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Technical Review
Number 7

Determinants of Increases in Medicare Expenditures for Physicians' Services

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-Based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public- and private-sector organizations in their efforts to improve the quality of health care in the United States. The reports and assessments provide organizations with comprehensive, science-based information on common, costly medical conditions and new health care technologies. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

To bring the broadest range of experts into the development of evidence reports and health technology assessments, AHRQ encourages the EPCs to form partnerships and enter into collaborations with other medical and research organizations. The EPCs work with these partner organizations to ensure that the evidence reports and technology assessments they produce will become building blocks for health care quality improvement projects throughout the Nation. The reports undergo peer review prior to their release.

AHRQ expects that the EPC evidence reports and technology assessments will inform individual health plans, providers, and purchasers as well as the health care system as a whole by providing important information to help improve health care quality.

We welcome written comments on this technical review. They may be sent to: Director, Center for Outcomes and Evidence, Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850.

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Background

In 1990, after a decade of rapid cost growth, Congress made two major changes to the Medicare program in an attempt to control expenditures for physicians' services. It implemented a fee schedule and a payment update system for physicians' services. The goal of this fee schedule was to set relative payment rates that would reflect the time, effort, and expense of providing each listed service. The goal of the payment update system, called the Volume Performance System (VPS), was to limit increases in physician fees by linking them to historical rates of increase in the volume of physicians' services. This system led to high rates of growth in the early 1990s, and was criticized for distorting relative payment levels in its use of different updates for surgery versus primary care payments, for setting unrealistic expenditure targets (because of relying on historical trends and legislated reductions), and for relying on two-year-old data to set targets.

In 1997, Congress established a new system for determining the annual update for Medicare payment rates for physicians' services. This system, known as the Sustainable Growth Rate (SGR) system, seeks to constrain costs by tying increases in physician payments to real per capita growth in the gross domestic product (GDP). In implementing the SGR, Congress agreed, in principle, that a system that would allow expenditures for physicians' services to grow at the same rate as the economy as a whole was affordable and reasonable. However, the SGR system is now under criticism by health care providers, members of Congress, and the Medicare Payment Advisory Commission (MedPAC), who are calling for its revision. Intensifying the debate is the fact that for the year 2002, the fee paid per unit of physician service decreased by 5.4 percent.[1] This decrease is the result of a number of factors including the slowing economy and errors made in estimating expenditures in prior years.

The major problem with the SGR system, its critics maintain, is that, in setting fees, it does not directly consider changes in the actual costs of providing physician services to the Medicare population. Such changes are driven by a confluence of progress in medical technology, changes in provider productivity, and changes in the health of beneficiaries in the traditional Medicare fee for service (FFS) program. Other systems used by Medicare to update payment rates implicitly include allowances for such changes.

With Medicare physician payments currently exceeding $40 billion per year, the payment update factor has important implications for the Medicare budget, as well as other possible consequences. Too small an update might limit beneficiary access to care, "unfairly" penalize physicians, or create incentives to funnel treatment to other types of services having no expenditure target. In the longer term, inadequate payment updates might discourage the development and adoption of new technologies for treating Medicare patients.

In light of these concerns, Congress mandated a study of sources of changes in FFS Medicare expenditures for physicians' services.

[1] The SGR system reduced payments to physicians by 4.8 percent in 2002. There was an additional reduction of 0.18 percent applied to the physician fee schedule conversion factor to account for an anticipated increase in the volume and intensity of services in response to the final year of implementation of resource-based practice expense RVUs. As required by law, an additional budget neutrality adjustment of 0.46 percent was also applied to the conversion factor to account for increases in physician work RVUs resulting from the 5-year review of physician work.

Approach

The tasks we undertook in response to the Congressional mandate were the following:

- Describe the processes used to update payment rates for Medicare physicians' services;
- Analyze national trends in expenditures for physicians' services; and
- Disaggregate the changes in Medicare expenditures for physicians' services into the components specified in the legislation, to the extent possible.

In order to describe the processes used to update payment rates for Medicare physicians' services we reviewed Federal Register Notices about the payment system, reports of the Medicare Actuary, and reports of the Physician Payment Review Commission and its successor, MedPAC. We also compiled information from these sources and from the National Health Accounts in order to analyze national trends in expenditures for physicians' services.

We assessed the changes in Medicare expenditures for the period between 1993 and 1998, a period for which we have both national estimates of expenditure trends and beneficiary-level data on the use of services.

Our overall approach was to estimate the effects of changes in demographics, case-mix, and sites of service delivery on the delivery of services over time, using survey and medical claims data about Medicare beneficiaries. We then drew on expert clinical opinion to help us account for the rest of the changes in service use, which might be due to changes in technology, productivity, and other factors.

The volume and intensity of physician services on the Medicare physician fee schedule are measured using a system called the Resource Based Relative Value Scale (RBRVS). Each service on the physician fee schedule is assigned a number of Relative Value Units (RVUs) that reflect the time, skill, expense, and other resources used in providing the service. We can thus quantify the volume and intensity of physicians' services consumed by counting the number of RVUs delivered to beneficiaries. In addition, a panel of physicians makes periodic recommendations to the Center for Medicare and Medicaid Services (CMS) about changes that are needed to update the fee schedule because of newly available services or services that have changed. Services that are added to the Medicare benefits package are also added to the fee schedule. We measured the changes in volume and intensity of physicians' services in the fee schedule updates and used them as an index of changes in medical practices, technology, and coverage.

Medicare phased the fee schedule into use over a five-year period beginning in 1992. Since most of the changes that resulted from the new payment system occurred in 1992, 1993 was the first year for which a baseline level of physicians' services volume could be established in terms of RVUs. The baseline was constructed using data from the 1993 Medicare Current Beneficiary Survey (MCBS) Cost and Use File and linked claims data for MCBS respondents in traditional FFS Medicare. The MCBS is an annual survey of a sample of Medicare beneficiaries conducted by CMS. It collects information about beneficiaries' health status and use of health care services. It also collects information about beneficiary spending on health care, health insurance

status, and other beneficiary characteristics. This information is linked to Medicare administrative data on respondents' use of services paid for by Medicare.

We modeled the volume of services (in RVUs) used by individual beneficiaries in our 1993 analysis sample as a function of beneficiary characteristics including age and health conditions. Our analysis was restricted to FFS enrollees who did not have end-stage renal disease (ESRD) and were not institutionalized, because both these groups had physician care patterns that differed from other Medicare beneficiaries and ESRD services were not added to the fee schedule until the middle of our study period.

We modeled the volume of services (in RVUs) used by individual beneficiaries in our 1993 analysis sample as a function of beneficiary characteristics including age and health conditions (case mix). Having fit our model to 1993 data, we then used the estimated coefficients from the 1993 model to predict service volume in terms of RVUs for future years. We compared the total predicted growth to the total volume of growth to see how much of the change in volume could be attributed to the demographic and case-mix factors in the model.

Results

Processes for Updating Payments for Physicians' Services in Medicare

Both the VPS and the SGR were designed to restrain growth in expenditures for physicians' services. The VPS expenditure target for growth in Medicare physicians' services spending consisted of four factors. These factors were the projected changes in the cost of providing physicians' services (measured using the Medicare Economic Index and the Consumer Price Index); projected changes in the number of Medicare beneficiaries; growth in volume and intensity of physicians' services over the previous five years; and changes in projected spending due to changes in law or regulation. In the SGR target formula, a factor tied to changes in real per capita growth in the GDP replaced the VPS factor based on the five-year historical trend in volume increases. This change was designed to ensure that physician expenditures would grow only as fast as the economy as a whole.

The expenditure targets are calculated and implemented by CMS. The targets set by the VPS and the SGR determine the year-to-year increases in the payment rates for physicians' services. The VPS targets for growth in physicians' services expenditures during our study period ranged from a high of 10 percent in 1993 to a low of –0.3 percent in 1997. Payment rate increases are then set by CMS so as to meet these targets: if actual expenditures are lower than the target, the payment rate increase is inflated to help meet the target and vice versa. The targets translated into physician payment updates that ranged from 0.6 percent to 7.7 percent over the 1993-1998 period. In turn, these updates dictate the increase (or decrease) in the dollar amount at which RVUs on the physician fee schedule are reimbursed.

Setting the physician expenditure targets also takes into account a number of ancillary ("Other") services included in the statutory definition of physicians' services (diagnostic laboratory tests and x-rays; physician-administered drugs, biologicals, and antigens; the services of particular non-physician health professionals; and services and supplies incidental to physicians' services). However, some of these services are not measured in RVUs, and the

prices paid for these services are not updated using the VPS or SGR. Instead, update methods span a range and include changes in charges and average wholesale prices.

Trends in Expenditures for Physicians' Services Across Payers

Expenditure changes during the mid-1990s for physicians' services showed broadly similar trends across payers. National Health Accounts estimates of per capita physician services expenditures show that expenditures grew at an inflation-adjusted average annual rate of 4.8 percent between 1993 and 1998. Per person expenditures from private insurance and out-of-pocket sources had an inflation-adjusted average annual rate of increase of 2.8 percent. Medicare per capita program expenditures for physician and supplier services grew 4.4 percent annualized; per capita physician fee schedule services grew 3.4 percent annualized.[2] Thus, the increases in expenditures allowed under the VPS system over this time period were not markedly different than those experienced by other payers.

Disaggregating Changes in Medicare Expenditures for Physicians' Services

To determine the causes of increased Medicare spending for physicians' services, we looked at changes in pricing and coverage policy and in the volume and intensity of physicians' services delivered. We also examined the use of and spending for other services that are included under the statutory definition of Medicare physicians' services.

Policy Changes in Prices and Coverage Rules

Policy changes that affect Medicare spending on physicians' services are of two types: changes that affect the price paid per service and changes in the services covered. The dollar conversion factor used to set prices for services on the physician fee schedule increased from $31.50 in 1993 to $36.70 in 1998, an increase of 16.6 percent in the amount paid per unit of service delivered. Over the period we examined, regulatory changes to the services covered by Medicare were projected to increase expenditures by approximately 5 percent.

Changes in the Volume and Intensity of Services Delivered

The other major determinant of increases in expenditures is the increase in the volume and intensity of services delivered. Volume and intensity can increase or decrease because of changes in medical practice, technology, the case mix of the population being served, and the supply of and demand for physicians' services. The price paid per service can also influence the number of services provided.

We found that the per capita volume of physicians' services used by Medicare beneficiaries increased more than 30 percent between 1993 and 1998 (from 38.1 to 49.9 RVUs; see table below). Using our model to control for the changing demographics and observable health status of the Medicare population, we found that the 1998 Medicare FFS population would have been

[2] The National Health accounts and Medicare estimates cover somewhat different sets of services and beneficiaries (e.g. HMO expenditures are treated differently). Theses differences are described in detail in Chapter 2.

expected to use slightly fewer services per capita than the 1993 Medicare FFS population. Thus, the changing age/gender composition, place of residence, and observable aspects of health status of the 1998 Medicare population were not responsible for the volume increase.

We disaggregated the volume increase into increases in the use of physicians' service codes that existed in 1993 (our base year) and "new" codes. The new codes include codes for established services that were newly covered by Medicare, new codes for new health care services, and codes that had been updated since 1993.[3] Fifty-eight percent of the total difference between 1993 and 1998 RVU use (7.5 out of 12.9 RVUs) was due to the increased use of codes that existed in 1993. Forty-two percent of the total difference between actual 1998 RVU use and predicted use was due to the use of new or updated codes.

Table: RVU for physician services use 1993 and 1998

Year	Predicted RVU Use	RVUs Based on 1993 Fee Schedule	Actual RVU Use in 1998	Mean Unexplained Change	Increase in Use of Existing Codes	New and Updated Codes	Number of Observations
	(1)	(2)	(3)	(3) minus (1)	(2) minus (1)	(3) minus (2)	
1993	38.1	38.1	-	-	-	-	9,627
1998	37.0	44.5	49.9	12.9	7.5	5.4	8,986

Source: Authors' analyses of Medicare Current Beneficiary Survey.

We also assessed changes in the relative proportion of physicians' services delivered in inpatient and outpatient settings. The number of inpatient RVUs increased only slightly, but the use of physicians' services in outpatient settings increased significantly. The proportion of total per-beneficiary RVUs associated with inpatient care declined from 36.7 percent to 29.9 percent of total RVU use.

We then looked at the patterns of increase in use by groups of beneficiaries who reported a history of particular diseases on the MCBS survey. Most of these groups had very similar levels of increase in RVU use. Many disease groups that were expected to show large increases in service use owing to technological change did not show such increases (at least relative to disease groups not expected to show such increases). Of the self-reported medical conditions we considered, only strokes, osteoporosis, and unspecified heart conditions were associated with a significant unexplained increase in RVU use compared to the absence of those conditions. A large increase in RVU use was also observed in beneficiaries just prior to death. In contrast, the

[3] Only the amount by which the RVUs for updated services were increased (or decreased) is included in the "new" codes category. Thus, if the use of an existing code that had been updated increased, then the 1993 number of RVUs times the increase in use would be reflected in the existing codes category, and the amount of the update times the increase in use would be in the new codes category.

care of patients with hip fracture and those with no reported medical conditions was associated with the decrease in RVU use, and lung cancer was associated with the largest drop in the use of inpatient services (fifty-four percent).

Changes in Clinical Technology and Productivity

Clinical experts identified a number of potential reasons for the increases in the use of physicians' services by stroke patients and osteoporosis patients and the large decline in the use of inpatient services by lung cancer patients. These reasons included the extension of Medicare coverage for bone scans for persons at risk for osteoporosis, new pharmaceutical therapies that may require additional office visits, a greater appreciation for aggressive rehabilitation of stroke patients and aggressive treatment of risk factors for stroke, and improvements in medical imaging. The reductions in RVUs for lung cancer treatment were postulated to be due to some combination of improved cancer staging, shifts in the site of chemotherapy, and the increased use of hospice care.

Effect of Medicare Managed Care Enrollment on Service Use

During the period 1993-1998, enrollment in Medicare managed care plans increased significantly. Numerous studies have shown that Medicare beneficiaries who choose to join managed care plans are healthier than average. The negative selection brought about by this exodus from traditional-fee-for service Medicare produces a concomitant rise in per-capita utilization (as measured by RVUs). However, our estimates suggest that this effect is small, ranging from negligible to 5.6 percent at most.

Use of Other Physicians' Services

In our sample, per beneficiary payments for all ancillary medical services not reimbursed through the fee schedule increased 5 percent, from $317 in 1993 to $333 in 1998 in our sample. The increase was largely due to the increase in the frequency of use of diagnostic laboratory and x-ray services.

Conclusions

In our sample of Medicare beneficiaries, per capita expenditures for physicians' services increased 19 percent in nominal dollars from $898 in 1993 to $1073 in 1998. Expenditures for physician fee schedule services increased 27 percent from $581 to $740, and other services included in the statutory definition of physicians' services increased 5 percent from $317 to $333. During that period, the physician fee schedule dollar conversion factor increased by 16.6 percent from $31.50 to $36.70.[4]

Changes in laws and regulations and increasing enrollment in managed care can account for at most one-half of the observed change in expenditures. According to CMS, changes in laws and regulations should have led to an increase of 5 percent in total expenditures for physicians'

[4] Note, however, that conversion factor increase does not translate into a commensurate increase in expenditures, owing to beneficiary cost sharing, the phase-in of the fee schedule, and other factors discussed in detail in the report.

services. We estimate that HMO enrollment can account for no more than a 5.6 percent increase in expenditures.

The per capita volume of physicians' services (in RVUs) delivered to non-ESRD, non-institutionalized fee-for-service Medicare beneficiaries increased 30 percent over the mid-1990s. Our analyses do not indicate that this increase is due to measurable changes in the demographic composition, the places of residence, the prevalence of health conditions, or other characteristics of the Medicare population. Indeed, our analysis indicates that, all else being equal, the 1998 FFS population should have used slightly fewer RVUs than the 1993 population. In addition, while we found that the use of services in outpatient settings increased substantially, the increase in expenditures could not be attributed directly to shifts in site of care from inpatient to outpatient settings.

Overall, the main driver of change in the volume and intensity of services was a general increase in the use of care by all categories of beneficiaries. Only a few medical conditions emerged as having unusual RVU growth. For these conditions, clinical experts were able to point to changes in medical knowledge and technology that could have contributed to the increase. Large increases in the use of physicians' services were also seen in patients just prior to death. Thus, changing medical technology appears to increase use of physicians' services in ways that are strong and pervasive. Furthermore, the increases in Medicare expenditures for physicians' services seem comparable to those of other payers. This finding indicates that the trends in Medicare beneficiaries' use of physicians' services are likely driven by the same set of factors as those driving the increase in overall health care spending.

This study has four main limitations. First, as with nearly all models of health care utilization and spending, our model can explain very little of the variation in service utilization across beneficiaries. Second, while we were able to attribute the unexplained increase in RVUs to both "new and updated" and "existing" service codes, this distinction does not isolate the effect of new technology, since existing services can undergo technological changes that are not captured in the fee schedule. Third, while we tried to control for patient characteristics, unobserved differences in severity of illness may have existed between the patients in our 1993 and 1998 samples. Finally, we cannot say whether or not the observed increases in service use are medically appropriate or whether they would have been different in magnitude if an alternative payment update system has been used.

Implications

Our analyses have several implications for the debate about the SGR payment update system:

1. Technical adjustments to the SGR targets are not a ready solution to the criticisms raised about the SGR. Such adjustments could be made to account for the changing composition of the FFS population, but they would be small adjustments relative to the overall increases in service use.
2. A payment update system that systematically attempted to measure "appropriate" increases in use due to changing technology would not be feasible. Such a system would have to consider changes across an extraordinarily broad set of dimensions and conditions to capture all of the possible ways in which technology can influence service provision.

3. Our analyses indicate that some of the largest increases in the use of physicians' services cannot be ascribed to discrete causes. These increases are surprisingly uniform across medical conditions, suggesting that a single update factor for physicians' services may be appropriate. However, what that factor should be remains an open policy question.

Technical Review

Chapter 1. Introduction

In 1990, after a decade of rapid growth in the cost of physicians' services, Congress attempted to control Medicare expenditures on these services. One measure it implemented was to impose a fee schedule and a payment update system for physicians' services. The goal of this fee schedule was to set relative fees that would reflect the time, effort, and expense of providing each listed service. The goal of the payment update system, called the Volume Performance System (VPS), was to limit increases in physician fees and to control costs by linking increases in physician payments to historical rates of increase in the volume of physicians' services. This system led to high rates of growth in the early 1990s, and was criticized for distorting relative payment levels in its use of different updates for surgery versus primary care payments, for setting unrealistic expenditure targets (because of relying on historical trends and legislated reductions), and for relying on two-year old data to set targets.

In 1997, Congress established a new system for determining the annual update for Medicare payment rates for physicians' services. This system, known as the Sustainable Growth Rate (SGR) system, seeks to constrain costs by tying increases in physician payments to real per capita growth in the gross domestic product (GDP). In implementing the SGR, Congress agreed, in principle, that a system that would allow expenditures for physicians' services to grow at the same rate as the economy as a whole was affordable and reasonable. However, the SGR system is now under criticism by health care providers and the Medicare Payment Advisory Commission (MedPAC) who are calling for its revision. Intensifying the debate is the fact that for the year 2002, the fee paid per unit of physician service decreased by 5.4 percent.[5] This decrease is the result of a number of factors including the slowing economy and errors made in estimating expenditures in prior years.

The major problem with the SGR system, its critics maintain, is that, in setting fees, it does not directly consider changes in the actual costs of providing physician services to the Medicare population. Such changes are driven by a confluence of progress in medical technology, changes in provider productivity, and changing trends in the health of beneficiaries in the traditional Medicare fee-for-service (FFS) program. Other systems used by Medicare to update payment rates implicitly include allowances for such changes.

