex	162,580	11.08	8.33	9.90	10.69	9.70	7.54
66984	Cataract surg w/iol 1 stage	1,680,887	8.52	5.77	7.34	8.13	7.26	7.34
67036	Removal of inner eye fluid	15,115	12.13	7.64	9.63	10.63	9.49	9.63
67040	Laser treatment of retina	9,497	14.50	10.01	12.00	13.00	11.66	12.00
67041	Vit for macular pucker	13,822	16.33	12.84	13.83	13.83	13.49	13.83
67042	Vit for macular hole	26,245	16.33	12.84	13.83	14.83	13.71	13.83
67108	Repair detached retina	15,946	17.13	13.64	15.63	16.63	15.24	15.63
67113	Repair retinal detach cplx	12,727	19.00	14.53	15.52	17.51	15.96	15.52
67145	Treatment of retina	26,205	6.32	3.41	4.38	5.35	4.59	3.41
67210	Treatment of retinal lesion	66,469	6.36	3.45	3.45	3.45	3.84	3.45
67255	Reinforce/graft eye wall	899	8.38	3.39	4.16	4.93	4.46	3.39
67900	Repair brow defect	9,335	6.82	5.21	6.01	6.01	5.74	6.01
67904	Repair eyelid defect	40,375	7.97	5.60	5.60	6.28	6.01	5.60
67917	Repair eyelid defect	18,222	5.93	4.09	4.09	4.83	4.50	4.09
67924	Repair eyelid defect	9,580	5.93	4.09	4.09	4.83	4.48	4.09

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule.