With Medicare physician payments currently exceeding $40 billion per year, the payment update factor has important implications for the Medicare budget, as well as other possible consequences. Too small an update might limit beneficiary access to care, "unfairly" penalize physicians, or create incentives to funnel treatment to other types of services having no expenditure target. In the longer term, inadequate payment updates might discourage the development and adoption of new technologies for treating Medicare patients.

To address some of the concerns about the SGR system, Congress mandated a study to examine the sources of changes in fee-for-service Medicare expenditures for physicians' services. The Balanced Budget Reconciliation Act (BBRA) of 1999 specifically calls for the estimation of the economic impact on expenditures for physicians' services of changes in

[5] The SGR system reduced payments to physicians by 4.8 percent in 2002. There was an additional reduction of 0.18 percent applied to the physician fee schedule conversion factor to account for an anticipated increase in the volume and intensity of services in response to the final year of implementation of resource-based practice expense RVUs. As required by law, an additional budget neutrality adjustment of 0.46 percent was also applied to the conversion factor to account for increases in physician work RVUs resulting from the 5-year review of physician work.

medical capabilities, technology, demographic characteristics of enrollees, service delivery locations, utilization, and other factors. These factors are listed in Table 1.

This report responds to the legislative mandate of the BBRA of 1999 by (1) analyzing changes in expenditures for physicians' services and (2) disaggregating, to the extent possible, the changes in Medicare expenditures for physicians' services into the components specified in the legislation. We begin the analysis of physicians' services expenditures in the Background section by briefly describing how the methods used to determine expenditures for physicians' services were updated during our study period, including the changes in services targeted by both the SGR and VPS and how these targets are calculated.

The Chapter 2 of the report presents the results of our comparison, beginning with a comparison of physicians' services expenditures by fee-for-service (FFS) Medicare with expenditures by other payers.

In Chapter 3, we present the results of our analyses of the determinants of those trends in the Medicare program over the period 1993-1998. Our overall approach is to estimate the effects of price changes, demographic and case-mix changes, and changes in the sites of service delivery using survey and medical claims data about Medicare beneficiaries. We draw on expert clinical opinion to explain the remaining "unexplained" changes resulting from technology, productivity, and other factors.

Changes in the price and volume of services delivered are tracked by looking at changes in the number of "relative value units" (RVUs) worth of services and the prices assigned to those RVUs over time (see Appendix E). The Resource-Based Relative Value System (RBRVS) was phased into use by Medicare over a five-year period beginning in 1992. We use 1993 as our base year, since most of the changes that resulted from the new payment system occurred in 1992; thus 1993 is the first year for which a baseline level of physicians' services volume in terms of RVUs can be established (PPRC, 1994a). The baseline was constructed using data from the 1993 Medicare Current Beneficiary Survey (MCBS) Cost and Use File and linked claims data for MCBS respondents for beneficiaries in traditional FFS Medicare. We then determine how much of the volume change (in RVUs) can be attributed to demographic and case-mix changes. These changes were tracked using data elements directly from the MCBS including age, gender, place of residence, self-reported health status and medical conditions, and geographic location. We examine the volume of services delivered in both types of settings. We provide clinical information changes in the medical technology applied to beneficiaries with selected conditions. Finally, we discuss the percentage of the increase in expenditures for physicians' services that is due to enrollment in Medicare+Choice plans.

Chapter 4 discusses the limitations of this study and Chapter 5 summarizes our findings about the determinants of increases in expenditures for physicians' services.

Background

The aim of this study is to investigate the sources of changes in Medicare expenditures for physicians' services over the middle of the last decade. In order to understand physician expenditure increases between 1993 and 1998, it is important to consider the policies *within* Medicare that influence physician expenditures by increasing reimbursement (prices) over time.

Table 2 summarizes the expenditure targets and performance adjustments applied to Medicare Part B physicians' services between 1992 and 1998. These factors influence Medicare

payment rates for physicians' services. Column 1 shows the components of the expenditure targets, and Column 2 shows the performance adjustments. The expenditure targets in Column 1 are designed to track changes in demand for Medicare physicians' services and adjust prices for these changes in demand. Expenditure targets are also designed to restrain volume increases to these identified sources of change. The performance adjustments compare actual expenditures with the expenditure targets. The annual update factor used to increase or decrease physician reimbursement rates reflects the expenditure target for the year and the performance adjustment needed to align spending with the target.

The update factor used to increase (or decrease) reimbursement rates for physicians' services over time has multiple implications, not only for physician expenditures but also for access and quality of care. The amount of the physician payment increase may affect beneficiary access to care, since beneficiaries are responsible for 20 percent of the payment the physician receives, and physician willingness to provide care to beneficiaries depends on its profitability. The magnitude of the updates may affect quality of care by influencing the development and adoption of new technologies for the Medicare population over time. Finally, the method for determining payment increases is also important because it has a direct effect on the Medicare budget.

Next, we will describe in more detail the expenditure targets and updates used in the SGR and the VPS, as shown in Table 2.

Expenditure Targets

Two expenditure targets were used in the 1990s: the VPS was used between 1992 and 1997, and the SGR was used from 1998 onward. The VPS (Table 2, column 1, row 1) target was based on physician input price changes, the change in the number of FFS enrollees, and changes in the volume or intensity of services over the previous five years, with an estimate of how legislative and regulatory factors would influence physician expenditures.[6] The sum of these factors was then reduced by a performance adjustment standard factor shown in Table 2, Column 2, Row 1. In addition, a performance "standard deduction" was created to offset what policymakers believed were historical trends that incorporated a certain amount of inefficient and inappropriate care (PPRC, 1995) .[7]

The input factors for the SGR system are shown in the second row of Column 1 in Table 2. The scope of physicians' services covered by the SGR is identical to that covered by the VPS. However, the SGR differs from the VPS, because the SGR ties increases in physician payments to real per capita growth in the GDP. The SGR formula does not consider historical changes in volume and intensity.

[6] Within the MVPS, different targets were developed for primary, surgical, and nonsurgical services in the 1990s. In 1990 there was just one service category. Between 1991 and 1993 there were two MVPS categories, one for surgical services and one for all other services. The Omnibus Reconciliation Act (1993) introduced a primary care services category. Between 1994 and 1997 there were three categories, surgical services, primary care services, and all other services. The category of "other nonsurgical services" includes services such as diagnostic tests.

[7] The performance standard deduction was –0.5 percentage points in 1990, - 1.5 percentage points in 1992, 3.5 percentage points in 1994 and –4.0 percentage points in 1995.

Performance Adjustments

The performance adjustment factor is used to "adjust" fee schedule updates to account for under- or over-expenditure compared to the target (Table 2, Column 2). If actual Medicare spending is more than allowed spending, the update adjustment factor reduces the conversion factor to recoup the difference. If actual spending is less than allowed spending, the update adjustment factor increases the update factor.

Rates for the Performance Adjustments between 1992 and 1998 are shown in Table 3. Under the VPS, the performance adjustment was based on the difference between expenditures above or below the target expenditures two years prior and actual expenditure increases or decreases two years prior. Thus, an adjustment for 1996 was based on the projected physician expenditures for FY1994 compared to the actual expenditures for FY1994.

The creation of the SGR under the Balanced Budget Act of 1997 (BBA97) changed the calculation of the performance adjustment.[8] The SGR changed the emphasis of the performance adjustment from the growth of expenditures from year to year to cumulative expenditures. Since 1999, the formula has included the cumulative allowed and actual expenditures, rather than expenditure growth from two years prior. [9,10] The SGR performance adjustment factor is limited by legislation to a range within -7.0 and +3.0 percent.

Updates and Conversion Factors

Prior to 1992, the update system for physician payments was related to historical charges, updated by the Medicare Economic Index. The Omnibus Budget Reconciliation Act of 1989 and the BBA97 changed that system to the VPS and SGR systems, respectively. Since 1992, price updates for physician payments comprise three types of factors. First, the updates compensate physicians for changes in input prices (the MEI). Second, the price factor is then reduced or increased by the performance adjustment factor. A third factor affects the update only if the size of the update falls outside the bounds set by Congress. The physician service updates are used to modify the dollar conversion factors that establish payment rates per unit of physicians' services.

Other Physicians' Services

Medicare Part B includes a wide range of services in addition to those provided directly by medical doctors within the definition of "physician services." Table 4 summarizes the main types of physicians' services provided under Medicare Part B and how payments for them are calculated and updated.

The VPS and the SGR targets, the performance adjustment factors, and the updates form the context for analyzing physician expenditures in the subsequent chapters of the report. The VPS and the SGR were designed to set reasonable price increases and to hold physician expenditures

[8] The update published in 1997 for 1998 used the MVPS target and performance to calculate the 1998 update.

[9] The Medicare VPS compared target and actual expenditures in a fiscal year (October 1-September 30). Under the SGR, the percentage increase in the target was determined on the basis of a fiscal year and applied to expenditures from April 1- March 31. The multiple time periods used were complex and increased the potential instability of the payment system. These problems were resolved by the BBRA 1999, which changed all time periods involved in the SGR calculations to the calendar year.

[10] The target for cumulative allowed expenditures was projected to be exceeded in 2002, which was one of the reasons for the reduction in the dollar conversion factor this year.

to those targets. In the next chapter, we describe trends in these targets and analyze Medicare Part B physician expenditures compared to other types of personal health care services and compared to other payers in the health care system.

Table 1: Balanced Budget Reconciliation Act (1999) mandates

Potential influences on expenditures for physicians' services mandated to be investigated under the Balanced Budget Reconciliation Act (1999)
Improvements in medical capabilities
Advancements in scientific technology
Demographic changes in the types of Medicare beneficiaries who receive benefits under such programs
Geographic changes in locations where Medicare beneficiaries receive benefits under such programs
Estimates of the rates of use of services among beneficiaries in different age groups
Other factors that might predict use of physicians' services

Source: Balanced Budget Reconciliation Act (1999).

Table 2: Expenditure targets and performance adjustment factors that determined update factors between 1992 and 1998

	Expenditure Targets	**Performance Adjustments**
1992-1997	Volume Performance Standard: Increase in input prices (Medicare Economic Index) Part B enrollment Changes in laws and regulations Increases in volume and intensity Minus a performance standard factor	Performance Adjustment Factor VPS from two years prior minus actual expenditure change
1998-	Sustainable Growth Rate Increases in input prices Part B enrollment Changes in laws and regulations Growth in per capita GDP	Performance Adjustment Factor The sum of the following: the difference between target prior-year expenditures and prior-year allowed expenditures, and the difference (which may be positive or negative) between the amount of the allowed expenditures for physicians' services from April 1, 1996 through the end of the prior year, and the amount of the actual expenditures for such services during that period (*Federal Register*, November 1, 2001 Volume 66, Number 212).

Source:
Federal Register September 4, 1990 Volume 55, No. FR 36178.
Final Rule, *Federal Register* Vol.56, No. 227, Monday, November 25, 1991.
Final Notice, *Federal Register*, Vol. 57, No. 228. Wednesday, November 25, 1992.
Final Notice with Comment Period, *Federal Register*, Vol. 58, No. 230, Thursday, December 2, 1993.
Final Notice, *Federal Register*, Vol. 59, No. 235, Thursday, December 8, 1994.
Final Notice, *Federal Register*, Vol. 60, No. 236, Friday, December 8, 1995.
Final Notice, *Federal Register*, Vol. 61, No. 227, Friday, November 22, 1996.
Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.
Notice with Comment Period, *Federal Register*, Vol. 63. No. 211, Monday, November 2, 1998.

Table 3: Medicare volume performance standard and sustainable growth rate, performance adjustments and updates 1992-1998

Fee schedule/ conversion factor update (in percent)			
Calendar Year	**MVPS/SGR Target**	**Performance Adjustment**	**Update**
1992 Weighted average	10%	-0.9%	1.9%
Surgical	6.5%		
Primary care	11.2%		
1993 Weighted average	10%		1.4%
Surgical	8.4%	0.4%	3.1%
Nonsurgical	10.8%	-1.9%	0.8%
1994 Weighted average	9.4%		7%
Surgical	9.1%	11.3%	10%
Primary care	10.5%	5.6%	7.9%
Other nonsurgical	9.2%	5.6%	5.3%
1995 Weighted average	7.5%		7.7%
Surgical	9.2%	12.8%	12.2%
Primary care	13.8%	5.8%	7.9%
Other nonsurgical	4.4%	5.8%	5.2%
1996 Weighted average	1.8%		0.8%
Surgical	-0.5%	1.8%	3.8%
Primary care	9.3%	-4.3%	-2.3%
Other nonsurgical	0.6%	-1.6%	0.4%
1997 Weighted average	-0.3%		0.6%
Surgical	-3.7%	-0.1%	1.9%
Primary care	4.5%	0.5%	2.5%
Other nonsurgical	-0.5%	-2.8%	-0.8%
1998	1.5%	-0.3%	2.3%

Note: Between 1993 and 1997 there was no overall average payment category. We have provided the average of the payment categories, weighted by the dollar amount of claims in each group, in order to facilitate comparisons of the targets, adjustments, and updates over time. (*Federal Register*, Vol. 61, No. 227, November 22, 1996).

Source:
Federal Register September 4, 1990 Volume 55, No. FR 36178.
Final Rule, *Federal Register* Vol.56, No. 227, Monday, November 25, 1991.
Final Notice, *Federal Register*, Vol. 57, No. 228. Wednesday, November 25, 1992.
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Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.
Notice with Comment Period, *Federal Register*, Vol. 63. No. 211, Monday, November 2, 1998.

Table 4: Services defined in Medicare Part B as physicians' services (1993-1998)

Service Type	Payment Method	Update Method
Physicians' services (includes Doctors of Osteopathy, Optometry, Dentistry, and Medicine)	Resource Based Relative Value Scale (RBRVS).	Sustainable Growth Rate System (SGR) Fee Schedule update
Services and supplies furnished incident to physicians' services	Most included in the practice expense component of RBRVS. In other cases charges are determined by the carrier, relative to average wholesale price.	Practice Expenses – SGR Increase in Average Wholesale Price
Outpatient physical therapy and speech therapy, and outpatient occupational therapy services	Fee schedule, but some services are paid at a percentage of RBRVS.	SGR Fee Schedule update
Antigens prepared by or under the direct supervision of a physician	Antigens were paid under the physician payment schedule after Jan. 1 1995.	Consumers' Price Index (Urban Consumers) (CPI-U)
Drugs and biologicals	Coverage limited. For covered items, before January 1998 drugs were paid using a mix of methods (cost, prospective payment basis, or they were based on the lower of the billed charge or the average wholesale price). (American Medical Association, 2001:7). After January 1 1998, drugs and biologicals were paid according to the actual charge, or 95% of the AWP, whichever was lower.	Increase in Average Wholesale Prices
Services of physician assistants, certified registered nurse anesthetists, certified nurse midwives, clinical psychologists, clinical social workers, nurse practitioners, and clinical nurse specialists	RBRVS used, but reimbursement rates vary. Some professionals such as physician assistants receive a discounted percentage of the total RBRVS charge.	SGR Fee Schedule update

Table 4: Services defined in Medicare Part B as physicians' services (1993-1998) (continued)

Service Type	Payment Method	Update Method
Clinical laboratory tests	Reasonable and prevailing charges subject to national limits. The clinical lab fee schedule is set using national median submitted charges. The amount paid is the lesser of the actual charge, the local fee, or the national limitation amount. Before 1998, payment schedules were set at 60% of the prevailing charge level in each area. After 1998, the national limit became 74% of the median of the local fees for tests.	CPI-U (frozen from 1995-2002)
X-ray, radium, and radioactive isotope therapy	Reasonable and prevailing charges.	CPI-U
Surgical dressings, splints, casts, and other devices used for reduction of fractures and dislocations	Reasonable and prevailing charges.	Increase in charges

Source:
Federal Register September 4, 1990 Volume 55, No. FR 36178
Final Rule, *Federal Register* Vol. 56, No. 227, Monday, November 25, 1991.
Final Notice, *Federal Register*, Vol. 57, No. 228. Wednesday, November 25, 1992.
Final Notice with Comment Period, *Federal Register*, Vol. 58, No. 230, Thursday, December 2, 1993.
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Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.
Notice with Comment Period, *Federal Register*, Vol. 63. No. 211, Monday, November 2, 1998.
Program Memorandum AB-02-163, November 8, 2002.

Chapter 2. Historical Trends in Medicare Expenditure Growth

This chapter reviews trends in aggregate Medicare expenditures for physicians' services and compares them to expenditures by other payers. To provide further context, it also reviews trends in aggregate Medicare payments and compares them to aggregate expenditures for other payers.

The first part of the chapter reviews trends in the Medicare expenditure targets and updates, including the Volume Performance Standard (VPS) and the Sustainable Growth Rate (SGR). Trends in price updates for services included in the Medicare Physician Fee Schedule are also described. The second part of the chapter compares trends in Medicare physicians' services expenditures with trends in other types of national health expenditures, trends in other types of Medicare services, and trends in expenditures by other payers. Medicare expenditures for physician services are compared to similar expenditures for Medicaid beneficiaries and privately insured Americans.

Trends in Performance Targets and Updates

Trend data for updates, targets, and conversion factors for Medicare physician services were collected from final rules published for physician payment updates, volume performance standards, and the sustainable growth rate in the *Federal Register* between 1991and 1998. Data on updates and targets are reported in their original form.

Targets for growth in Part B expenditures for physician services during the 1990s are shown in Table 5. In 1990, physicians were collectively expected to hold expenditure growth to 9.1 percent; overall, the targets for expenditure growth remained between 7.3 and 10 percent until 1996. In 1996 the target was reduced to 1.8 percent, and then to –0.3% in 1997.

When the VPS was introduced, there were separate targets for surgical and other nonsurgical services. The surgical services target was 3.3 percent in 1991 and increased to 8.4 percent in 1993 and to 9.1 percent in 1994 and 1995. In 1996, the surgical target decreased to –0.5 percent and then to –3.7 percent in 1997. In 1994, the primary care target was introduced and set at 10.5 percent. Primary care targets increased substantially between 1994 and 1997, peaking at 13.8 percent in 1995. Targets for other nonsurgical services increased in the 1990s between 8.6 percent in 1991 and 9.2 percent in 1994, falling to 0.5 percent in 1997. In 1998, the Sustainable Growth Rate of 1.5 percent replaced the other separate targets.

Updates and Conversion Factors

Update factors determine the year-to-year change in the dollar conversion factor, used to reimburse physicians and others reimbursed through the physician fee schedule. Table 6 shows the trends in the updates to the fee schedules between 1992 and 1997 and the single conversion factor introduced in 1998. The update to the fee schedule in 1993 was below 2 percent. In 1994 and 1995 the weighted average update surged to around 7 percent, but then the update factor dropped below 1 percent in 1996 through 1998. Between 1993 and 1997 the fee schedule updates contained different update factors for surgical services, primary care (after 1994), and

nonsurgical services; but the Balanced Budget Act replaced these updates with a single update factor and conversion factor.[11]

The update factors determine the changes in prices paid per RVU over the period 1993 to 1998. Table 6 shows the update factors and correspondingly updated dollar conversion factors. (The conversion factors are multiplied by the RVUs for a physician service to produce payment amount.) Updates are shown in percentages while conversion factors are shown in dollars (rounded to two decimal places). In 1998 the single conversion factor was rebased at $36.69.

The Balanced Budget Act and the move to a single rebased conversion factor had the most significant impact on surgical services. The surgical conversion factor increased from $31.96 in 1993 to $41.00 in 1997. After the introduction of the single conversion factor, surgical services were reimbursed at the uniform conversion factor of $36.70 in 1998.

The first column of Table 7 shows the cumulative increase in the conversion factors for different service types between 1993 and 1998. The cumulative increase in the conversion factor for surgical services was 14.7 percent. Primary care and nonsurgical services increased by 17.3 percent between 1993 and 1998. The cumulative increase for surgical services over this period was lower than the increase for other services because of introduction of the uniform conversion factor in 1998. Table 6 shows the difference between primary and nonsurgical conversion factors, which is not reflected in the cumulative growth of 17.3 between 1993 and 1998 in Table 7. The cumulative primary and nonsurgical rate is the same because primary services were updated by the nonsurgical update in 1993, and in 1998 the conversion factors were also identical.

Table 7 compares the annualized growth rate between 1993 and 1997 (center column) and 1993 and 1998, shown in the final column. The impact of the single conversion factor introduced in 1998 is shown in the final column. Between 1993 and 1997 the annualized growth rate for surgical services was 6.4 percent, but between 1993 and 1998 the growth rate was lower at 2.8 percent, reflecting the influence of the lower uniform conversion factor. Primary care services grew at relatively similar rates between 1993 and 1997 and between 1993 and 1998, mainly because the 1998 uniform conversion factor was based on the 1997 primary care services conversion factor. Nonsurgical services grew at an average rate of 2 percent between 1993 and 1997 and by 3.2 percent between 1993 and 1998.

Changes in the update factors during the study period largely reflect the feedback loop between target and actual expenditures. As reported in Table 3 of Chapter 1, the Performance Adjustment Factor for surgical services was 0.4 percent in 1993, 12.8 percent in 1995 and –0.1 percent in 1997. This was because expenditures in years prior to 1995 had not met the VPS targets, while those in 1993 and 1997 were close to targets. The Medicare Economic Index was fairly stable between 1993 and 1998. During the study period, the Medicare Economic Index ranged between 2.0 and 2.7 percent. The fee schedule update ranged between 0.6 percent and 7.5 percent. In addition, especially in the early years of the 1990s, there were relatively high initial expenditure targets for most types of services.

[11] Prior to 1994, primary care services were updated using the nonsurgical services update. When the primary care update and conversion factor was introduced in 1994, the name of the nonsurgical update was changed to "other nonsurgical services."

Historical Trends in Health Expenditures

Data and Methods

To describe the trends between 1993 and 1998 in expenditures for physician services, we collected data from a variety of sources. National health expenditure data from the Health Care Financing Administration's National Health Accounts data set *National Health Expenditures*, released in March 2001, were used. This data set contains national health expenditures for categories of services from 1960 and 1999. Data were also gathered from Physician Payment Review Commission reports, MedPAC reports, reports of the Supplementary Medical Insurance Trust Fund, and various issues of the *Green Book* data compilations published by the House Ways and Means Committee of the United States Congress. Medicare benefit payments data for Part B services and Medicare enrollment data for managed care and fee-for-service enrollees were collected from Health Care Financing Administration publications, including the *Health Care Financing Review's Medicare and Medicaid Statistical Supplement* and from various issues of the *Statistical Abstract of the United States.* Below we describe the composition of the National Health Accounts, other data sources, and some of the strengths and limitations of the data sources.

National Health Accounts data disaggregate expenditures according to standard categories. In the National Health Accounts, the type of product consumed or, in the case of services, the type of establishment providing the service determines what is included or excluded from health care spending (Health Care Financing Administration, 2001). We used expenditure categories from the National Health Accounts to quantify trends in physician service expenditure. The first expenditure category is "physician and clinical services." This category of expenditure comprises services provided in establishments operated by Doctors of Medicine (M.D.) and Doctors of Osteopathy (D.O.), outpatient care centers, plus the portion of medical laboratories services that are billed independently by the laboratories. This category also includes services rendered by a doctor of medicine (M.D.) or doctor of osteopathy (D.O.) in hospitals, if the physician bills independently for those services. The second major category of health expenditure classification used in the National Health Accounts is "other professional services," which includes services of registered and practical nurses in private duty, podiatrists, optometrists, physical therapists, clinical psychologists, chiropractors, naturopaths, and Christian Science practitioners. Finally, the National Health Accounts separately list expenditures for dental services.

The second major type of data used is Medicare program expenditures, the amounts Medicare paid physicians or other suppliers.[12] These data have various strengths and weaknesses. Published Medicare expenditure data are highly aggregated and do not break down expenditures to a high level of detail (Welch, 1998). Available expenditure data do not correspond to the statutory definition of physician services.[13] Published Medicare program

[12] These do not include beneficiary out-of-pocket expenditures.

[13] In our analyses in chapter 3 we use raw claims level data that we can aggregate to match the statutory definition of physicians' services.

expenditures are not compiled consistently.[14] Medicare data are reported in different ways between 1990 and 1998 in the statistical sources examined, with two conventions used: "physicians and suppliers" or expenditure reimbursed under the "Physician Fee Schedule." Data showing expenditures for Physicians and Suppliers are available between 1990 and 1998. Physician Fee Schedule expenditure data are available between 1993 and 1998. "Physicians and suppliers" includes a wider range of services[15] than "physician fee schedule." Medicare Physician Fee Schedule expenditures include expenditures for services reimbursed under the Medicare Fee Schedule, and include both physicians and other providers. However, one of the advantages of Medicare program expenditure data is that program expenditures exclude Part B managed care enrollee expenditures, whereas National Health Accounts includes this group. With increasing enrollment in Medicare managed care plans in the 1990s, this factor is particularly important. We report both estimates of program expenditures.

The National Health Accounts and the Medicare program expenditure data sources provide different, but complementary, estimates of Part B physician expenditures. National health accounts data enable comparisons between public and private expenditures over time, and between Medicare and Medicaid expenditures. Differences exist in the age, income, and health status of these population groups, however, and their benefit packages are not comparable. Despite differences in the populations served and the services provided, the National Health Accounts have the strong advantage of using a consistent method of compiling annual data over time.

Population and enrollee data were used to develop per person expenditure estimates. The number of Medicare beneficiaries was growing more rapidly than the number of persons covered by private insurance over this time period, making comparisons of per capita expenditures important (Moon, 1999). Medicare fee-for-service Part B enrollee counts were used to create Medicare Part B per capita expenditures. Where Medicare expenditures are disaggregated as fee-for-service and managed care expenditures, the appropriate enrollee population was used to estimate fee-for-service or managed care cost estimates. National population data from the Census were used to create per capita figures for other population groups in the National Health Accounts.

In sum, comparing per person physician expenditures across payers and across times requires data from a variety of data sources. The mix of data sources provides complementary estimates of physician expenditures during the study period.

Expenditure Trends

The 1990s saw major shifts in the financing of health care, which influenced the rate of health care inflation in the public and private sectors. Whereas in 1990 total health expenditures

[14] Published data on Medicare physician program expenditures are based on Health Care Financing Administration data. The published sources consulted included *Health Care Financing Review Statistical Abstract* (1999), the House Ways and Means *Green Book* series, and the *Statistical Abstract of the United States.*

[15] Medicare Program expenditures for "physician and suppliers" under Medicare Supplementary Medical Insurance (Part B) includes the package of services defined in the introduction. For example, this includes medical care; anesthesia; X-rays; mammography; psychological, physical and occupational therapy; lab tests; and some drugs. "Physicians and Suppliers" excludes expenditures for prepaid or managed care plans, home health agencies, and independent laboratories. However, this category also includes "durable medical equipment" and "other services" that are not part of the package of services included in this study. Therefore, this estimate will tend to overstate expenditures.

grew from the previous year by almost 12 percent, expenditure growth was 5.4 percent over the previous year in 1995, and 5.6 percent in 1999. These lower growth rates for health expenditure were experienced by private, Federal, State and local payers, and across all types of care except for drugs, home health services, and some types of personal health care services and supplies.

Table 8 compares the trends in total (per capita) health expenditures of privately insured Americans over the last thirty years compared to Americans insured under Medicare. The real average annual change in expenditures for the Medicare insured was 5.3 percent, compared to 6.5 percent for privately insured Americans. Between 1985 and 1991, Medicare's inflation-adjusted annual growth slowed to around 3.3 percent compared to 8.1 percent per enrollee for the privately insured. As more privately insured Americans enrolled in managed care insurance plans in the early and mid-1990s, average growth rates fell for this group compared to Medicare. Private insurance expenditures began to grow more rapidly towards the end of the 1990s. Between 1997 and 1998, Medicare's expenditures fell by .1 percent in real terms while expenditures for privately insured Americans increased 5.9 percent.

Although year-to-year growth in total national health expenditures was slowing in the middle years of the 1990s, personal health expenditures were increasing at a faster rate than all health expenditures (see Table 9). Expenditure trends for physicians' services mirrored the trends of slower growth in total health expenditures during most of the 1990s. Physician and clinical service expenditure increased at a faster rate than hospital care, but not as fast as total personal health expenditure. Hospital services grew at a much slower rate than physician and clinical services in the latter half of the 1990s.

Table 10 shows that between 1970 and 1999 third party payments increased as a proportion of total expenditures for physician and clinical services. Direct consumer payments decreased as a percentage of all payments while third party payments increased. Third party payers accounted for 54 percent of physician service expenditure in 1970. By 1990 third party payers were funding 81 percent of physician service expenditure. Through the 1990s this trend continued and by 1999 third party payers were responsible for almost 89 percent of physician expenditures.

Direct consumer payments for physician and clinical services declined from 19 percent in 1990 to 11 percent of total expenditures in 1999. The decreasing share of out-of-pocket payments for physician services reflects changing insurance coverage and the role of public programs such as Medicaid and Medicare in paying for physician services. The proportion of payments for physicians' services made by private insurance grew between 1970 and 1999, from 30 percent to 43 percent in 1990 and to 48 percent of physician expenditures by 1999. Medicare's share of payments increased from 12 percent in 1970 to 19 percent in 1990. Throughout the 1990s Medicare's share remained between 18 and 20 percent of total physician expenditures.

For services provided by other health professionals, out-of-pocket payments also fell as private third party payments for these services increased between 1970 and 1999. Out-of-pocket payments for other professional services fell from 44 to 30 percent of all expenditures for these services, as shown in Table 11. Whereas the public sector has increased its expenditures over time for physician services, the share of expenditures paid by Federal, State, and local sources for other professional services declined in relation to other payers between 1970 and 1999. The decline in the share of public payments occurred outside of the Medicare and Medicaid programs. Medicare financed 5 percent of these services in 1970 and 11 percent in 1999, while Medicaid expenditures decreased by one percentage point relative to other payers.

Table 12 shows the increases in expenditures by private insurers and individuals between 1990 and 1999. Per person expenditures for physician, clinical, other professional, and dental services increased from $411 in 1990 to $716 in 1999 (592 in constant 1990 dollars), real increase of 44 percent. Total private insurance expenditures increased by 57 percent for physician and clinical services.

Medicaid expenditures for physician and clinical services were considerably lower than expenditures in either Medicare or by private insurers (Table 10), but the rate of growth in total expenditures was higher (Table 13). In part this was a result of increased enrollment throughout this period, rather than comparatively faster increases in per person expenditures. Medicaid expenditures per enrollee increased nearly 27 percent in real terms between 1990 and 1998 (Table 14). Physician and other clinical service expenditures increased by almost 24 percent, and other professional service expenditures 49 percent in real terms.

Table 15 shows growth in Medicare expenditures in the 1990s and the effect of payment policy changes across different types of services. Expenditures for some services grew more rapidly than expenditures for others. Medicare inpatient hospital costs for the period 1992-1997 were increasing at a rate of almost 6 percent, while physician services grew on average by just under 5 percent. Between 1992 and 1997, the fastest growing areas of Medicare expenditure were skilled nursing facility providers and home health providers. Growth in expenditures per beneficiary was fastest before 1998, partly because of high growth in home health and skilled nursing facility expenditures. Following the Balanced Budget Act, the average change in expenditures for physician services was under 4 percent, and expenditures declined by 0.5 percent in the hospital sector.

Medicare expenditures for physician, clinical, dental, and other professional services between 1990-1999 are shown in Table 16. The rows at the top of the table are based on National Health Accounts and the lower rows show program expenditure estimates. National Health Accounts data show considerably higher overall expenditures, probably as a result of including managed care enrollees. Total expenditures on physician, clinical, dental, and other professional services increased from almost $32 billion in 1990 to almost $60 billion in 1999 (46.5 billion in 1990 constant dollars), a real increase of 46 percent between 1990 and 1998, with an average annual growth rate of 4.8 percent. Physician and clinical services increased by 42.6 percent over the period, with an average annual growth rate of 4.5 percent. Other professional service expenditures increased by 97 percent in real terms between 1990 and 1998, an average annual increase of 8.9 percent. (Dentists' expenditures were very low in dollar terms at the start of the decade ($2 million) but they increased at a rapid rate between 1990 and 1998.)

Data from benefits paid are shown in the lower section of the table. Medicare program expenditures on physicians and suppliers grew from $29.6 billion in 1990 to $44.2 billion in 1998 ($37 billion in 1990 dollars). These expenditures are for non-ESRD fee-for-service enrollees only, and during this period the number of Medicare enrollees enrolling in Medicare managed care plans increased. Over this period the expenditures grew 25 percent, with an average annual increase of 2.8 percent. Physician fee schedule expenditures, which are a subset of national health expenditures and physician and supplier expenditures, are also shown in Table 16. Total expenditures paid for under the physician fee schedule grew at similar rate. Medicare physician fee schedule expenditures grew by 2.3 percent annually between 1993 and 1998.

Per person (enrollee) estimates of Medicare expenditures are shown in Table 17. Medicare expenditure data for each year from the National Health Accounts was divided by the number of

Part B enrollees.[16] Physician fee schedule and physician and suppliers expenditures were divided by the number of fee-for-service or non-ESRD fee-for-service enrollees.

National Health Accounts data show that Medicare expenditures increased from $978 to $1590 per enrollee between 1990 and 1998 ($1316 in constant dollars), a real increase of 29.4 percent (Table 17). This parallels the expenditures for private health insurers discussed above. The real average annual percentage increase for per person physician services expenditures paid by Medicare was 3.4 percent. Physician and clinical services increased 26.5 percent and other professional service expenditures 73.9 percent in real terms between 1990 and 1999.

Medicare program expenditures show similar trends to National Health Accounts estimates, although the time periods available differ. Physician and supplier expenditures increased at a real average annual rate of 3.4 percent per year. This is close to the National Health Accounts average annual increase of 3.3 percent. Physician fee schedule expenditures increased at a real annualized rate of 3.2 percent, from $820 per person to $1065 per person in 1998 ($893 in constant dollars).

In conclusion, the real average annual increases for Medicare benefits paid for physicians and suppliers were 3.4 percent for the period 1990 through 1997. Medicare expenditures for physician and clinical services estimated by the National Health Accounts show a similar 3.3 percent annualized average growth rate for physician and clinical services for the period 1990 through 1998. These estimates are close to the annualized percentage growth rates shown in Table 9 for the period 1990 through 1998 of 3.7 percent for physician and clinical service expenditures across all payers. These growth rates suggest some similarities in expenditures for physician and clinical services, despite different enrollee populations.

Discussion

The 1990s were a period of important changes in the health care sector, as payers in the public and private sectors sought greater control over costs. Within the Medicare program, a number of policy changes were introduced that affected the financing of Medicare Part B services. The physician fee schedule update and the expenditure targets discussed in the Background and Introduction sections of Chapter 1 were the principal tools used to influence expenditure growth in the Medicare program.

The broad trends suggest similarities in expenditure increases during the 1990s for physician services across a variety of payers. Per person private expenditures increased at a real annual average rate of 4 percent between 1990 and 1999. Medicaid expenditures increased by 3.0 percent (Table 13 and 14). Per person National Health Accounts estimates of physician and clinical services expenditures financed by Medicare also showed a real annual average increase (between 1990 and 1999) of 3.3 percent, and Medicare program expenditure data showed a real average annual increase of 3.4 percent between 1990 and 1998.

Similar trends in expenditure growth by payers across National Health Accounts data raise the question of what common factors are driving these trends. Aggregate expenditure data do not enable us to understand the factors driving these trends. As mentioned in the Data and Methods section of this chapter, comparisons between public and private sector expenditures are made possible using the National Health Accounts, which have similar data collection strategies

[16] As mentioned in the discussion on data and methods, National Health Accounts data do not allocate expenditures to managed care and fee-for-service enrollees; therefore, the expenditures are divided by the number of total Part B enrollees.

and service definitions. However, there are differences between Medicare and private health insurance programs in terms of the health and demographic characteristics of the population covered and the range and level of benefits provided, among other factors.

These increases in Medicare expenditures may be explained by a number of factors, including the types of benefits provided, the mix and intensity of services utilized by Medicare beneficiaries, and changes in the enrolled population. The next chapter of the report assesses the direction of these trends by examining data on the utilization and expenditures of Medicare beneficiaries.

Table 5: Medicare volume performance standard, 1990-1997, and sustainable growth rate 1998[1]

	Medicare Volume Performance Standard 1990-1997								Sustainable Growth Rate 1998[1]
	1990	1991	1992	1993	1994	1995	1996	1997	
All/weighted average	9.10%	7.30%	10.00%	10.00%	9.40%	7.50%	1.80%	-0.30%	1.50%
Surgical services	….	3.30%	6.50%	8.40%	9.10%	9.20%	-0.5%	-3.70%	….
Primary care services	….	….	….	….	10.50%	13.80%	9.30%	4.50%	….
Nonsurgical	….	8.60%	11.20%	10.80%	9.20%	4.40%	0.6%	-0.50%	….

[1] The new and updated code effect for 1996 is -0.6. This is because while the median RVU use in 1996 was higher than the median use based on the 1993 schedule by 0.4 RVUs (due to the addition of new codes and the updating of existing ones), the mean value is lower. This is likely due to devaluing over the period 1994-1996 of the practice expense RVUs for certain services, largely provided in inpatient settings, that were thought to be overvalued.

Note: The Medicare Volume Performance Standard and the Sustainable Growth rates are shown in this table. The rates are expenditure target growth rates for Medicare. The targets are established prospectively and then performance (how the actual growth rate compared to the target for that year) is retrospectively assessed. The performance adjustment factor is then used to reduce or increase the physician fee schedule update relative to the Medicare Economic Index. The physician fee schedule update is used to update the conversion factor.

Sources:
Centers for Medicare & Medicaid Services Office of the Actuary (2002), *Estimated Sustainable Growth Rate and Final Conversion Factor, for Medicare Payments to Physicians in 2002*. February 4.
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Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.

Table 6: Physician fee schedule updates and conversion factors by service type, 1993-1998

	1993	$CF	1994	$CF	1995	$CF	1996	$CF	1997	$CF	1998	$CF
1998 Single conversion factor											0.60%	$36.69
All services	1.40%		7.00%		7.50%		0.80%		0.60%			
Surgical	3.10%	$32.00	10%	$35.20	12.20%	$39.50	3.80%	$40.80	1.90%	$41.00		
Primary care[1]			7.90%	$33.70	7.90%	$36.40	-2.30%	$35.40	2.50%	$35.80		
Nonsurgical	0.80%	$31.30	5.30%	$32.90	5.20%	$34.60	0.40%	$34.60	-0.80%	$33.90		

$CF = Dollar Conversion Factor.

[1] The primary care conversion factor commenced in 1993. In 1998 the separate conversion factors were replaced with a single conversion factor. Between 1993 and 1997 "all services" is a weighted mean of all services. This was not an update category between 1993 and 1997.

Sources:
Final Notice, *Federal Register*, Vol. 57, No. 228. Wednesday, November 25, 1992.
Final Notice with Comment Period, *Federal Register*, Vol. 58, No. 230, Thursday, December 2, 1993.
Final Notice, *Federal Register*, Vol. 59, No. 235, Thursday, December 8, 1994.
Final Notice, *Federal Register*, Vol. 60, No. 236, Friday, December 8, 1995.
Final Notice, *Federal Register*, Vol. 61, No. 227, Friday, November 22, 1996.
Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.

Table 7: Average annual percentage change in all conversion factors

	1993-1998[1] Cumulative Increase	1993-1997 Annualized Growth Rate	1993-1998 Annualized Growth Rate
Surgical	14.7%	6.4%	2.8%
Primary care, 1994-1998	17.3%	3.4%	3.2%
Nonsurgical	17.3%	2.0%	3.2%

[1] In 1993 there was no separate primary care conversion factor. The conversion factor used to calculate increases is the nonsurgical rate.