Table B.3b. Updated Work RVUs, Procedures with 10-Day Global Periods

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
10040	Acne surgery	30,342	1.21	0.97	0.97	0.97	0.98	0.97
10060	Drainage of skin abscess	413,247	1.22	0.74	0.74	0.74	0.81	0.74
10061	Drainage of skin abscess	154,272	2.45	1.49	1.49	1.49	1.59	1.49
10120	Remove foreign body	42,785	1.22	0.74	0.74	0.74	0.76	0.74
10140	Drainage of hematoma/fluid	57,576	1.58	1.10	1.10	1.10	1.25	1.10
10160	Puncture drainage of lesion	60,332	1.25	0.77	0.77	0.77	0.82	0.77
10180	Complex drainage wound	10,405	2.30	1.82	1.82	2.30	2.20	1.82
11200	Removal of skin tags < w/15	82,964	0.82	0.34	0.34	0.34	0.35	0.34
11400	Exc tr-ext b9+marg 0.5 cm <	26,675	0.90	0.42	0.42	0.42	0.47	0.42
11401	Exc tr-ext b9+marg 0.6–1 cm	56,457	1.28	0.80	0.80	0.80	0.86	0.80
11402	Exc tr-ext b9+marg 1.1–2 cm	78,114	1.45	0.97	0.97	0.97	1.04	0.97
11403	Exc tr-ext b9+marg 2.1–3 cm	33,831	1.84	1.36	1.36	1.36	1.45	1.36
11404	Exc tr-ext b9+marg 3.1–4 cm	13,311	2.11	1.63	1.63	1.63	1.73	1.63
11406	Exc tr-ext b9+marg > 4.0 cm	15,154	3.52	2.55	2.55	2.55	2.87	2.55
11420	Exc h-f-nk-sp b9+marg 0.5/ <	17,892	1.03	0.55	0.55	0.55	0.61	0.55
11421	Exc h-f-nk-sp b9+marg 0.6–1	25,764	1.47	0.99	0.99	0.99	1.07	0.99
11422	Exc h-f-nk-sp b9+marg 1.1–2	28,898	1.68	1.20	1.20	1.20	1.30	1.20
11423	Exc h-f-nk-sp b9+marg 2.1–3	12,509	2.06	1.58	1.58	1.58	1.68	1.58
11440	Exc face-mm b9+marg 0.5 cm/ <	28,749	1.05	0.57	0.57	0.57	0.64	0.57
11441	Exc face-mm b9+marg 0.6–1 cm	29,574	1.53	1.05	1.05	1.05	1.15	1.05
11442	Exc face-mm b9+marg 1.1–2 cm	25,786	1.77	1.29	1.29	1.77	1.41	1.29
11443	Exc face-mm b9+marg 2.1–3 cm	7,524	2.34	1.86	1.86	1.86	1.96	1.86
11601	Exc tr-ext mal+marg 0.6–1 cm	21,952	2.07	1.10	1.10	1.10	1.20	1.10
11602	Exc tr-ext mal+marg 1.1–2 cm	126,304	2.27	1.30	1.30	1.30	1.42	1.30
11603	Exc tr-ext mal+marg 2.1–3 cm	68,762	2.82	1.85	1.85	1.85	2.00	1.85
11604	Exc tr-ext mal+marg 3.1–4 cm	27,874	3.17	2.20	2.20	2.20	2.43	2.20
11606	Exc tr-ext mal+marg > 4 cm	28,712	5.02	4.05	4.05	4.05	4.30	4.05
11621	Exc s/n/h/f/g mal+mrg 0.6–1	9,863	2.08	1.11	1.11	1.11	1.30	1.11
11622	Exc s/n/h/f/g mal+mrg 1.1–2	39,789	2.41	1.44	1.44	1.44	1.59	1.44
11623	Exc s/n/h/f/g mal+mrg 2.1–3	20,118	3.11	2.14	2.14	2.14	2.34	2.14
11640	Exc f/e/e/n/l mal+mrg 0.5 cm <	8,393	1.67	0.70	0.70	1.19	0.97	0.70
11641	Exc f/e/e/n/l mal+mrg 0.6–1	30,348	2.17	1.20	1.20	1.20	1.43	1.20
11642	Exc f/e/e/n/l mal+mrg 1.1–2	72,790	2.62	1.65	1.65	1.65	1.90	1.65
11643	Exc f/e/e/n/l mal+mrg 2.1–3	29,155	3.42	2.45	2.45	3.42	2.78	2.45
11644	Exc f/e/e/n/l mal+mrg 3.1–4	9,905	4.34	3.37	3.37	4.34	3.71	3.37
11646	Exc f/e/e/n/l mal+mrg > 4 cm	8,066	6.26	5.29	5.29	6.26	5.69	5.29
11750	Removal of nail bed	194,732	1.58	1.10	1.10	1.10	1.15	1.10
11765	Excision of nail fold toe	44,899	1.22	0.74	0.74	0.74	0.75	0.74

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
12031	Intmd rpr s/a/t/ext 2.5 cm/ <	49,892	2.00	1.52	1.52	1.52	1.56	1.52
12032	Intmd rpr s/a/t/ext 2.6–7.5	224,558	2.52	2.04	2.04	2.04	2.09	2.04
12034	Intmd rpr s/tr/ext 7.6–12.5	18,288	2.97	2.49	2.49	2.49	2.54	2.49
12041	Intmd rpr n-hf/genit 2.5cm/ <	15,803	2.10	1.62	1.62	1.62	1.67	1.62
12042	Intmd rpr n-hf/genit2.6–7.5	39,010	2.79	2.31	2.31	2.31	2.38	2.31
12051	Intmd rpr face/mm 2.5 cm/ <	42,023	2.33	1.85	1.85	2.33	1.99	1.85
12052	Intmd rpr face/mm 2.6–5.0 cm	59,173	2.87	2.39	2.39	2.87	2.52	2.39
13101	Cmplx rpr trunk 2.6–7.5 cm	75,178	3.50	3.02	3.02	3.02	3.10	3.02
13121	Cmplx rpr s/a/l 2.6–7.5 cm	128,380	4.00	3.52	3.52	3.52	3.61	3.52
13131	Cmplx rpr f/c/c/m/n/ax/g/h/f	26,329	3.73	3.25	3.25	3.73	3.43	3.25
13132	Cmplx rpr f/c/c/m/n/ax/g/h/f	173,065	4.78	4.30	4.30	4.78	4.46	4.30
13151	Cmplx rpr e/n/e/l 1.1–2.5 cm	22,307	4.34	3.86	3.86	4.34	4.05	3.86
13152	Cmplx rpr e/n/e/l 2.6–7.5 cm	33,770	5.34	4.86	4.86	5.34	5.04	4.86
17000	Destruct premalg lesion	4,588,227	0.61	0.13	0.13	0.13	0.13	0.13
17004	Destroy premal lesions 15/ >	861,245	1.37	0.89	0.89	0.89	0.89	0.89
17110	Destruct b9 lesion 1–14	2,049,227	0.70	0.22	0.22	0.22	0.22	0.22
17111	Destruct lesion 15 or more	105,055	0.97	0.49	0.49	0.49	0.49	0.49
17260	Destruction of skin lesions	14,457	0.96	0.48	0.48	0.48	0.49	0.48
17261	Destruction of skin lesions	121,528	1.22	0.74	0.74	0.74	0.75	0.74
17262	Destruction of skin lesions	239,408	1.63	1.15	1.15	1.15	1.16	1.15
17263	Destruction of skin lesions	43,931	1.84	1.36	1.36	1.36	1.38	1.36
17270	Destruction of skin lesions	8,806	1.37	0.89	0.89	0.89	0.90	0.89
17271	Destruction of skin lesions	46,243	1.54	1.06	1.06	1.06	1.07	1.06
17272	Destruction of skin lesions	74,213	1.82	1.34	1.34	1.34	1.35	1.34
17273	Destruction of skin lesions	13,853	2.10	1.62	1.62	1.62	1.63	1.62
17280	Destruction of skin lesions	26,776	1.22	0.74	0.74	0.74	0.75	0.74
17281	Destruction of skin lesions	97,241	1.77	1.29	1.29	1.29	1.30	1.29
17282	Destruction of skin lesions	89,820	2.09	1.61	1.61	1.61	1.62	1.61
17283	Destruction of skin lesions	13,619	2.69	2.21	2.21	2.21	2.22	2.21
20670	Removal of support implant	7,925	1.79	1.31	1.31	1.79	1.46	1.31
22513	Perq vertebral augmentation	23,139	8.65	7.04	7.04	7.04	7.24	7.04
22514	Perq vertebral augmentation	25,044	7.99	6.38	6.38	6.38	6.55	6.38
36558	Insert tunneled cv cath	122,510	4.59	3.47	3.47	3.47	3.53	3.47
36561	Insert tunneled cv cath	128,750	5.79	4.67	4.67	4.67	4.72	4.67
36581	Replace tunneled cv cath	35,432	3.23	2.11	2.11	2.11	2.15	2.11
36589	Removal tunneled cv cath	88,824	2.28	1.46	1.46	1.46	1.49	1.46
36590	Removal tunneled cv cath	50,893	3.10	1.98	1.98	1.98	2.05	1.98
37609	Temporal artery procedure	13,943	3.05	1.93	1.93	1.93	2.13	1.93
38500	Biopsy/removal lymph nodes	8,502	3.79	2.67	2.67	3.42	2.95	2.67
38571	Laparoscopy lymphadenectomy	11,611	12.00	9.27	9.27	9.27	9.64	9.27