Source: Calculated from data reported in the *Federal Register*:
Final Notice, *Federal Register*, Vol. 57, No. 228. Wednesday, November 25, 1992.
Final Notice with Comment Period, *Federal Register*, Vol. 58, No. 230, Thursday, December 2, 1993.
Final Notice, *Federal Register*, Vol. 59, No. 235, Thursday, December 8, 1994.
Final Notice, *Federal Register*, Vol. 60, No. 236, Friday, December 8, 1995.
Final Notice, *Federal Register*, Vol. 61, No. 227, Friday, November 22, 1996.
Final Notice, *Federal Register*, Vol. 62, No. 211, Friday, October 31, 1997.

Table 8: Average annual growth in per enrollee Medicare and private health insurance expenditure for all services

	1969-1998	1985-1991	1991-1993	1993-1997	1997-1998
Medicare	5.3%	3.3%	6.2%	5.5%	-.1%
Private insurance	6.5%	8.1%	5.4%	1.5%	5.9%

Source: *35-Year Anniversary Chart Book.* Health Care Financing Administration, 2000.

Note: All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html** Table 10)

Table 9: Year-to-year percentage increase in health expenditure (all payers)

	1990	1993	1994	1995	1996	1997	1998	Average Annualized Percentage Growth, 1993-1998
National health expenditures	7.9	6.0	3.2	3.3	3.3	3.7	3.5	3.8
All personal health expenditures[1]	8.9	7.9	2.5	9.2	6.3	6.4	6.2	6.2
Hospital care	6.3	5.5	1.6	1.3	1.7	1.6	1.3	2.0
Physician and clinical	7.3	5.9	2.9	3.9	3.4	3.4	3.2	3.7
Other professional services	7.4	6.0	2.3	2.7	2.1	3.4	4.2	3.4

[1] "Personal health expenditures" are a subset of national health expenditures. Personal health expenditures include hospital, physician and clinical, other professional services, and other goods and services such as drugs and nursing care.

Source: *Health Care Financing Review*, Summer 2001 Volume 22 (4):102.

Note: All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html** Table 10)

Table 10: Sources of payments for physician and clinical services, selected calendar years, 1970-1999

Percentage of Total Expenditures								
Year	Medicare[1] (%)	Medicaid[1] (%)	Out-of-pocket Payments (%)	Private Health Insurance (%)	Other Private Funds (%)	Federal (%)	State and Local (%)	Total columns (3) – (7) (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1970	12	5	46	30	2	16	6	100
1980	17	5	30	35	4	24	7	100
1990	19	5	19	43	7	25	6	100
1991	18	5	18	45	7	24	6	100
1992	17	6	16	46	7	24	7	100
1993	17	6	15	48	7	24	6	100
1994	18	7	13	48	8	25	6	100
1995	19	7	12	49	8	26	6	100
1996	19	7	12	49	8	26	6	100
1997	20	7	12	48	8	26	6	100
1998	20	7	12	48	8	27	5	100
1999	20	7	11	48	9	27	5	100

[1] Medicare and Medicaid are subsets of the Federal and State payments, but are given as percentages of total national expenditures on physician and clinical services.

Source: National Health Accounts, Health Care Financing Administration: http://www.hcfa.gov/stats/nheoact/tables/t6.htm#d.

Table 11: Sources of payments for other health professional services, selected calendar years, 1970-1999

Percentage of total								
Year	Medicare[1] (%)	Medicaid[1] (%)	Out-of-pocket Payments (%)	Private Health Insurance (%)	Other Private Funds (%)	Federal (%)	State and Local (%)	Total columns (3) – (7) (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1970	5	5	44	6	5	32	14	100
1980	8	5	46	23	8	13	10	100
1990	10	2	31	35	9	12	13	100
1991	11	3	29	34	9	14	13	100
1992	12	3	29	35	9	15	12	100
1993	12	3	28	36	9	15	11	100
1994	13	3	27	36	9	16	11	100
1995	13	4	27	38	9	16	10	100
1996	13	4	27	39	9	16	10	100
1997	12	4	28	39	9	15	9	100
1998	12	4	30	39	9	14	9	100
1999	11	4	30	39	8	14	9	100

[1] Medicare and Medicaid are subsets of the Federal and State payments, but are given as percentages of total national expenditures on physician and clinical services.

Source: National Health Accounts, Health Care Financing Administration: http://www.hcfa.gov/stats/nheoact/tables/t6.htm#d.

Table 12: Total and per person private insurance and out-of-pocket expenditures, 1990-1999, in 1990 constant dollars

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Growth 1990-99	Average Annual Growth
Population (in millions)	254	257	260	263	265	268	270	273	275	278	9%	1%
Physician and clinical -- Private health insurance (in millions)	$67,698	$75,709	$82,997	$88,514	$91,472	$94,392	$95,948	$98,687	$102,158	$106,448	57%	5%
Physician and clinical -- Out-of- pocket (in millions)	$30,401	$29,885	$28,928	$27,348	$25,137	$23,137	$23,299	$24,404	$25,086	$25,388	-16%	-2%
Other professional services – Private insurance (in millions)	$6,280	$6,466	$7,316	$8,094	$8,370	$9,446	$10,313	$11,000	$11,593	$12,342	97%	8%
Other professional services -- Out-of-pocket (in millions)	$5,699	$5,591	$6,033	$6,372	$6,296	$6,795	$7,100	$8,011	$8,943	$9,416	65%	6%
Dental – Private insurance (in millions)	$15,178	$15,565	$17,038	$17,443	$18,382	$19,563	$20,411	$21,049	$21,851	$22,916	51%	5%
Dental – Out-of-pocket (in millions)	$15,364	$15,403	$16,485	$16,509	$17,019	$17,720	$18,078	$19,526	$20,557	$21,224	38%	4%
Total national expenditure, (in millions)	$140,434	$148,781	$159,351	$165,214	$168,039	$172,896	$177,481	$184,200	$191,482	$199,427	42%	4%
Total expenditure, per person	$411	$441	$479	$500	$516	$533	$545	$556	$573	$592	44%	4%

Source: Centers for Medicare & Medicaid Services (2001) *National Health Accounts Data* (2001 edition). [Computer File] http://www.hcfa.gov/stats/nhe-oact/.

Note: All figures inflation-adjusted using a GDP deflator (http://w3.access.gpo.gov/usbudget/fy2001/hist.html, Table 10)

Table 13: Total Medicaid expenditure on physician, clinical, and other professional services, 1990-1999, in 1990 constant dollars

National Health Expenditure Estimates, Millions of Dollars	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Growth 1990-99	Average Annual Growth
Medicaid physician and clinical services expenditures	$7,025	$8,784	$10,504	$11,652	$12,301	$12,997	$13,451	$13,780	$13,999	$14,643	108.4%	8.5%
Medicaid other professional services	$445	$529	$560	$767	$772	$893	$1,048	$1,116	$1,088	$1,144	157.2%	11.1%
Dental	$756	$911	$1,127	$1,540	$1,566	$1,590	$1,626	$1,681	$1,720	$1,825	141.5%	10.3%
Total Medicaid[1]	$7,470	$9,313	$11,064	$12,419	$13,073	$13,890	$14,499	$14,896	$15,087	$15,787	111.3%	8.7%

[1] Excludes Children's health insurance expansion programs.

Source: Centers for Medicare & Medicaid Services (2001) *National Health Accounts Data* (2001 edition). [Computer File] http://www.hcfa.gov/stats/nhe-oact/.

Note: All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html**, Table 10)

Table 14: Medicaid expenditure on physicians' services per recipient, 1990-1998, in 1990 constant dollars

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Percentage Growth 1990-98	Average Annual Growth Rate (%)
Medicaid recipients (in millions)	25.255	28.28	30.926	33.432	35.053	36.282	35.118	34.872	40.649	61.0%	6.1%
Physician and clinical services (in dollars)	$278	$311	$339	$348	$351	$358	$383	$395	$345	23.9%	2.7%
Other professional services (in dollars)	$18	$18	$18	$23	$22	$25	$30	$32	$27	49.0%	5.1%
Dental (in dollars)	$30	$32	$37	$46	$45	$44	$47	$48	$42	39.7%	4.3%
Total (in dollars) per enrollee[1]	$326	$362	$394	$417	$418	$427	$459	$475	$413	26.8%	3.0%

[1] Excludes children's health insurance expansion programs.

Source: Centers for Medicare & Medicaid Services (2001) *National Health Accounts Data* (2001 edition). [Computer File] http://www.hcfa.gov/stats/nhe-oact/.

Note: All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html** ,Table 10)

Table 15. Average annual Medicare expenditure growth rates by provider sector: before and after the Balanced Budget Act

Percent Average Annual Expenditure Growth Rate per Medicare Fee-for-Service Beneficiary	1992–1997[1]	1997–1999[1]
Inpatient hospital	5.3	-1.8
Home health (combined Parts A and B)	21.4	-28.2
Skilled nursing facility	30.4	-0.9
Physician services	4.3	2.4
Outpatient hospital	6.2	-6.4
Medicare+Choice (per M+C beneficiary)	7.4	5.2
Total Medicare (per beneficiary)	7.5	-2.0

[1] Years are fiscal years.

Source: Office of the Actuary, HCFA. Reproduced from MedPAC. *Medicare Payment Policy: Report to Congress*, March 2000.

Note: These figures are not inflation-adjusted.

Table 16: Total Medicare expenditure on physician services, 1990-1998, in 1990 constant dollars

National Health Accounts[1] (in millions of dollars)	1990	1991	1992	1993	1994	1995	1996	1997	1998	Growth 1990-98	Average Annual Growth 1990-98
Physician and clinical services	$30,153	$30,646	$31,137	$31,950	$34,159	$36,655	$38,120	$40,229	$43,009	42.6%	4.5%
Other professional services	$1,755	$2,181	$2,467	$2,715	$2,966	$3,257	$3,376	$3,392	$3,459	97.1%	8.9%
Dental services	$2	$2	$5	$17	$22	$33	$47	$62	$76	3713.9%	57.6%
Total Medicare	$31,910	$32,829	$33,608	$34,681	$37,147	$39,945	$41,544	$43,684	$46,545	45.9%	4.8%
Medicare benefits paid (in millions of dollars)										**Change**	**Average Annual Increase**
Physician and suppliers	$29,609	$31,163	$30,593	$31,797	$33,191	$35,620	$35,605	$36,003	$37,026	25.0%	2.8%
Physician fee schedule				$24,060	$25,802	$27,485	$26,730	$26,618	$26,948	12.0%	2.3%

[1] National Health Accounts data, current dollars.

* Change 1993-1998.

Source: Medicare Trustees Report, 2002 and the Health Care Financing Review *Statistical Supplement* (1999 and 2000).

Note: All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html**, Table 10)

Table 17: Annual Medicare expenditures per enrollee, 1990-1999, in 1990 constant dollars

Enrollment	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Cumulative Growth 1990-1998	Average Annual Increase
non-ESRD enrollment				31.93	32.13	32.03	31.58	30.88	30.19			
Fee for service enrollees only	31.25	31.68	32.12	32.35	32.08	31.57	30.93	30.41	30.43	30.19	-2.6	-0.3
All Part B enrollees (in millions)	32.63	33.24	33.93	34.61	35.17	35.69	36.14	36.46	36.78	37.04	12.7	1.5
National Health Accounts (in millions of dollars)												
Physician and clinical services	$924	$922	$918	$923	$971	$1,027	$1,055	$1,104	$1,169	$1,221	26.5%	3.0%
Other professional services	$54	$66	$73	$78	$84	$92	$93	$93	$94	$113	73.9%	7.2%
Dentists[1]	$0	$0	$0	$1	$1	$1	$2	$2	$2	$2		
Total	$978	$988	$991	$1,002	$1,056	$1,119	$1,149	$1,198	$1,266	$1,316	29.4%	3.3%
Medicare benefits paid (in millions of dollars)											Change	Average annual increase
Physicians and suppliers	$947	$984	$952	$983	$1,034	$1,128	$1,151	$1,184	$1,217	….	28.5%	3.4%
Physician fee schedule				$754	$803	$858	$846	$862	$893	….	18.4%	3.2%

[1] Actual per person dental expenditures for Medicare were not zero between 1990 and 1992 but were less than one dollar for every enrollee.

Source: Centers for Medicare & Medicaid Services (2001), *National Health Accounts Data* (2001 edition). [Computer File] http://www.hcfa.gov/stats/nhe-oact/. Medicare benefits paid data from the *Statistical Abstract of the United States*, 2000, and the Health Care Financing Review *Statistical Supplement* (1999).

Note: Percentage changes are 1990-1997 for physician and suppliers, and 1995-1998 for physician fee schedule expenditures.

All figures inflation-adjusted using a GDP deflator (**http://w3.access.gpo.gov/usbudget/fy2001/hist.html** ,Table 10)

Chapter 3: Decomposing the Change in Medicare Expenditures for Physicians' Services

In order to decompose the changes in expenditures described in Chapter 2 into components attributable to factors such as the age/gender mix of the Medicare population, we examined the use of physicians' services by the sample of beneficiaries included in the Medicare Current Beneficiary Survey (MCBS) in detail. Beneficiaries in the MCBS sample, which we describe and analyze below, had annualized per capita spending on the services included in the statutory definition of physicians' services that increased 15 percent from $960 to $1108 over the period 1993-1998.[17]

We conducted analyses of the determinants of this increase in the expenditures for physicians' services in the Medicare program over the period 1993-1998. Total expenditures for any class of good or service are the sum of the quantities (volume) of the goods or services multiplied by their prices. In the context of the Medicare program, total expenditures for physicians' services can be represented as follows:

(1) Total expenditures $= \sum_i Volume_i * Price_i$ where services are indexed by *i*.

Changes in total expenditures are thus functions of changes in the volume of services delivered, changes in the price of such services, and any interactions between these factors. To determine the causes of this increase in per fee-for-service beneficiary spending on physicians' services, we first looked at changes in prices and coverage policy that influenced spending. We then looked at changes in the volume and intensity of services delivered. We concentrated on the use of and spending for services on the physician fee schedule but also discuss the other services that are included under the statutory definition of Medicare physicians' services below.

Policy Changes in Prices and Coverage Rules

Policy changes that affect Medicare spending on physicians' services are of two types: changes that affect the price paid per service and changes in the services covered.

Each year updates to the dollar conversion factor used to set payment rates are published in the *Federal Register*. As shown in Table 6, the conversion factor increased from $31.30 for nonsurgical services and $32 for surgical services in 1993 (weighted average is $31.48) to $36.70 for all services in 1998. This represents an increase of 16.6 percent in the amount paid per relative value unit of service delivered. (The dollar conversion factor is calculated using the methods described in the section on Expenditure Trends in the previous chapter.)

It should be noted, however, that this does not translate directly into an increase of 16.6 percent in the price per unit of service delivered. The main reason for this is beneficiary cost-sharing: the average amount that Medicare paid per RVU was approximately $23 when the 20

[17] This increase was less than the per capita increase in total Part B spending reported in the National Health Accounts and the increase in physician fee schedule spending per enrollee reported by Medicare. This is because the National Health Accounts include spending on a wider set of services than those included in the statutory definition of physicians' services and the fee schedule spending includes a narrower set of services. Some of the public figures may also include spending for managed care enrollees. In addition, there is a sampling error of plus or minus approximately $20 in the MCBS figures.

percent Medicare coinsurance and the Part B deductible of $100 are taken into account.[18] In addition, there are differences resulting from the phase-in of the RBRVS fee schedule, the treatment of nonphysician providers, and the geographic adjusters. The physician fee schedule was not completely phased in until 1996, so providers in localities where the historical payment amount for a service was less than 85 percent or more than 115 percent of the fee schedule amount were paid a blend of the fee schedule amount and the historical payment amount. Also, nonphysician providers are reimbursed under the physician fee schedule but are paid a percentage of the fee schedule amount – ranging from 65 to 100 percent. For example, psychologists are paid 80 percent of the amount that a psychiatrist would be paid for the same service. However, we found that the percentage of services delivered by nonphysician practitioners over this period increased very little, so this is not a major source of divergence between the conversion factor increase and the average price per service. Finally, physicians who are not part of the Physician Participation Program are reimbursed at 95 percent of the fee schedule amount.

One of the components that feeds into the calculation of the changes in the conversion factor are changes in law or regulations projected to affect spending. These changes include specific legislative language that affects payments for groups of providers – for example, limits on payment for anesthesia teams and rules regarding the payment of nonphysician providers such as nurse practitioners. They also include changes in the package of services covered by Medicare. For example, Medicare began to cover a number of screening services in 1998. Another major component of these changes is the set of updates made to the physician fee schedule – these updates are described below and included in our analysis of changes in volume and intensity of services delivered. A list of the changes in law and regulation affecting payment for physicians' services is provided in Appendix F.

Table 18 summarizes the projected effects of these changes on expenditures for physicians' services. Over the period we examine, such changes were expected to have a cumulative effect of increasing expenditures by approximately 5 percent.

Together, the conversion factor used to update the physician fee schedule and law and regulation changes could have increased expenditures by approximately 23 percent. They did not, however, translate directly into a 23 percent increase in per capita expenditures because of the factors discussed above (the phase-in of the fee schedule, beneficiary cost-sharing) and changes in the volume and intensity of services delivered.

Changes in the Volume and Intensity of Services Delivered

The other major determinant of increases in expenditures is the increase in the volume and intensity of services delivered. Volume and intensity can increase or decrease as a result of changes in medical practice, changes in technology, changes in the case mix of the population being served, and other changes in the supply of and demand for physicians' services.

In the case of the physician fee schedule, volume and intensity can be measured using the Resource Based Relative Value Scale (RBRVS). As described in Appendix A, the RBRVS assigns each service on the physician fee schedule a number of relative value units (RVUs) that

[18] Authors' analyses of MCBS claims data.

reflect the time, skill, expense, etc. of providing the service. We can thus quantify the volume and intensity using the number of RVUs delivered to beneficiaries over time.

We can also use updates to the RBRVS as a measure of changes in volume and intensity due to changing medical practices and technology. The RBRVS can change from year to year in two ways. First, the number of RVUs assigned to service codes can increase or decrease in quantity if the nature of a service changes. Second, codes and their associated RVUs can be eliminated or new codes can be added to account for new or outdated services. The RBRVS is updated through an annual review process (described below). Health Care Financing Administration (HCFA, now Centers for Medicare and Medicaid Services (CMS)) is also required to conduct a comprehensive review of the RBRVS scale every five years. Two such comprehensive reviews have occurred since the system was implemented in 1992, the first in 1996 (effective in 1997) and the second in 2001. Codes are also added to the fee schedule when services are added to the Medicare benefits package.

Changes to the RBRVS made by CMS are largely based on recommendations from physicians. A committee of medical professionals called the Specialty RVS Update Committee (RUC) advises CMS on changes to the RBRVS. The Committee is coordinated by the American Medical Association. The RUC has 29 members and the majority (20) are representatives of medical specialty societies. Physician specialty societies develop lists of services or procedures that they would like included in the RBRVS or updated in the RBRVS. They then survey samples of their members about those services to develop estimates of how much time and effort is involved in performing them. In the survey, respondents are asked to respond about the care of a "typical" case. Respondents are also asked to compare the service to other "reference" services for which codes exist in order to maintain the relative weighting of the entire system. Specialty societies then present the findings of their surveys and recommendations about the number of RVUs that the services merit to RUC. The RUC will only recommend a code change if there is agreement among two-thirds of RUC members about the change. The RUC reports annually to CMS, and CMS accepts about 95 percent of its recommendations (AMA, 2001). Examples of updates to the RBRVS are the 1997 and 1998 increases in the number of RVUs assigned to the highest-level evaluation and management office visit code for established patients (99215). This change presumably reflects the greater complexity of the sickest patients seen in an outpatient setting and decisionmaking about their care.

In order to keep the entire fee schedule "budget neutral" in the years 1993 through 1995 and 1997 HCFA (now CMS) made across-the-board percentage cuts in the number of RVUs assigned to each service to balance the new codes and updates.[19] Medical societies protested that this worked against the intent of the resource-based system and caused problems for other payers using the RBRVS system. As a result, budget neutrality adjustments in 1996 and since 1997 have been made through the conversion factor.[20]

The RBRVS system and the methods used to update it are, of course, imperfect. Specialty societies have no incentive to identify overvalued codes. Surveys done of new codes before they are well established may reflect additional time and effort associated with learning how to perform the new service or procedure. In addition, the population receiving a service may

[19] The RVUs were cut by 2.8 percent in 1993, 1.3 percent in 1994, and 1.1 percent in 1995. The work RVUs were cut by 8.3 percent in 1997 after the five-year review.

[20] In addition, the 8.3 percent cut in the work RVUs was eliminated in 1999.

change over time, which could change the amount of work and expense associated with the service.

Nonetheless, we think that RVUs are the best available measure of volume and intensity. We base our analyses of changes in the volume and intensity of physicians' services on the number of RVUs delivered to Medicare beneficiaries over our study period. The next two sections describe our methods and our results. The results examine the implications of our findings for changes due to the composition of the Medicare population, the places of residence of Medicare beneficiaries, the sites where services are delivered, and changes in the technology applied to beneficiaries with conditions identified as having significant changes in the use of physicians' services.

Methods

We modeled the use of physicians' services using data from the 1993 MCBS and linked Medicare claims. Our strategy using the MCBS data was to track changes in the volume of services delivered by looking at changes in the number of RVUs worth of services consumed by beneficiaries over time.

The RBRVS was phased in over a five-year period beginning in 1992. We used 1993 as our base year since most of the changes due to the new payment system occurred in 1992 and thus 1993 is the first year for which a baseline level of physicians' services volume in terms of relative value units can be established (PPRC, 1994a). We chose 1998 as our reference year because it was the latest year for which MCBS data were available and because it reflects RVU use after the first major five-year review of the RBRVS in 1996.[21]

We constructed the baseline using data from the 1993 Medicare Current Beneficiary Survey (MCBS) Cost and Use File and linked claims data for MCBS respondents. The Medicare Current Beneficiary Survey is an annual rotating panel survey of Medicare beneficiaries. The Cost and Use File, which is available through 1998, contains information about respondents' demographics, health status, insurance coverage, and cost to the Medicare program. Using the claims data linked to the MCBS allowed us to us to look in detail at the exact mix of services (using CMS Common Procedural Coding System (HCPCS) codes, which can be matched to RVUs) that are being used over time. All figures we report are weighted using the MCBS cross-sectional weights.[22]

We modeled the volume of services consumed (in RVUs) as a function of beneficiary characteristics. These characteristics were constructed from MCBS data elements. Demographic characteristics included age, gender, place of residence, education, and date of death. To capture beneficiary health status we included self-reported problems with activities of daily living (ADLs) and instrumental activities of daily living (IADLs), history of smoking, and

[21] While we provide information below about the increases in RVU use between 1993 and 1998, we do not examine them in detail for a several reasons. First, the changes to the RBRVS schedule during these years were small. Thus, within-service technological change was mainly evaluated during the five-year review making the 1993 to 1998 comparison the most meaningful. Second, we were concerned that we could not fully account for the MCBS panel design and that our results would be confounded by beneficiaries appearing in the sample in multiple years. (This is not a problem with 1993 to 1998 comparisons since respondents are rotated out after four years.) Third, the across-the-board cuts in the RVUs, the different conversion factors for primary versus specialty care, etc. make interpreting the small year-to-year changes in patient categories extremely difficult.

[22] Unweighted figures for our sample differ little from those reported (e.g. 1993 average RVUs were less than 1 percent higher).

history of having certain medical conditions.[23] We also used information about whether or not beneficiaries have employer-provided supplemental insurance, Medigap insurance, or Medicaid, since beneficiaries with reduced cost-sharing because of such coverage use more physicians' services (Lillard, 1999).[24] We include supplemental insurance status but not income in our models because the latter is extremely unreliable in the MCBS. The MCBS asks only a single question about total income for the respondent and spouse, if married. It misses income from other people, such as children, who may be living in the household and who can help pay some expenses. Second, combining all income into one question results in both a significant bias (typically under-reporting) and misreporting (Goldman and Smith, 2001). Changes in the volume of services delivered to beneficiaries resulting from differing practice patterns in the geographic locations where beneficiaries reside were captured using variables for urban versus rural residence and for census region.[25]

We calculated the number of RVUs used by each beneficiary using claims data and a longitudinal database supplied to us by the American Medical Association. This database contained the RVUs assigned to each CPT code, by year. Using this information, we matched RVUs to each CPT code on the MCBS respondents' medical claims.[26]

In summary, we fit an individual-level model of the following type to the 1993 MCBS data for beneficiaries in traditional FFS Medicare in order to estimate the baseline effects of demographics and case mix on the volume of services used by beneficiaries.

$$(2)\quad \text{Total 1993 RVUs}_i = f(age_i, gender_i, age_i * gender_i, education_i, urban_i, region_i, insurance_i, ADLs/IADLs_i, smoked_i, conditions_i)$$

[23] The medical conditions in the models and tables below are the conditions that are included in the MCBS survey. The MCBS asks about medical conditions at different levels of specificity: for example, it asks respondents which of their joints are affected by arthritis but doesn't differentiate between emphysema, asthma, and COPD. However, we felt that the benefit of having a consistently reported set of conditions that captured respondents' medical history and did not depend on respondents' use of care outweighed these limitations. In addition, we did fit the models using diagnoses from the beneficiaries' Part B claims instead of using their self-reported conditions. This did not change our results qualitatively.

[24] One might suspect that adverse selection would make the possession of insurance and the amount of expected expenditures endogenous. However, there is little evidence of adverse selection in the market for supplemental Medigap insurance once observable health status is controlled for (Lillard et al., 1999; Hurd and McGarry, 1997). This is due to the fact that Medigap coverage is effectively subsidized by the Medicare program and that Medigap insurance is frequently employer-provided.

[25] We investigated whether part of the increase could be due to changes in the geographic distribution of beneficiaries in the MCBS sample, since Medicare payments for physicians' services are adjusted by a set of geographic practice cost indices (GPCIs). We obtained sets of GPCIs for 1993-1998 and attempted to match them to our claims files. We were able to match only 84.4 percent of the line items in 1993 and 77.8 percent of the line items in 1998 to GPCIs using the carrier number and locality codes on the claims. Using an algorithm that assigned a GPCI based only on the provider's carrier or State yielded a match rate of 95.1 percent in 1993 and 91.4 percent in 1998. We then computed the mean GPCI value across the sample: the mean national value is 1.0. For 1993 it was 1.00 and for 1998 it was .99, indicating that the distribution of the MCBS sample across high and low cost areas is virtually identical to the national distribution.

[26] Anesthesia services were excluded from the RVU analyses and included in our analyses of other physicians' services since anesthesia services, unlike other physician fee schedule services, are paid using a system of base and time units.

All of the covariates were entered as indicator variables.[27] Beneficiaries reported a history of more than two medical conditions on average and were coded into each of those conditions (i.e., the condition categories are not mutually exclusive).

Medicare beneficiaries with ESRD or who were institutionalized at any point during the calendar year in question were excluded from the model, as were beneficiaries in Medicare HMOs or without Part B coverage for any part of the year. Medicare beneficiaries with ESRD were excluded because the monthly payments made to physicians for their management of ESRD patients were added to the RBRVS fee schedule in 1995. They thus would appear to have experienced a large increase in RVUs but in fact this was due only to a previously capitated service being added to the RBRVS fee schedule. Persons who were institutionalized were found to have different patterns of care use than noninstitutionalized persons: while they had higher-than-average use of RVUs, the variance in their RVU use was lower than that for almost all other patient categories.[28] Excluding these populations reduced our sample to 9,627 beneficiaries in 1993 and 8,986 beneficiaries in 1998. Per capita expenditures for our sample increased slightly more than for the entire MCBS FFS sample: they increased 19.5 percent (from $898 to $1073) over the 1993-1998 period we examined while the expenditures for the entire sample rose 15 percent.

After much experimentation, Model (2) was fit as a standard ordinary least squares (OLS) regression using the MCBS cross-sectional weights and robust standard errors to account for survey design effects. The coefficients from the model of RVU use are presented in Appendix B and are as expected. For example, many beneficiary attributes were associated with a greater use of services – including older age, major medical conditions, and higher educational attainment. The age and gender variables and interaction terms were included because they are frequently used predictors of Medicare services (e.g., the adjusted average per capita cost (AAPCC) payment rates for Medicare+Choice plans) and of specific interest to Congress. They are not, however, all significant in this framework given the inclusion of stronger predictors such as the condition categories (i.e., age is often a proxy for the presence of medical conditions).

We also fit Model (2) using a two-part model with a probit model for the probability of any RVU use as the first part and a log-linear OLS model for the second part. Estimates from this model were retransformed using Duan's smearing estimator (Duan, 1983). In addition, we fit a variety of two-part models using generalized linear models (GLMs) for the second part (Manning and Mullahy, 2001). We found that the two-part model with the GLM gamma function and a log link performed the best in terms of mean squared error and absolute prediction error. However, all of the models except for the OLS model overpredicted the mean of the 1993 sample and overpredicted RVU use by beneficiaries with major medical conditions. Since one of our major aims was to look at mean changes in use over time and by condition, we decided to use the standard OLS regression. (Regression coefficients from the two-part GLM gamma model are presented in Appendix C. They are similar to the OLS model in sign and relative magnitude.) In addition, we experimented with including interactions between major medical

[27] The indicator variables are: <65 years; 65-69 years; 70-74 years; 75-79 years; 80-84 years; 85+ years; Male; <65 years and male; 65-69 & male; 70-74 & male; 75-79 & male; 80-84 & male; 85+ & male; > High school education; Medicaid; Private supplement; Drug coverage; Urban residence; Northeast region; Midwest; South; West; Other region; zero ADLs; 1-2 ADLs; 3+ ADLs; zero IADLs; 1-2 IADLs; 3+ IADL; Ever smoked; Hardening of the arteries; Hypertension; Myocardial infarction; Angina pectoris/CHD; Other heart condition; Stroke/brain hemorrhage; Other cancer (not listed below); Skin cancer; Lung cancer; Colon cancer; Breast cancer; Prostate cancer; Diabetes; Arthritis; Alzheimer's; and no self-reported conditions.

[28] Institutionalized beneficiaries used 50 percent more RVUs on average in 1993 than non-institutionalized beneficiaries.

conditions since comorbidities could be important predictors of service use.[29] We found that the only interactions that were marginally significant were those between orthopedic conditions (hip fracture and osteoporosis) and some cancers and asthma/emphysema/chronic obstructive pulmonary disease (COPD).[30] However, these varied according to the way that comorbidities were specified, and the interaction terms as a group were not jointly significant.

Having fit our model to 1993 data, we then used the estimated coefficients from the 1993 model to generate predicted service volume in terms of RVUs for future years. We then compared the total predicted growth to the total volume growth to see how much of the change in volume could be attributed to the demographic and case-mix factors in the model.

We compared predicted RVU use to actual use in two ways. Using our AMA database, we assigned each claim in 1994-1998 two RVU values. One was based on the RVU schedule in place in 1993. The other was based on the RVU schedule in use during that year. By comparing the value based on the 1993 schedule to the value based on the current year schedule we quantified the extent to which the change in RVU use was due to new or updated codes versus an increase (or decrease) in the use of existing codes. Before doing this we adjusted the 1994 through 1998 codes upwards to account for the across-the-board cuts in the fee schedule made by CMS.

In doing this, we depend on the RBRVS update system to accurately reflect the intensity of new codes and changes in intensity within codes over time. If this is the case, then the difference between the use based on the 1993 fee schedule and later years' RVU usage reflects technological change in services delivered. The limitation of this approach is that there may be inaccuracies in the RBRVS system, lags between changes in delivery, and changes in assigned RVUs and other changes to the RBRVS system that fail to reflect technological changes. (This is discussed further below.)

We then analyzed the changes in the volume of RVUs billed over time for physicians' services and for the professional services of nonphysician practitioners. We decomposed this into the components due to changes in the composition of enrollment in the Medicare program and the components that can not be explained by population composition. We then examined the conditions that had use that differed substantially from the use predicted by our model in order to shed light on the unexplained component of volume growth. We also sought to disentangle changes in the use of existing services from the use of new services or services that had changed in intensity although we did not attempt to quantify the change due to physicians' coding practices. Lastly, for selected conditions that showed significant or unexpected changes in the use of services over time, we sought input from appropriate clinical experts for possible explanations of the observed changes.

Results

Table 19 presents descriptive statistics about the volume of physicians' services used by Medicare beneficiaries in 1993 versus 1998. It presents mean and median total RVUs used, as well as breakdowns of inpatient and outpatient RVUs used. It also stratifies use by beneficiaries

[29] Comorbidities were modeled using indicators for the number of other conditions interacted with each condition and by creating and interacting terms for six major types of conditions: orthopedic conditions, cardiovascular conditions, neurological conditions, diabetes, cancers, and respiratory conditions.

[30] The MCBS has a single response category for asthma/ emphysema/ COPD.

with and without a self-reported major medical condition. For 1998 it presents both the number of RVUs used and the number in terms of the 1993 RVU schedule.[31] There was more than a 30 percent increase in the volume of physicians' services used by Medicare beneficiaries between 1993 and 1998 (from 38.1 to 49.9 RVUs.) There was no significant increase in the number of inpatient RVUs used, but a large increase in the use of physicians' services in outpatient settings. (Note: Laboratory RVUs are included in the total but not shown. They average less than one RVU per person in both 1993 and 1998.) There was significant increase in the use of services by both persons with and without self-reported medical conditions.

In 1993, 88.7 percent (weighted) of the sample used some physician services (Table 20). The rate was 89.8 percent in 1998. The average probability of any physician service use in 1998 predicted by the probit model developed on the 1993 sample is 89.0 percent. The characteristics of the population in 1998 are, therefore, consistent with a slightly higher probability of any use of physician services than the 1993 population, but both the predicted and actual rate changed very little.

However, conditional on use, beneficiaries used more services on average in 1998 than 1993. The second and third rows of Table 21 list 1993 and 1998 use. Both the mean and median number of services used increased, indicating that the increase was not due only to higher spending on the most severe cases. In addition, the last row of the table, predicted 1998 use, takes into account the changing demographics and health status of the Medicare population. All else being equal, the 1998 population as a whole would have been expected to use slightly fewer services.

RVU Use by Beneficiary Types

The 1.1 RVU difference between the predicted use of 37.0 RVUs by the 1998 sample and the use of 38.1 RVUs by the 1993 sample can be decomposed into components attributable to the observed beneficiary characteristics in the model. As shown in Table 22, a difference of 0.2 RVUs can be attributed to both the age/gender composition and the place of residence of the 1993 versus the 1998 samples. Specifically, the 1998 population has a greater proportion of disabled beneficiaries and beneficiaries in the oldest age category. Beneficiaries over age 85 use fewer RVUs worth of physicians' services than younger beneficiaries. Disabled beneficiaries also use fewer RVUs worth of services than other age groups, controlling for medical conditions. The use of RVUs by age/gender categories in 1993 and 1998 is presented in Appendix E. The 1998 population also has a lower proportion of beneficiaries living in urban areas and more beneficiaries living in the West, which contribute to lower predicted use. Other beneficiary characteristics are responsible for a net difference of 0.7 RVUs between 1993 and predicted 1998 use. These include lower rates of reported difficulties with ADLs and IADLs, and fewer beneficiaries with a history of heart attacks. (Appendix D presents the characteristics of the 1993 and 1998 sample populations.)

Table 23 shows the actual and predicted number of RVUs in each year between 1993 and 1998. The predicted RVUs are generated using model (2) described above. After increasing in

[31] In all of the tables included in this report the reported "actual" number of RVUs used reflect the number of RVUs that would have been assigned to the service had CMS not made the across-the-board cuts in the RBRVS schedule. The fee schedule figures for 1998 are approximately five percent lower than those we report due to those cuts.

1994, predicted RVUs fall steadily from 1994 to 1998 with the evolving changes in the demographics of the Medicare population.

Comparing the second and third columns of Table 23 allowed us to decompose the change in RVU use. The first column is predicted 1994-1998 use based on the model developed on 1993 data, the second is 1994-1998 use based on the 1993 RVU schedule, the third is use in terms of the concurrent RVU schedule. The total change between the first and third columns (49.9 - 37.0=12.9) for 1998 can be decomposed into two components.

Increase in the use of existing codes. The difference between 1998 use based on the 1993 schedule and predicted 1998 use is 7.5 RVUs. This constitutes 58 percent of the total difference between 1993 and 1998 use (7.5/12.9=58%). These 7.5 RVUs represent the increase in the use of codes that existed in 1993 by beneficiaries in 1998. This increase in the use of existing service codes could be caused by supply-side practice pattern changes such as improvements in the ability of physicians to provide such services. Such improvements could reflect a form of technological change. For example, physicians over this period might have been able to perform certain surgical procedures on older patients as their skill and experience with the procedure grew. It could also reflect demand-side changes as technologies mature and diffuse, wealth effects, or taste change.

Use of new or updated codes. The difference between 1998 actual use and 1998 use based on the 1993 schedule is 5.4 RVUs. This represents 42 percent of the total difference between 1998 use and predicted use. It can be explained by new technology substituting for old technologies, completely new technologies, newly covered services, or any adjustment of the 1993 RVU schedule due to changing intensity within service codes made by the RUC.

These patterns did vary somewhat by disease, as shown in Table 24. The predicted RVUs in this table come from applying the model (2) coefficients to the 1998 MCBS respondents. Table 24 is sorted from highest to lowest mean unexplained change in RVU use. At the top of the table are the conditions that saw unexplained increases in the volume of physicians' services such as osteoporosis and stroke. Decedents also experienced an increase in the use of existing services. At the bottom are the diseases that had lower unexplained growth. Some of these experienced treatment contraction – that is, a reduced use of the services available in 1993. Lung cancer patients, for example, used fewer established services in 1998 than 1993. This was due to a reduction in the use of physicians' services in the inpatient setting (as shown in Table 25 and discussed in more detail below.) All conditions saw some use of services that were either not available in 1993 or for which the number of RVUs increased between 1993 and 1998.

It is interesting to note, however, how few diseases had unexplained increases or decreases in RVU use that differed significantly from the mean increase in RVU use by persons without the condition. The conditions that had significantly higher unpredicted increases have a plus (+) next to them in Table 24, the conditions that had significantly lower increases have a minus (-) next to them. Of the self-reported medical conditions only three (plus decedents) had a significant unexplained increase in RVU use compared to people without those conditions. Two other patient types had significantly lower gains – hip fracture patients and patients without any reported conditions.[32]

[32] In addition, when the size of the critical region is adjusted to account for the fact that we are making multiple comparisons only the difference between persons with a condition and without any conditions is significant.

Site of Care Delivery

Consistent with commonly reported national trends, the increase in the use of outpatient services was much greater than the increase in the use of inpatient care. The proportion of RVUs associated with inpatient care declined from 36.7 percent to 29.9 percent of total RVU use. The total RVUs reported in Table 24 are the sum of RVUs delivered in inpatient settings and billed separately by physicians, services delivered in outpatient settings, and services related to diagnostic tests. The site of care delivery was determined using the place of service code listed on the physician bill. What little increase there was in inpatient settings largely came about because of the use of new or updated codes – these explain 86 percent of the unexplained increase in the inpatient use of RVUs. In addition, half of the conditions examined in Table 25 experienced declines in the use of existing services. In particular, lung cancer patients saw a large decline in their use of existing inpatient services. Of the patient types examined, only decedents received substantially more existing inpatient physicians' services in 1998 than in 1993. Decedents also received a particularly large number of new services. Stroke and osteoporosis patients who had high overall increases in RVU use also had higher unpredicted use of inpatient RVUs. Beneficiaries with a history of having broken a hip actually used fewer inpatient RVUs than predicted.