HCPCS Code	CPT Short Descriptors	2018 Medicare Volume	PFS Work RVUs	New wRVUs, 25th Pctl. Visits	New wRVUs, Median Visits	New wRVUs, 75th Pctl. Visits	New wRVUs, Mean Visits	New wRVUs, Mode of Visits
40808	Biopsy of mouth lesion	11,998	1.01	0.53	0.53	0.53	0.59	0.53
46221	Ligation of hemorrhoid(s)	70,956	2.36	1.39	1.39	1.39	1.41	1.39
46500	Injection into hemorrhoid(s)	12,294	1.42	0.45	0.45	0.45	0.47	0.45
49422	Remove tunneled ip cath	10,165	6.29	3.77	3.77	3.77	3.97	3.77
49440	Place gastrostomy tube perc	18,920	3.93	3.17	3.17	3.17	3.21	3.17
54161	Circum 28 days or older	8,999	3.32	2.84	2.84	2.84	2.93	2.84
58661	Laparoscopy remove adnexa	12,987	11.35	9.74	9.74	9.74	10.01	9.74
62264	Epidural lysis on single day	9,020	4.42	3.78	3.78	3.78	3.80	3.78
63650	Implant neuroelectrodes	54,809	7.15	5.54	5.54	6.61	5.99	5.54
63685	Insrt/redo spine n generator	12,528	5.19	3.58	3.58	3.58	3.89	3.58
64555	Implant neuroelectrodes	7,444	2.32	0.71	1.78	1.78	1.34	1.78
64561	Implant neuroelectrodes	11,588	5.44	3.94	3.94	5.44	4.67	3.94
64590	Insrt/redo pn/gastr stimul	8,585	2.45	1.97	1.97	1.97	2.04	1.97
64612	Destroy nerve face muscle	94,140	1.41	0.93	0.93	0.93	0.93	0.93
64632	N block inj common digit	21,353	1.23	0.75	0.75	0.75	0.76	0.75
64633	Destroy cerv/thor facet jnt	61,379	3.84	2.23	2.23	2.23	2.25	2.23
64635	Destroy lumb/sac facet jnt	252,467	3.78	2.17	2.17	2.17	2.19	2.17
64640	Injection treatment of nerve	90,882	1.23	0.75	0.75	0.75	0.76	0.75
65855	Trabeculoplasty laser surg	151,350	3.00	2.52	2.52	2.52	2.57	2.52
66761	Revision of iris	76,347	3.00	1.55	1.55	1.55	1.74	1.55
67228	Treatment x10sv retinopathy	76,671	4.39	3.42	3.42	3.42	3.45	3.42
67800	Remove eyelid lesion	19,825	1.41	1.17	1.17	1.17	1.20	1.17
67840	Remove eyelid lesion	45,961	2.09	1.61	1.61	1.61	1.65	1.61
68760	Close tear duct opening	9,678	1.78	1.30	1.30	1.30	1.33	1.30
68761	Close tear duct opening	341,423	1.41	0.93	0.93	0.93	0.94	0.93
68801	Dilate tear duct opening	31,685	0.82	0.34	0.34	0.34	0.35	0.34
68810	Probe nasolacrimal duct	24,497	1.54	1.06	1.06	1.06	1.12	1.06
68840	Explore/irrigate tear ducts	39,647	1.30	0.82	0.82	0.82	0.83	0.82
69420	Incision of eardrum	13,418	1.38	0.90	0.90	0.90	0.91	0.90
69433	Create eardrum opening	42,244	1.57	0.60	0.60	0.60	0.63	0.60
69436	Create eardrum opening	11,887	2.01	1.53	1.53	1.53	1.57	1.53

NOTE: The CPT short descriptors are those available in the Physician Fee Schedule.

Table B.4a. Remaining Work RVUs After Updating, 296 Procedures Where Reporting Was Required, 90-Day Procedures

Specialty	Median of Reported Visits (Percent)	75th Percentile of Reported Visits (Percent)	Mean of Reported Visits (Percent)	Modal Reported Visits (Percent)
Cardiac surgery	65	84	74	57
Cardiology	71	86	78	65
Colorectal surgery	74	84	79	68
Dermatology	72	75	73	64
Diagnostic radiology	78	85	83	77
General surgery	77	85	82	74
Hand surgery	63	76	66	58
Interventional radiology	77	86	83	77
Neurology	73	80	75	71
Neurosurgery	73	80	75	71
Nurse practitioner/physician asst.	66	76	68	49
Ophthalmology	83	90	81	81
Orthopedic surgery	71	78	73	69
Other specialty	74	86	79	68
Otolaryngology	77	82	78	71
Plastic and reconstructive surgery	70	77	72	63
Podiatry	66	87	74	45
Primary care	71	83	77	66
Surgical oncology	77	84	81	73
Thoracic surgery	66	84	75	58
Urology	73	77	75	66
Vascular surgery	77	85	81	74
Total	74	82	76	70