For outpatient services the overall trends were quite different. There was a mean increase of more than 10 RVUs in outpatient settings (Table 26). This increase was dominated by the enhanced use of existing codes, which accounted for 67 percent of the overall outpatient increase. Osteoporosis patients and stroke patients saw an increase in the use of outpatient RVUs that was higher than patients without these conditions, as did stroke patients. Beneficiaries with heart conditions other than those specifically mentioned on the MCBS survey (which were hypertension, hardening of the arteries, myocardial infarction, and angina/CHD) had significantly higher use. Lung cancer patients, who experienced declines in the use of inpatient RVUs, had high growth in the use of outpatient RVUs. Also notable was that Parkinson's patients saw a large unexplained increase while Alzheimer's patients used fewer outpatient RVUs than would have been predicted given 1993 baseline practice patterns. Colon cancer patients also had lower-than-average growth in the use of outpatient physicians' services.

Trends in sites of care delivery can cause changes in the number of RVUs paid for under the physician fee schedule. As described in Appendix A, the total number of RVUs assigned to a service is the sum of the practice expense, malpractice expense, and physician work RVUs associated with that service code. Practice expense RVUs for some services delivered in facilities are reduced relative to outpatient settings since the facility, rather than the physician, incurs the costs of staff, supplies etc. In other words, physicians receive a lower payment for providing these services in a facility than in their office. In 1993, out of the more than 8000 codes in our AMA databases 534 were subject to these site of service differentials; in 1998 675 were. However, when we assigned services delivered in the facilities the appropriate reduced number of RVUs, as opposed to the full number of RVUs that would have been assigned had the service taken place in an outpatient setting, it reduced our 1993 per beneficiary average number of RVUs by only 0.12. Applying the site-of-service differential in 1998 reduced the RVUs by 0.57. Therefore, while we cannot comment on the exact magnitude of site-of-care shifts given the different sets of services covered by the differential, if anything the site-of-service differential seems to have had the effect of reducing RVUs by more in 1998 than in 1993.

Changes in Clinical Technology and Productivity

Accordingly, we examined the patterns in the unexplained use of the RVUs overall, and in inpatient and outpatient settings, and chose a set of conditions for further study. We looked at conditions that had seen unusual growth or declines in RVU use. We also looked for those with increases in both percentage terms and absolute terms, those suffered by significant numbers of Medicare beneficiaries, and those that were sufficiently well defined to permit clinical experts to comment on them. These criteria led us to choose osteoporosis, stroke, and lung cancer for further examination.

The clinical experts offered the following as potential explanations for the observed changes in use:

Osteoporosis. Between 1993 and 1998 the use of the dual energy x-ray absorptionmetry (DEXA) scan became reimbursable by Medicare for "persons at risk of osteoporosis" – a very large proportion of the Medicare population. This change in policy, combined with the development of new pharmaceutical therapy demonstrated to be effective in reducing fractures, led to an increase in the number of people identified and treated for osteoporosis. (Indeed, the reported prevalence of osteoporosis in the MCBS sample increased.) This probably also resulted in increases in physician office visits and radiology services. Additionally, the drugs mentioned above were the subject of direct-to-consumer advertising campaigns by pharmaceutical companies, which also likely increased patient demand for osteoporosis-related services.

Stroke. There was the development of a "new technology" for stroke between 1993 and 1998, the use of thrombolytic therapy for patients with acute stroke. However, the proportion of acute stroke patients receiving this therapy is so small that it cannot account for the increase in use during this time period. Rather, the clinical experts we surveyed reported that three factors likely contributed to the growth of RVUs used during this time period:

1. The greater appreciation of the value of aggressively treating risk factors for recurrent stroke. This led to increased physician office visits for management. Greater use of cholesterol-lowering agents, antiplatelet agents, and more aggressive blood pressure control were cited in particular.
2. The advent of improvements in the accuracy and convenience of imaging of the carotid arteries (magnetic resonance angiography and improvements in Doppler ultrasound) probably led to more of these examinations being performed and subsequent aggressive management of persons found to be at highest risk (including increased use of carotid endarterectomy).
3. A greater realization of the value of post-stroke rehabilitation at improving outcomes of patients with stroke, leading to increased use.

Lung Cancer. Unlike the two conditions listed previously, lung cancer had little overall change in RVU use but a large decrease in the use of existing services between 1993 and 1998, all of which was due to a decrease in hospital use. Three factors were postulated to be responsible for this observation:

1. Improvement in staging, leading to a reduction in the number of surgical resections (i.e., patients were shown to be inoperable for cure because of better imaging).
2. Shifts in the site of chemotherapy from the inpatient to the outpatient settings.

3. Increase in the use of hospice care, so that patients were not receiving terminal care in-hospital.

Effect of Medicare Managed Care Enrollment

During the period 1993-1998, there was a large increase in enrollment in Medicare managed care plans. The number of Medicare managed care enrollees grew from almost two million in 1993 to over 6 million in 1998 (16 percent of the Medicare population). Numerous studies have shown that there is favorable selection into Medicare HMOs: that is, that healthier-than-average beneficiaries choose to join such plans (see, for example, Medicare Payment Advisory Commission: *Improving Risk Adjustment in Medicare.* Washington, DC: November 2000). If this is the case, then part of the increase we see in the use of RVUs could be due to the healthier segment of the Medicare population enrolling in managed care plans. (Overall, our 1998 population is "healthier" in 1998 than it was in 1993, as evidenced by our lower predicted use of RVUs. However, it is possible that in the absence of HMO enrollment it would have been healthier still.)

In order to determine the magnitude of this effect we estimated the relative use of physicians' services by Medicare managed care versus FFS enrollees. We had to estimate this difference because claims-level information about the use of physicians' services by Medicare managed care enrollees is not collected by CMS nor by the MCBS survey. In addition, most previous research on the magnitude of selection between Medicare HMOs and FFS Medicare has been based on total costs or on the use of inpatient care. (We were not able to find estimates of the extent of differences in use of "physicians' services.") First, we used our regression model to predict RVU use based on the observed characteristics of the managed care enrollees. We applied the model to all beneficiaries enrolled in managed care plans at any point during 1993 or 1998, regardless of whether they had Part B coverage for the entire year. However, we did weight beneficiaries in the sample by the amount of time they were enrolled. We included these part-year enrollees because prior research has found that new Medicare HMO enrollees are particularly healthy (MedPAC, 2000).

We found that on the basis of observed characteristics, the managed care and FFS enrollees were predicted to have roughly the same amount of RVU use in both 1993 and 1998. Appendix D shows the distributions of the characteristics of the FFS and managed care populations. Compared to FFS, the managed care population is younger, has lower rates of problems with ADLs and IADLs, and has a lower prevalence of many (but not all) conditions. However, they are better educated and more urban, characteristics which are predictive of greater use.[33]

In estimates of this kind, unobserved selection is always an issue. HMO enrollees may, for example, have systematically less severe heart disease or have preferences for less intensive care that are not captured in the model. We therefore estimated RVU use for the set of 1998 part-year HMO enrollees for which we had some information about their actual use of care. They were also estimated to have roughly the same average RVU use as the FFS sample (37.0 RVUs for the FFS sample and 37.3 for the part-year HMO enrollees.) However, those beneficiaries that

[33] In addition, we assumed that those with Medicare HMO coverage would have use comparable to those with privately purchased supplemental coverage in our FFS sample, which increases the predicted number of RVUs for these Medicare HMO enrollees.

enrolled in Medicare HMOs during 1998 incurred expenditure for physicians' services at half the rate of the average FFS beneficiary. (Their annualized expenditures were $547 versus $1073 for the average beneficiary remaining in FFS Medicare.) New, part-year HMO enrollees thus had unobserved characteristics that led them to spend 50 percent less on physicians' services than predicted during the period they were enrolled in fee-for-service Medicare.

For the Medicare managed care population as a whole, this 50 percent underprediction is probably an upper bound on the selection effect. First, it is for new enrollees who are known to have particularly low costs. Established enrollees likely have use that regresses towards a higher mean level of use. Second, no previous estimates of selection have been close to 50 percent in magnitude. Taking 50 percent as an upper bound on selection, the effect of increasing Medicare managed care enrollment over this period was at most a 5.6 percent increase in expenditures.[34] The lower bound on the selection effect from our model estimates was a negligible effect.

Other Physicians' Services

There are a number services not included on the standard RBRVS fee schedule that are nonetheless considered physicians' services and are included in the calculations of appropriate fee schedule updates under the MVPS and SGR. They are independent diagnostic laboratory and x-ray services (i.e. not hospital laboratories); anesthesia services; and certain health professionals, dressings, casts, and splints, and services and supplies provided incident to physicians' services.

Per beneficiary payments for all non-RVU services went up five percent, from $317 in 1993 to $333 in 1998 in our sample. As shown in Table 28, diagnostic labs and x-rays account for 67 percent of spending in this category in 1993 and nearly 75 percent in 1998. They are also the only type of non-fee schedule physicians' service that is used by a sufficiently large percentage of our sample of FFS beneficiaries to make fitting a model of use feasible. We fit a regression model to explain expenditures and service use for diagnostic tests that was similar to the model (2) fit for RVU use. This model is described below. We also present data below on the use of anesthesia services, a service used by 20 percent of our sample.

The mean number of per beneficiary health professional services did not change between 1993 and 1998, so the small increase in expenditures for health professional services in Table 27 translated into a small increase in the price paid per service. The use of services and supplies furnished incident to physicians' services went down considerably between 1993 and 1998 in our sample; however, very few beneficiaries used them so this is likely a statistical anomaly.

Much of the change in expenditures for non-RVU services is due to increased expenditures for diagnostic services. Table 27 presents the 1993 and 1998 actual, predicted, and unexplained changes in expenditures and use of diagnostic services. In terms of counts, diagnostic services use went up in 1998 for nearly all conditions. The overall mean count of services billed increased by 20 percent from 13.3 to 16.0. In dollar terms, laboratory and x-ray use increased by 16 percent but the unit price of diagnostic services went down over the period from an average of $16 per lab to $15.50. Unfortunately, there is no unit of service for diagnostic labs and x-rays

[34] This was calculated as follows: the FFS population was 94 percent of the total Medicare population in 1993. It was 84 percent of the total population in 1998. The 10 percent of beneficiaries who joined HMOs had spending of $547 which was half the average level of spending ($1073) of those who remained in FFS. Thus, the effect on the average spending of the FFS pool was 1/[((84*1)+(10*0.5))/94]=1.056 times higher than expenditures would have been for the entire pool including the HMO enrollees.

comparable to RVUs so it is difficult to determine which conditions saw increases in the "volume" of diagnostic tests. Nonetheless, some of the same small set of conditions that experienced RVU use increases also experienced growth in the use of labs and x-rays, including stroke patients and osteoporosis patients. Lung cancer patients, who saw an increase in their use of outpatient services, also used more services in this category.

Less anesthesia was used in 1998 than in 1993 overall, and less was used in the treatment of quite a few conditions. Lung, colon, breast, and prostate cancer patients used fewer units of and spent less on anesthesia services. Decedents had a slightly greater number of bills for anesthesia and their increase in spending on anesthesia was high relative to other conditions. (See Table 29.)

Discussion

In our sample of Medicare beneficiaries, per capita expenditures for physicians' services increased 19 percent in nominal dollars from $898 to $1073 over the period 1993-1998. Expenditures for physician fee schedule services increased 27 percent from $581 to $740, and other services included in the statutory definition of physicians' services increased 5 percent from $317 to $333. The physician fee schedule dollar conversion factor increased by 19 percent from $31.50 to $37.60.[35]

Changes due to law and regulation and increasing enrollment in managed care can account for at most one-half of this change in expenditures. According to CMS, changes in laws and regulation should have led to increases of 5 percent in total expenditures for physicians' services. We estimate that HMO enrollment can explain at most a 5.6 percent increase in expenditures.

We found that the volume of physicians' services delivered to non-ESRD, non-institutionalized fee-for-service Medicare beneficiaries, measured using the RBRVS, increased 30 percent over the mid-1990s. Our analyses do not indicate that this is due to measurable changes in the demographic composition of the Medicare population, places of residence, the prevalence of health conditions, or other beneficiary characteristics. Indeed, our analysis indicates that all else being equal, the FFS population in 1998 should have used slightly fewer RVUs than the 1993 population. In addition, while we found that the use of services in outpatient settings increased substantially, this increase could not be directly attributed to shifts in site of care from inpatient to outpatient settings.

In fact, the evidence suggests increased use of physicians' services by every type of Medicare beneficiary that we examined. We had hypothesized that conditions in which there had been rapid technological change would see the greatest increases, but there was evidence of technological change across all conditions. When we queried clinical experts about the determinants of changes in use for selected medical conditions, they pointed to a number of changes in medical knowledge and technology that could have contributed, indicating that within conditions the impact of new technologies is also diffuse.

[35] Note, however, that conversion factor increase does not translate into a commensurate increase in expenditures owing to beneficiary cost-sharing, the phase-in of the fee schedule, and other factors discussed in detail above.

Table 18. Projected percentage increase in expenditures for physicians' services resulting from changes in law or regulations

Legislative Factors	1994	1995	1996	1997	1998	Cumulative Change
All services / weighted average	2%	3.5%	-0.5%	-0.7%	0.6%	4.9%
Surgical	1.4%	5.3%	-0.6%	-2.1%		
Primary care	3.2%	9.5%	5.7%	3.4%		
Nonsurgical	1.9%	-2.7%	-2.4%	-1.5%		

Source: *Federal Register* Notices.

Table 19. RVU use by year and service categories, 1993 & 1998

Type of Beneficiary	Number of Observations	1993 RVUs						Number of Observations	1998 Based on 1993						1998 Actual					
		Total RVUs		Outpatient		Inpatient			Total RVUs		Outpatient		Inpatient		Total RVUs		Outpatient		Inpatient	
		mean	median	mean	median	mean	median		mean	median	mean	median	mean	median	mean	median	mean	median	mean	median
All	9627	38.1 (.80)	14.1	23.6 (.50)	11.7	14.0 (.59)	0.0	8,986	44.5 (1.83)	16.6	30.8 (1.61)	14.0	13.1 (.54)	0.0	49.9 (1.68)	20.6	34.2 (1.37)	17.2	14.9 (.62)	0.0
Beneficiaries with conditions	8787	40.6 (.89)	15.6	25.0 (.54)	13.1	15.1 (.67)	0.0	8,277	46.9 (1.99)	18.5	32.4 (1.76)	15.2	13.8 (.58)	0.0	52.5 (1.82)	22.8	36.0 (1.50)	18.6	15.7 (.67)	0.0
Beneficiaries without conditions	840	14.3 (1.14)	2.6	10.4 (.69)	2.6	3.8 (.67)	0.0	709	18.9 (1.84)	3.7	13.2 (1.32)	3.4	5.5 (1.26)	0.0	21.5 (1.91)	4.6	14.9 (1.24)	4.2	6.3 (1.41)	0.0

Note: For mean total RVUs and outpatient RVUs, the increases over time are all significant at p=0.05. The change in inpatient RVUs is not significant. For mean total RVUs and outpatient RVUs, the difference between beneficiaries with and without conditions are all significant at p=0.05. Standard errors are in parentheses.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 20: Probabilities of any use of physicians' services

	Number of Observations	Mean
Rate of use in 1993	9,627	0.887
Rate of use in 1998	8,986	0.898
Predicted rate of use in 1998	8,986	0.890

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 21: RVU consumption for physician services

	Mean	Median[1]	Number of Observations
1993 use	38.1	14.1	9,627
1998 use	49.9	20.6	8,986
1998 use based on 1993 RVUs	44.5	16.6	8,986
1998 predicted use based on 1993 model	37.0	33.2	8,986

[1] Comparing the median prediction to the median use demonstrates that our model does not mirror the distribution of the actual data. However, as discussed in the text, alternative modeling strategies introduced unacceptable levels of bias.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 22: Decomposing the predicted change in RVU for physician services use

	RVUs	Difference
1993 use	38.1	
1998 predicted	37.0	-1.1
1998 predicted holding 1993 age/gender distribution constant	37.9	-0.2
1998 predicted holding 1993 residence constant	37.9	-0.2
1998 predicted holding 1993 health status and other characteristics constant	37.3	-0.7

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 23: RVU for physician services use by year

Year	Predicted RVU Use	RVUs Based on 1993 Schedule	Actual RVU Use	Mean Unexplained Change	Existing Codes	New and Updated Codes	Number of Observations
	(1)	(2)	(3)	(3) minus (1)	(2) minus (1)	(3) minus (2)	
1993	38.1	38.1	38.1	-	-	-	9,627
1994	38.5	41.6	41.5	3.0	3.0	0.0	9,857
1995	38.0	42.6	42.6	4.6	4.6	0.0	8,978
1996	37.5	47.9	47.3	9.8	10.3	-0.6	8,655
1997	37.3	46.6	51.4	14.1	9.3	4.8	8,881
1998	37.0	44.5	49.9	12.9	7.5	5.4	8,986

Note: The new and updated code effect for 1996 is -0.6. This is because, while the median RVU use in 1996 was higher than the median use based on the 1993 schedule by 0.4 RVUs (due to the addition of new codes and the updating of existing ones) the mean value is lower. This is likely due to devaluing over the period 1994-1996 of the practice expense RVUs for certain services, largely provided in inpatient settings, that were thought to be overvalued.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 24: Differences between predicted and actual use of RVUs for physician services in 1998, sorted from highest to lowest unexplained change

	RVUs						Existing Codes		New and Updated Codes		
	Actual 1993 Use	Predicted 1998 Use	1998 Based on 1993 Schedule	1998 Actual Use	Mean Unexplained Change		Effect Size	(% change)	Effect Size	(%)	Number of Observations in 1998
		(1)	(2)	(3)	(3)-(1)		(2)-(1)	[(2)-(1)]/(2)	(3)-(2)	[(3)-(2)]/(2)	
Decedent	92.6	90.9	111.1	125.5	34.6	+	20.3	18.2%	14.4	12.9%	339
Parkinson's	44.9	43.9	57.5	67.7	23.8		13.6	23.7%	10.2	17.8%	139
Osteoporosis	43.5	39.4	55.0	60.8	21.4	+	15.6	28.4%	5.8	10.5%	1,267
Stroke/brain hemorrhage	46.3	43.8	56.3	65.1	21.3	+	12.5	22.2%	8.8	15.7%	1,039
Other heart condition	52.5	50.4	60.2	67.7	17.3	+	9.7	16.2%	7.5	12.5%	2,647
Breast cancer	53.1	51.6	64.3	68.5	16.9		12.7	19.7%	4.2	6.5%	355
Angina pectoris/CHD	57.3	55.7	63.1	71.6	15.9		7.4	11.7%	8.5	13.5%	1,326
Hypertension	43.0	42.2	51.1	56.9	14.7		8.8	17.2%	5.8	11.5%	4,965
Myocardial infarction	60.5	58.4	64.4	73.0	14.6		6.0	9.4%	8.6	13.3%	1,350
Arthritis	42.4	40.9	49.8	55.1	14.2		8.9	17.9%	5.3	10.7%	5,438
Diabetes	53.1	51.1	56.9	64.9	13.8		5.8	10.1%	8.0	14.0%	1,462
Emphysema, asthma, COPD	47.4	46.7	53.0	60.4	13.7		6.3	11.9%	7.4	14.1%	1,407
Skin cancer	45.0	44.2	51.1	57.8	13.6		6.9	13.5%	6.7	13.1%	1,596
Hardening of the arteries	54.3	54.6	59.7	67.6	13.0		5.1	8.5%	7.9	13.3%	1,106
Mental disorder	40.0	37.9	37.7	49.8	11.9		-0.1	-0.4%	12.1	32.0%	883
Other cancer (not listed below)	47.8	46.5	50.3	57.8	11.3		3.8	7.6%	7.5	14.8%	495
Prostate cancer	69.9	67.2	66.9	75.6	8.4		-0.4	-0.6%	8.7	13.1%	269
Alzheimer's	42.7	45.8	44.4	52.3	6.5		-1.4	-3.1%	7.9	17.8%	251
Broken hip	54.5	54.3	51.9	59.7	5.4	-	-2.4	-4.6%	7.8	15.0%	456
No self-reported conditions	14.3	17.2	18.9	21.5	4.3	-	1.8	9.4%	2.6	13.5%	709
Lung cancer	109.8	109.5	103.6	113.8	4.3		-5.8	-5.6%	10.2	9.8%	89
Colon cancer	63.5	64.2	59.5	68.2	4.0		-4.7	-7.9%	8.7	14.6%	227
MEAN	38.1	37.0	44.5	49.9	12.9		7.5	16.8%	5.4	12.1%	8,986

- Mean unexplained change for people with condition significantly lower than residual for people without condition at $p < 0.05$.
+ Mean unexplained change for people with condition significantly higher than residual for people without condition at $p < 0.05$.

CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 25: Differences between predicted and actual use of RVUs in 1998, inpatient

INPATIENT							Existing Codes		New and Updated Codes		
	Actual 1993 Use	Predicted 1998 Use	1998 Based on 1993 Schedule	1998 Actual Use	Mean Unexplained Change		Effect Size	(% change)	Effect Size	(%)	Number of Observations in 1998
		(1)	(2)	(3)	(3)-(1)		(2)-(1)	[(2)-(1)]/(2)	(3)-(2)	[(3)-(2)]/(2)	
Hardening of the arteries	22.2	21.5	22.1	25.1	3.7		0.6	2.8%	3.1	13.8%	1,106
Hypertension	16.9	15.7	16.1	18.3	2.6		0.4	2.6%	2.2	13.5%	4,965
Myocardial infarction	29.8	27.7	25.8	29.8	2.1		-1.9	-7.3%	3.9	15.2%	1,350
Angina pectoris/CHD	25.2	23.4	22.4	25.9	2.5		-1.1	-4.7%	3.5	15.8%	1,326
Other heart condition	23.1	21.2	20.5	23.7	2.5		-0.7	-3.5%	3.2	15.4%	2,647
Stroke/brain hemorrhage	20.8	18.6	24.4	28.0	9.4	+	5.9	24.1%	3.5	14.5%	1,039
Other cancer (not listed below)	19.2	17.7	16.0	18.2	0.5		-1.8	-11.0%	2.2	14.0%	495
Skin cancer	15.1	13.8	13.0	14.9	1.0		-0.8	-6.4%	1.9	14.4%	1,596
Lung cancer	52.8	50.4	32.7	36.8	-13.6	-	-17.7	-54.0%	4.1	12.6%	89
Colon cancer	25.9	26.4	24.4	27.3	0.9		-2.0	-8.1%	2.9	11.9%	227
Breast cancer	14.1	12.8	12.5	14.0	1.2		-0.3	-2.4%	1.5	12.3%	355
Prostate cancer	19.8	17.8	20.6	23.1	5.3		2.9	13.8%	2.5	12.0%	269
Diabetes	22.1	20.0	20.7	23.5	3.5		0.7	3.6%	2.7	13.2%	1,462
Arthritis	15.2	13.8	13.9	15.8	2.0		0.1	0.5%	1.9	13.8%	5,438
Alzheimer's	12.3	13.9	18.4	20.7	6.8		4.5	24.7%	2.3	12.2%	251
Mental disorder	12.2	10.6	12.0	14.6	4.0		1.4	11.8%	2.6	21.5%	883
Osteoporosis	12.7	10.0	14.6	16.4	6.4	+	4.6	31.8%	1.8	12.1%	1,267
Broken hip	26.8	26.5	20.8	23.8	-2.7		-5.7	-27.2%	3.0	14.3%	456
Parkinson's	18.4	18.7	18.2	20.0	1.3		-0.5	-2.5%	1.7	9.5%	139
Emphysema, asthma, COPD	18.9	18.3	19.2	21.9	3.7		0.9	4.6%	2.8	14.4%	1,407
No self-reported conditions	3.8	4.7	5.5	6.3	1.7		0.8	14.9%	0.8	15.2%	709
Decedent	66.5	65.4	78.0	88.2	22.8	+	12.6	16.2%	10.2	13.0%	339
MEAN	14.0	12.9	13.1	14.9	2.1		0.2	1.6%	1.8	14.1%	8,986

- Mean unexplained change for people with condition significantly lower than residual for people without condition at $p < 0.05$.
+ Mean unexplained change for people with condition significantly higher than residual for people without condition at $p < 0.05$.

CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 26: Differences between predicted and actual use of RVUs in 1998, outpatient

OUTPATIENT	RVUs						Existing Codes		New and Updated Codes		
	Actual 1993 Use	Predicted 1998 Use	1998 Based on 1993 Schedule	1998 Actual Use	Mean Unexplained Change		Effect Size	(% change)	Effect Size	(%)	Number of Observations in 1998
		(1)	(2)	(3)	(3)-(1)		(2)-(1)	[(2)-(1)]/(2)	(3)-(2)	[(3)-(2)]/(2)	
Hardening of the arteries	31.7	32.7	36.6	41.4	8.7		3.9	10.7%	4.8	13.1%	1,106
Hypertension	25.7	26.1	34.1	37.7	11.6		8.0	23.5%	3.6	10.4%	4,965
Myocardial infarction	30.3	30.3	37.7	42.2	11.9		7.4	19.6%	4.5	11.9%	1,350
Angina pectoris/CHD	31.6	31.7	39.6	44.5	12.8		7.9	20.0%	4.8	12.2%	1,326
Other heart condition	29.0	28.7	38.7	43.0	14.3	+	10.0	25.8%	4.3	11.0%	2,647
Stroke/brain hemorrhage	25.1	24.8	30.6	35.7	11.0		5.9	19.2%	5.1	16.6%	1,039
Other cancer (not listed below)	28.1	28.3	33.1	38.2	9.9		4.9	14.8%	5.0	15.1%	495
Skin cancer	28.7	29.2	37.0	41.8	12.6		7.8	21.1%	4.8	13.0%	1,596
Lung cancer	56.8	58.8	70.4	76.4	17.7		11.6	16.5%	6.1	8.6%	89
Colon cancer	36.4	36.6	33.8	39.5	2.9	-	-2.7	-8.1%	5.7	16.8%	227
Breast cancer	38.5	38.4	51.3	53.8	15.4		12.9	25.1%	2.5	4.9%	355
Prostate cancer	49.7	49.0	44.8	50.9	2.0		-4.2	-9.3%	6.1	13.7%	269
Diabetes	30.3	30.5	35.4	40.6	10.1		4.9	13.9%	5.1	14.5%	1,462
Arthritis	26.8	26.6	35.1	38.5	11.9		8.5	24.3%	3.4	9.7%	5,438
Alzheimer's	30.1	31.4	25.0	30.5	-0.9	-	-6.4	-25.6%	5.5	21.8%	251
Mental disorder	27.4	26.9	25.2	34.4	7.6		-1.7	-6.7%	9.3	36.7%	883
Osteoporosis	30.4	29.0	39.5	43.4	14.3		10.4	26.4%	3.9	9.9%	1,267
Broken hip	26.8	26.9	29.1	33.5	6.6		2.3	7.8%	4.4	15.0%	456
Parkinson's	25.9	24.5	38.2	46.6	22.1		13.7	35.8%	8.4	22.0%	139
Emphysema, asthma, COPD	28.1	28.1	33.0	37.5	9.5		4.9	14.9%	4.6	13.8%	1,407
No self-reported conditions	10.4	12.2	13.2	14.9	2.7	-	1.0	7.6%	1.7	12.5%	709
Decedent	24.8	24.1	30.6	34.5	10.4		6.5	21.2%	3.9	12.8%	339
MEAN	23.6	23.7	30.8	34.2	10.5		7.1	23.0%	3.4	11.1%	8,986

- Mean unexplained change for people with condition significantly lower than residual for people without condition at $p < 0.05$.
+ Mean unexplained change for people with condition significantly higher than residual for people without condition at $p < 0.05$.

CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 27: Mean per beneficiary payments for non-RVU services, 1993 and 1998

	1993 Mean Payments per Beneficiary in Dollars	1998 Mean Payments per Beneficiary in Dollars
Anesthesia	30.97	32.86
Diagnostic laboratory and x-ray	213.51	248.15
Health professionals	15.34	18.85
Incident to services	40.87	6.95
Dressings, casts, splints	0.001	0.002
Total non-RVU services	317.47	333.37

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 28: Differences between predicted and actual use of and expenditures for diagnostic labs and x-rays in 1993 and 1998

Diagnostic Labs and X-rays	1993 Payment (current dollars)	Predicted 1998 Payment: OLS Model	1998 Payment (current dollars)	Mean Unexplained Change	1993 Counts	Predicted 1998 Counts: OLS Model	1998 Counts	Mean Unexplained Change	Number of Observations 1998
		(1)	(2)	(2)-(1)		(3)	(4)	(4)-(3)	
Hardening of the arteries	313.3	316.4	372.4	56.0	17.9	18.1	22.6	4.5 +	1106
Hypertension	247.6	243.4	280.8	37.4	15.3	15.3	18.4	3.1	4965
Myocardial infarction	340.1	330.4	365.0	34.5	19.0	18.6	22.8	4.2	1350
Angina pectoris/CHD	336.9	327.1	408.0	80.9 +	19.3	18.9	24.7	5.8 +	1326
Other heart condition	310.7	300.4	352.9	52.5	18.5	18.2	22.1	3.9 +	2647
Stroke/brain hemorrhage	255.8	245.3	313.5	68.1 +	15.8	15.6	21.8	6.3 +	1039
Other cancer (not listed below)	268.7	264.7	298.9	34.2	15.5	15.6	20.2	4.6	495
Skin cancer	247.1	245.1	315.7	70.6 +	15.2	15.3	19.1	3.9	1596
Lung cancer	454.2	468.8	644.3	175.5	24.4	25.6	39.3	13.7	89
Colon cancer	344.9	343.0	339.6	-3.4	19.3	19.4	20.6	1.2	227
Breast cancer	280.4	275.3	344.1	68.8	17.8	18.0	20.5	2.5	355
Prostate cancer	383.6	380.2	360.5	-19.7 -	21.3	21.1	23.6	2.5	269
Diabetes	312.5	302.8	328.7	25.9	20.2	19.9	24.6	4.7 +	1462
Arthritis	238.0	230.9	275.1	44.2	14.8	14.7	17.7	3.0	5438
Alzheimer's	268.6	282.5	292.3	9.8	17.6	18.8	18.2	-0.5 -	251
Mental disorder	202.1	192.3	221.6	29.3	12.8	12.5	14.7	2.2	883
Osteoporosis	258.8	239.0	298.7	59.7	16.9	16.1	19.5	3.4	1267
Broken hip	228.0	224.2	273.1	49.0	15.7	15.9	19.3	3.4	456
Parkinson's	263.4	253.9	310.8	56.9	15.9	16.0	18.4	2.4	139
Emphysema, asthma, COPD	252.9	248.0	296.8	48.7	15.5	15.4	19.0	3.6	1407
No self-reported conditions	79.8	96.8	91.4	-5.4 -	5.0	6.5	5.9	-0.6 -	709
Decedent	351.1	341.4	408.2	66.8	22.9	22.8	26.1	3.3	339
MEAN	213.5	208.9	248.2	39.3	13.3	13.2	16.0	2.8	8986

- Mean unexplained change for people with condition significantly lower than residual for people without condition at $p < 0.05$.
+ Mean unexplained change for people with condition significantly higher than residual for people without condition at $p < 0.05$.

CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Table 29: Differences between predicted and actual use of and expenditures for anesthesia in 1993 and 1998

Anesthesia	1993 Payment (current dollars)	1998 Payment (current dollars)	Change	1993 Counts	1998 Counts	Change	Number of Observations 1998
	(1)	(2)	(2)-(1)	(3)	(4)	(4)-(3)	
Hardening of the arteries	43.9	45.4	1.5	22.8	20.2	-2.6	1106
Hypertension	34.6	36.8	2.3	18.2	17.0	-1.1	4965
Myocardial infarction	46.3	47.9	1.6	21.8	24.4	2.6	1350
Angina pectoris/CHD	45.5	47.4	1.8	20.7	19.5	-1.2	1326
Other heart condition	43.1	43.6	0.5	21.5	20.6	-0.9	2647
Stroke/brain hemorrhage	33.2	41.0	7.8	17.1	20.5	3.4	1039
Other cancer (not listed below)	39.1	52.5	13.4	24.4	22.6	-1.8	495
Skin cancer	32.3	35.5	3.3	16.5	16.7	0.2	1596
Lung cancer	95.5	75.4	-20.2	45.2	26.1	-19.1	89
Colon cancer	62.0	57.6	-4.4	33.8	23.0	-10.8	227
Breast cancer	41.4	40.6	-0.8	22.4	14.4	-8.0	355
Prostate cancer	58.2	57.6	-0.6	32.6	29.2	-3.3	269
Diabetes	40.8	42.0	1.2	20.2	18.4	-1.8	1462
Arthritis	34.2	36.3	2.2	19.0	16.9	-2.1	5438
Alzheimer's	23.1	21.4	-1.7	6.8	8.6	1.8	251
Mental disorder	21.5	26.7	5.2	8.6	13.4	4.8	883
Osteoporosis	28.5	38.1	9.6	12.8	19.9	7.1	1267
Broken hip	34.8	44.4	9.6	18.9	24.6	5.7	456
Parkinson's	30.5	26.6	-3.9	13.7	15.4	1.7	139
Emphysema, asthma, COPD	36.7	38.6	2.0	18.0	18.4	0.4	1407
No self-reported conditions	14.7	16.4	1.7	7.1	5.7	-1.5	709
Decedent	73.9	86.5	12.5	36.8	37.4	0.7	339
MEAN	31.0	32.9	1.9	16.5	14.7	-1.8	8986

CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease.

Note: Anesthesia was used so infrequently that a model for its use could not be fit reliably; no predicted values or “unexplained changes”, therefore, are included in this table.

Source: Authors' analyses of Medicare Current Beneficiary Survey.

Chapter 4. Limitations

This study has four main limitations. First, as with nearly all models of health care utilization and spending, our model can explain very little of the variation in service utilization across beneficiaries. Despite having a rich set of covariates, including measures of education, insurance, and numerous attributes of health status, we were able to explain only 4 percent of the variation in RVU use among beneficiaries. Thus, it is possible that there are changes in unobserved beneficiary characteristics that are causing some of the increase in service use.

Second, while we were able to attribute the unexplained increase in RVUs to both "new and updated" and "existing" service codes, this distinction does not isolate the effect of new technology, since existing services can undergo technological changes that are not captured in the fee schedule. The new and updated codes are only a lower bound on the extent of technological change. For example, there may be technological change within existing codes that is not recognized by the RUC review committee, or that does not increase the work associated with providing a service. In addition, during the period we examined, the practice expense and malpractice components of the RBRVS were not resource-based. (They were based on surveys of physician practice costs and charges, respectively; resource-based practice expenses are currently being phased into the fee schedule.) Thus, these components of our RVU totals do not as accurately reflect the "volume and intensity" of services delivered. There might also be changes in technology that produce increases in the use of physicians' services indirectly. For example, better prescription drugs or improved diagnostic tests could increase the use of physician office visits and other physicians' services. In addition, technological change can lead to changes in the identification of the diseases we examined and even to changes in the health status of the population over time.

Third, while we tried to control for patient characteristics, unobserved differences in severity of illness may have existed between the patients in our 1993 and 1998 samples. There may, therefore, be a portion of our unexplained increase in RVU use that is due to increasing severity within the disease groups we included in our models.

Finally, we cannot say whether or not the observed increases in service use are medically appropriate or whether they would have been different in magnitude if an alternative payment update system had been used. There is certainly an interrelationship between payment updates and the volume of services delivered: physicians do respond to the prices paid for services. Thus, we cannot evaluate whether service use would have been higher or lower had an SGR-like payment update system been in place during the time period we examined.

Chapter 5. Conclusions

In our sample of Medicare beneficiaries, per capita expenditures for physicians' services increased 19 percent in nominal dollars from $898 in 1993 to $1073 in 1998. Expenditures for physician fee schedule services increased 27 percent from $581 to $740, and other services included in the statutory definition of physicians' services increased 5 percent from $317 to $333. During that period, the physician fee schedule dollar conversion factor increased by 16.6 percent from $31.50 to $36.70.[36]

Changes in laws and regulations and increasing enrollment in managed care can account for at most one-half of the observed change in expenditures. According to CMS, changes in laws and regulations should have led to an increase of 5 percent in total expenditures for physicians' services. We estimate that HMO enrollment can account for no more than a 5.6 percent increase in expenditures.

The per capita volume of physicians' services (in RVUs) delivered to non-ESRD, non-institutionalized fee-for-service Medicare beneficiaries increased 30 percent over the mid-1990s. Our analyses do not indicate that this increase is due to measurable changes in the demographic composition, the places of residence, the prevalence of health conditions, or other characteristics of the Medicare population. Indeed, our analysis indicates that, all else being equal, the 1998 FFS population should have used slightly fewer RVUs than the 1993 population. In addition, while we found that the use of services in outpatient settings increased substantially, the increase in expenditures could not be attributed directly to shifts in site of care from inpatient to outpatient settings.

Overall, the main driver of change in the volume and intensity of services was a general increase in the use of care by all categories of beneficiaries. Only a few medical conditions emerged as having unusual RVU growth. For these conditions, clinical experts were able to point to changes in medical knowledge and technology that could have contributed to the increase. Large increases in the use of physicians' services were also seen in patients just prior to death. Thus, changing medical technology appears to increase use of physicians' services in ways that are strong and pervasive. Furthermore, the increases in Medicare expenditures for physicians' services seem comparable to those of other payers. This finding indicates that the trends in Medicare beneficiaries' use of physicians' services are likely driven by the same set of factors as those driving the increase in overall health care spending.

Implications

Our analyses have several implications for the debate about the SGR payment update system:

1. Technical adjustments to the SGR targets are not a ready solution to the criticisms raised about the SGR. Such adjustments could be made to account for the changing composition of the FFS population, but they would be small adjustments relative to the overall increases in service use.
2. A payment update system that systematically attempted to measure "appropriate" increases in use due to changing technology would not be feasible. Such a system would

[36] Note, however, that conversion factor increase does not translate into a commensurate increase in expenditures, owing to beneficiary cost sharing, the phase-in of the fee schedule, and other factors discussed in detail in the report.

have to consider changes across an extraordinarily broad set of dimensions and conditions to capture all of the possible ways in which technology can influence service provision.

3. Our analyses indicate that some of the largest increases in the use of physicians' services cannot be ascribed to discrete causes. These increases are surprisingly uniform across medical conditions, suggesting that a single update factor for physicians' services may be appropriate. However, what that factor should be remains an open policy question.

Future Research

There are clearly a number of areas in which further research would be valuable. First, more detailed investigations of service use and coding would help to disentangle the effects of coding practices, new technology, productivity, consumer demand, care substitution, and other factors. A detailed breakdown of RVU use into office visits, outpatient procedures by various specialties, inpatient procedures, etc. would allow for a greater understanding of shifting care and coding patterns. In particular, the extent of increases in the RVU weights associated with similar visits over time ("upcoding") could be gauged by looking over time at the distribution of office visit types (across the levels of intensity captured in the evaluation and management codes.) A more refined classification of codes would also reveal the extent to which the "new and updated" codes we observed capture truly new technology versus services newly covered by Medicare or coding changes unrelated to technological change (e.g. the splitting of codes into finer categories such as insertion of pacemaker, single chamber or dual chamber.) An examination of only the work RVU portion of the physician fee schedule could also be helpful in this respect because it would isolate changes in physician labor. Finally, a study of the RBRVS update process could shed light on the degree to which it truly reflects changes in technology.