Table B.4b. Remaining Work RVUs After Updating, 296 Procedures Where Reporting Was Required, 10-Day Procedures

Specialty	Median of Reported Visits (Percent)	75th Percentile of Reported Visits (Percent)	Mean of Reported Visits (Percent)	Modal Reported Visits (Percent)
Cardiac surgery	75	77	78	75
Cardiology	71	71	72	71
Colorectal surgery	59	60	60	59
Dermatology	55	58	57	55
Diagnostic radiology	76	76	77	76
General surgery	71	72	74	71
Hand surgery	67	70	72	67
Interventional radiology	76	76	77	76
Neurology	64	65	64	64
Neurosurgery	79	80	82	79
Nurse practitioner/physician asst.	44	45	46	44
Ophthalmology	73	73	75	73
Orthopedic surgery	78	79	81	78
Other specialty	63	64	64	63
Otolaryngology	57	60	61	57
Plastic and reconstructive surgery	81	88	85	81
Podiatry	56	56	59	56
Primary care	49	50	52	49
Surgical oncology	76	77	78	76
Thoracic surgery	77	78	79	77
Urology	77	91	85	77
Vascular surgery	72	72	73	72
Total	60	61	62	60

Appendix C. Adjusting Work RVUs Using Information on the Number and Level of Post-Operative Visits

Updating Work RVUs Based on the Number and Level of Visits

The revaluation approach outlined in Chapter 3 and described in detail in Appendix A relies on empirical estimates of the *number* of post-operative visits from claims-based analyses but *not* information on the *level* of visits collected via the survey. We collected survey data for three procedures—cataract surgery, hip arthroplasty, and complex wound repair. We present adjusted work RVU results for these three procedures where we adjust not only the number of visits but also the work per visit based on results from the survey. Specifically, we calculate updated work RVUs using the same reverse building block approach as described in Chapter 3 in two steps:

1. removing work RVUs for the number of assumed visits that are not typically furnished (as in our main results) using the average work per Time File visit ($\text{VisitRVU}_{\text{tf}}$);
2. adjusting work for visits that *are* typically furnished using the difference between the average work per Time File visit ($\text{VisitRVU}_{\text{tf}}$) and the average work per visit reported via the survey ($\text{VisitRVU}_{\text{survey}}$).

The resulting equation is:

$$\begin{aligned} &WorkRVU_{new} \\ &= WorkRVU_{pfs} - \overline{VisitRVU_{tf}}\,(VisitCount_{tf} - VisitCount_{claims}) \\ &- (\overline{VisitRVU_{tf}} - \overline{VisitRVU_{survey}})VisitCount_{claims} \end{aligned}$$

This exploratory analysis was necessarily limited to the three procedures for which we collected survey data.

Results

We found larger reductions in work RVUs when using information on both the number and level of visits rather than just the number of visits for cataract surgery and hip arthroplasty. This is because survey respondents reported that post-operative visits involved less work on average for these visits compared with E&M visits, and as a result we revised work downward for visits that *did* typically occur in addition to removing work entirely for visits that *did not* typically occur as in our main results (Table C.1). The reduction for complex repair procedures is unchanged because the single post-operative visit during the global period is not typically provided. Given that survey respondents indicated that the relatively few post-operative visits following complex wound repair procedures involved more work than the equivalent E&M visit, one possibility would be to subtract the higher survey-reported number of work RVUs.

Table C.1. Change in Work RVUs Using Information on the Number and Level of Visits Compared with Using Information on Only the Number of Visits

Procedure	Change in Work RVUs, Number Only	Change in Work RVUs, Number and Level
Cataract surgery	–13.8%	–16.1%
Hip arthroplasty	–26.6%	–26.9%
Complex wound repair*	–11.3%	–11.3%

NOTES: Complex wound repair reports the discounted volume-weighted average across procedure codes in the complex wound repair category where reporting of post-operative visits were required (HCPCS codes 13101, 13121, 13131, 13132, 13151, and 13152). We used the median reported number of post-operative visits for revaluation.

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