Second, further refinements to our modeling could improve predictions. The major challenges in modeling health care costs and use from a statistical standpoint are that many individuals do not access health care at all and that the distribution of costs for those who do is extremely right-skewed. All of our analyses have focused on mean use and expenditures since we were interested in overall trends. However, given the skewed distribution of care use, there would be value in understanding if and how the distribution of care use also changed. This could be done by examining median use or use by different deciles of the distribution. Least Absolute Deviation (LAD) models could assist in these analyses.

Third, further work could be done on selected patient groups. With the more detailed information on service use described above, we could test whether there is evidence supporting our clinical experts' explanations of the changes observed in care use by osteoporosis, stroke, and lung cancer patients. We could also investigate additional patient groups. In particular, further investigation of decedents seems warranted given their large increase in the use of physicians' services. It would be interesting to know if this increase has come despite or because of the increased use of hospice care by Medicare beneficiaries over this time period. Such an investigation would require that the decedent group be further disaggregated and the care patterns of decedent subgroups analyzed.

Fourth, there may be important interactions between demographic change and technological change over the longer term that would affect projections of physicians' expenditures. We found that, given the patterns of care observed in 1993, the 1998 cohort of Medicare beneficiaries

would be expected to use fewer services. This was due in large part to the fact that beneficiaries in the oldest age group (age 85 and older), which grew between 1993 and 1998, receive fewer services than beneficiaries in the age categories below them (ages 75-84). However, it is interesting to note that the increases in RVU use by those over age 80 between 1993 and 1998 were much higher than the increases for other age groups. Thus, the effects of the aging of the population on service use are not static. Given the widely reported decline in disability among older persons, it may be that older persons are better candidates for aggressive care than they were in the past. It may also be that as physicians gain skill with new diagnostic, surgical, and other technologies they are increasingly willing to apply them to riskier patient groups. These issues have important implications for future health care trends and warrant further investigation.

Finally, health services research could also reveal areas in which changes in physician practice would bring greater health benefits to beneficiaries or lower costs to the Medicare program. Such research is needed to answer the fundamental question about the increases in expenditures for physicians' services we describe: are those increases in Medicare expenditures producing commensurate health gains for Medicare beneficiaries?

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Appendixes

Appendix A

Payment for Physicians' Services Under the Resource Based Relative Value Scale

Appendix A. Payment for Physicians' Services Under the Resource Based Relative Value Scale

Payments for most physicians' services under Medicare Part B are determined according to a common scale for pricing physicians' services called the Resource Based Relative Value Scale (RBRVS). The RBRVS was created to provide a standard system of pricing physicians' services that weighted services according to the resources used in delivering the service. The RBRVS system established Relative Value Units (RVU) as the method for assessing the value of and paying for the services of health care providers within Medicare Part B.[37]

Payments under the RBRVS are based on the principle that payments for various services should reflect their relative resource use. A formula is used to calculate the resources used in producing medical services. A Relative Value Scale unit represents a combination of a physician work component, a practice expense factor, and a malpractice expense relative value. The RVU physician work component accounts for 55 percent, on average, of a final RVU factor. The physician work values represent the time, technical skill, physical effort, mental effort, and judgment required; and the stress experienced by the physician performing the service because of potential risk to the patient. The RVU work, malpractice, and practice expense factors are multiplied by a geographic cost factor that varies according to the location of the billing physician. Finally, this value is multiplied by a conversion factor that determines the final dollar payment. Conversion factors are standard throughout the nation but are updated annually through the update factor discussed above.

For physician services furnished after January 1, 1992, payments were based on the RBRVS fee schedule. Between 1992 and 1998, many other professional providers were brought within the RBRVS payment system, while other services continued to be reimbursed according to historical charges. As a result, some services are paid according to the RBRVS, while others are paid and adjusted over time using other factors. Some professional service payments reflect physician RBRVS payments, but final payments are discounted relative to the final physician payment. For example, nurse practitioners are paid 85 percent of the physician payment (determined by the RBRVS) for a service provided to a patient.

[37] In addition to medical doctors, Medicare reimbursed other professionals as if they were medical doctors. For example, Optometrists are considered "physicians" under Medicare law.

Appendix B

1993 OLS Model Estimation Results

Appendix B. 1993 OLS Model Estimation Results

Dependent Variable: 1993 RVUs; Mean = 38.1	Coefficient	Robust Standard Error
65-69 years	4.32	3.63
70-74 years	8.84*	3.89
75-79 years	8.21**	4.38
80-84 years	0.10	3.49
85+ years	-1.41	6.22
Male	2.68	4.48
65-69 & male	1.39	5.24
70-74 & male	-2.09	5.51
75-79 & male	3.19	6.37
80-84 & male	10.67**	5.87
85+ & male	0.15	7.94
> High school education	4.02**	2.36
Medicaid	17.80*	4.13
Private supplement	15.49*	2.16
Drug coverage	-1.16	2.10
Urban residence	8.45*	1.85
Midwest	-0.63	3.01
South	-4.59*	2.24
West	-1.84	2.78
Other	-4.07	4.47
1-2 ADLs	0.40	2.77
3+ ADLs	6.02	4.52
1-2 IADLs	15.09*	2.81
3+ IADL	21.80*	4.37
Ever smoked	1.32	1.87
Hardening of the arteries	4.53	3.18
Hypertension	3.97*	1.69
Myocardial infarction	12.11*	4.00
Angina pectoris/CHD	5.20	3.35
Other heart condition	7.45*	2.41
Stroke/brain hemorrhage	-6.93*	3.13
Other cancer (not listed below)	9.94*	4.55
Skin cancer	5.52*	2.26
Lung cancer	56.95*	19.33
Colon cancer	19.55*	6.33
Breast cancer	13.99*	7.02
Prostate cancer	25.49*	6.70
Diabetes	8.13*	2.56
Arthritis	3.52**	1.98
Alzheimer's	-7.57	6.00

1993 OLS Model Estimation Results (continued)

Dependent Variable: 1993 RVUs; Mean = 38.1	Coefficient	Robust Standard Error
Mental disorder	2.41	3.18
Osteoporosis	-3.51	3.38
Broken hip	12.98	9.51
Parkinson's	-5.45	4.69
Emphysema, asthma, COPD	1.51	2.43
Decedent	43.75*	8.05
Constant	-11.45*	4.77
Number of observations	*9,627*	
R^2 = 0.0684		

* significant at p< 0.0.5
** significant at p< 0.10

OLS = ordinary least squares.
ADLs = activities of daily living.
IADLs = instrumental activities of daily living.
CHD = chronic heart disease.
COPD = chronic obstructive pulmonary disease.

Note: Omitted categories are <65 years, <65 years and male, Northeast region, zero ADLs, zero IADLs, and no self-reported conditions.

Appendix C

1993 Two-part Model Estimation Results

Appendix C. 1993 Two-part Model Estimation Results

	Probit Model on Any Use		GLM Model on Use Given Any Use	
	Coefficient	Robust Standard Error	Coefficient	Semi-Robust Standard Error
65-69 years	-0.09	0.11	-0.01	0.10
70-74 years	0.11	0.11	0.11	0.10
75-79 years	0.16	0.11	0.09	0.10
80-84 years	0.26*	0.12	-0.08	0.09
85+ years	0.01	0.12	-0.05	0.13
Male	-0.30*	0.10	0.14	0.13
65-69 & male	0.08	0.13	0.07	0.16
70-74 & male	-0.01	0.14	-0.11	0.15
75-79 & male	0.14	0.14	0.05	0.16
80-84 & male	0.11	0.15	0.22	0.15
85+ & male	0.50*	0.16	-0.04	0.19
> High school education	0.12*	0.05	0.06	0.05
Medicaid	0.51*	0.09	0.37*	0.09
Private supplement	0.69*	0.06	0.30*	0.07
Drug coverage	0.01	0.05	-0.05	0.05
Urban residence	0.05	0.05	0.22*	0.05
Midwest	-0.01	0.06	-0.02	0.06
South	-0.08	0.06	-0.08**	0.05
West	-0.17*	0.07	-0.01	0.06
Other	-0.22	0.16	0.06	0.12
1-2 ADLs	0.02	0.06	0.03	0.06
3+ ADLs	0.01	0.09	0.11	0.08
1-2 IADLs	0.17*	0.06	0.38*	0.06
3+ IADL	-0.02	0.09	0.48*	0.08
Ever smoked	-0.07	0.05	0.04	0.05
Hardening of the arteries	0.07	0.07	0.11**	0.06
Hypertension	0.32*	0.04	0.08**	0.04
Myocardial infarction	0.09	0.07	0.22*	0.07
Angina pectoris/CHD	0.15*	0.08	0.11**	0.06
Other heart condition	0.31*	0.06	0.20*	0.05
Stroke/brain hemorrhage	-0.04	0.08	-0.07	0.07
Other cancer (not below)	0.11	0.09	0.29*	0.09
Skin cancer	0.37*	0.07	0.11*	0.05
Lung cancer	0.54**	0.30	0.87*	0.21
Colon cancer	0.24**	0.14	0.39*	0.11
Breast cancer	0.31*	0.14	0.37*	0.12
Prostate cancer	0.29**	0.17	0.56*	0.10
Diabetes	0.48*	0.07	0.11*	0.05
Arthritis	0.25*	0.04	0.07	0.05

1993 Two-part Model Estimation Results (continued)

	Probit Model on Any Use		GLM Model on Use Given Any Use	
	Coefficient	**Robust Standard Error**	**Coefficient**	**Semi-Robust Standard Error**
Alzheimer's	0.27	0.17	-0.08	0.15
Mental disorder	0.11	0.09	0.17*	0.08
Osteoporosis	0.07	0.09	-0.05	0.07
Broken hip	0.20	0.13	0.36*	0.18
Parkinson's	0.39**	0.20	-0.12	0.11
Emphysema, asthma, COPD	0.23*	0.07	0.05	0.05
Decedent	-0.02	0.12	0.82*	0.09
Constant	0.14	0.12	2.56*	0.13
	R^2(pseudo) = 0.1513		(1/df) deviance = 1.5625 (1/df) pearson = 3.1202	
Number of observations	*9,627*		*8,619*	

Note: The probability of any use was 88.7 percent. The mean of number of RVUs conditional on use was 42.97.

* significant at p< 0.05
** significant at p< 0.10

GLM = generalized linear model.
ADLs = activities of daily living.
IADLs = instrumental activities of daily living.
CHD = chronic heart disease.
COPD = chronic obstructive pulmonary disease.

Note: Omitted categories are <65 years, <65 years and male, Northeast region, zero ADLs, zero IADLs, and no self-reported conditions.

Appendix D

Actual Characteristics of the 1993 FFS, 1993 HMO, 1998 FFS, and 1998 HMO Samples

Appendix D. Actual Characteristics of the 1993 FFS, 1993 HMO, 1998 FFS, and 1998 HMO Samples

	1993 Characteristics (%)		1998 Characteristics (%)		RVU Model Regression Coefficient
	FFS Proportion	HMO Proportion	FFS Proportion	HMO Proportion	
65-69 years*	23.6	27.4	19.8	27.6	4.32
70-74 years*	26.0	29.1	24.1	24.3	8.84
75-79 years*	19.4	18.8	20.1	21.0	8.21
80-84 years*	12.8	13.1	13.9	11.9	0.1
85+ years*	9.2	7.5	10.3	8.5	-1.41
< 65 years	9.12	4.23	11.8	6.74	ne
Male	42.6	43.6	43.3	44.5	2.68
65-69 & male	10.8	11.6	9.1	12.9	1.39
70-74 & male	11.1	13.6	10.9	10.4	-2.09
75-79 & male	7.8	7.3	8.3	8.9	3.19
80-84 & male	4.5	5.4	5.1	5.2	10.67
85+ & male	2.9	2.8	3.3	3.1	0.15
High school education or less	74.89	28.95	70.49	68.06	ne
> High school education*	25.1	29.0	29.5	31.9	4.02
Medicaid*	12.8	0.0	14.6	0.0	17.8
Private supplement*	74.6	100.0	73.7	100.0	15.49
Drug coverage*	50.9	67.4	63.0	91.4	-1.16
No supplement	12.6	0	11.72	0	ne
Urban residence*	72.2	94.9	70.3	94.1	8.45
Northeast	21.79	11.01	21.27	21.39	ne
Midwest§	24.8	16.3	23.2	22.4	-0.63
South§	36.9	18.1	36.1	34.7	-4.59
West§	15.3	54.5	17.9	20.3	-1.84
Other§	1.3	0.1	1.5	1.2	-4.07
0 ADLs	68.23	74.55	70.86	76.33	ne
1-2 ADLs	20.5	18.6	19.1	16.5	0.4
3+ ADLs	11.2	6.8	10.2	7.2	6.02
0 IADLs	60.30	68.21	62.73	71.26	ne
1-2 IADLs	25.5	22.6	23.7	20.6	15.09
3+ IADL	14.2	9.2	13.6	8.2	21.8
Ever smoked	61.3	63.6	60.4	64.8	1.32
Hardening of the arteries	15.2	13.0	12.3	10.7	4.53
Hypertension	53.7	52.0	55.5	54.5	3.97
Myocardial infarction§	15.7	12.2	14.8	13.8	12.11
Angina pectoris/CHD	15.7	14.0	15.0	13.8	5.2
Other heart condition¥	28.9	26.9	28.8	24.8	7.45
Stroke/brain hemorrhage	10.8	8.8	11.0	9.7	-6.93
Other cancer (not below)	6.9	5.7	5.4	5.7	9.94

Actual Characteristics of the 1993 FFS, 1993 HMO, 1998 FFS, and 1998 HMO Samples (continued)

	1993 Characteristics (%)		1998 Characteristics (%)		RVU Model Regression Coefficient
	FFS Proportion	HMO Proportion	FFS Proportion	HMO Proportion	
Skin cancer	16.2	16.7	17.9	16.1	5.52
Lung cancer	1.0	0.2	1.1	1.0	56.95
Colon cancer	2.9	3.1	2.5	2.6	19.55
Breast cancer¥	4.2	5.8	4.1	5.0	13.99
Prostate cancer¥	2.2	2.2	3.0	3.9	25.49
Diabetes	17.0	16.3	16.1	17.1	8.13
Arthritis	59.5	55.9	60.2	59.4	3.52
Alzheimer's	1.7	1.2	2.4	2.4	-7.57
Mental disorder*	6.3	3.6	7.9	4.5	2.41
Osteoporosis¥	9.7	11.1	14.0	10.6	-3.51
Broken hip¥	3.9	3.2	4.6	2.9	12.98
Parkinson's§	1.7	0.7	1.5	1.5	-5.45
Emphysema, asthma, COPD	14.7	15.1	15.4	13.7	1.51
Decedent¥	3.9	2.3	3.5	2.3	43.75
Without any conditions	9.38	10.71	8.40	9.36	ne

* = significant between FFS and HMO in both years.
§ = significant between FFS and HMO only in 1993.
¥ = significant between FFS and HMO only in 1998.
ne = no coefficient estimate.

ADLs = activities of daily living.
IADLs = instrumental activities of daily living.
CHD = chronic heart disease.
COPD = chronic obstructive pulmonary disease.

Appendix E

Total Actual RVU Use by Beneficiary Age/Gender Categories, 1993 and 1998

Appendix E. Total Actual RVU Use by Beneficiary Age/Gender Categories, 1993 and 1998

1993 RVUs			
Age	**Female**	**Male**	**Total**
< 65 RVUs	36.59	33.16	34.52
< 65 observations	592	940	1,532
65-69 years RVUs	31.09	33.63	32.25
65-69 observations	968	855	1,823
70-74 years RVUs	37.55	38.66	38.02
70-74 years observations	994	749	1,743
75-79 years RVUs	41.16	45.77	43.02
75-79 years observations	967	670	1,637
80-84 years RVUs	37.48	49.50	41.74
80-84 years observations	1,032	577	1,609
85+ years RVUs	41.05	42.35	41.46
85+ years observations	863	420	1,283
Total RVUs	37.15	39.37	38.10
Total observations	5,416	4,211	9,627

1998 RVUs (in 1998 schedule)			
Age	**Female**	**Male**	**Total**
< 65 RVUs	48.59	37.16	42.13
< 65 observations	620	785	1,405
65-69 years RVUs	31.29	43.36	36.81
65-69 observations	751	651	1,402
70-74 years RVUs	48.26	49.18	48.67
70-74 years observations	999	839	1,838
75-79 years RVUs	54.21	52.26	53.40
75-79 years observations	913	659	1,572
80-84 years RVUs	59.84	78.64	66.65
80-84 years observations	955	560	1,515
85+ years RVUs	56.19	59.45	57.23
85+ years observations	851	403	1,254
Total RVUs	49.11	50.91	49.89
Total observations	5,089	3,897	8,986

Appendix F

Legislative Changes to Prices and Coverage, 1994-1998

Appendix F. Legislative Changes to Prices and Coverage, 1994-1998

1994 • Refinements made in the RVUs for 1993 and 1994 including projected increases in primary care services payment rates and reduced payment rates for most surgical services and many nonsurgical services other than primary care. • Physician fee schedule update would increase the performance standard rates of increase for surgical, primary care, and other nonsurgical services. • A payment freeze would affect nonsurgical services other than primary care. • Lower payment limits were established for clinical laboratory services. • OBRA '93 also included a provision to lower payment for practice expenses for certain services paid under the physician fee schedule. This provision would lower the VPS for both surgical and nonsurgical services. • An OBRA '93 provision that limited payment for the anesthesia care team would also reduce the surgical services VPS.
1995 • Refinements made in the RVUs for 1994 and 1995 would reduce payment rates for most surgical services and many nonsurgical services other than primary care. • adjustments to the physician fee schedule updates would increase the volume performance standard rates for surgical, primary care, and other nonsurgical services. • Nonsurgical service payments, other than primary care, were frozen. • A lower payment limit for clinical laboratory services was introduced. • OBRA '93 lowered payment for practice expenses, resulting in a lower VPS for both surgical and nonsurgical services. • OBRA '93 limited payment for anesthesia care teams, which would also have the effect of reducing the VPS for surgical services.
1996 • RVU refinements for 1995 and 1996 would increase some payment rates; therefore, the volume performance standard for primary care services would increase while there would be reduced payment rates for most surgical services and many nonsurgical services other than primary care. • Lower payments for practice expenses for certain services paid under the physician fee schedule would reduce the VPS for both surgical and nonsurgical services.
1997 • Changes in the RVUs for 1996 and 1997 would cause increased payment rates for primary care services and increases in the volume performance standard for those services. • Payment reductions would occur for most surgical services and many nonsurgical services other than primary care, which would lower the volume performance standard rates of increase for these services. • A volume and intensity adjustment for 1997 was required to ensure that changes in volume and intensity related to the fee changes did not cause an increase in expenditures. The MVPS targets are increased by this volume and intensity adjustment.

RVU = relative value units.
OBRA = Omnibus Budget Reconciliation Act.
VPS = volume performance system.

Legislative Changes to Prices and Coverage, 1994-1998 (continued)

1998

- Legislative changes contained in the Balanced Budget Act of 1997 included a single conversion factor for the Medicare physician fee schedule, which would cause the payments for surgical services to decline, while increasing the payments for nonsurgical services. These measures would cause an overall increase in expenditures for fiscal year 1998 relative to fiscal year 1997.
- Coverage changes for screening mammography, colorectal cancer screening, screening PAP smears, and screening pelvic exams would cause increases in Medicare expenditures.
- Changes in payments for nurse practitioners, clinical nurse specialists, and physician assistants would also increase expenditures.
- Provisions relating to payments for laboratory services would cause reductions in Medicare expenditures. (Laboratory service payments were frozen for fiscal years 1998-2002.)
- Fee changes associated with implementation of the 1998 physician fee schedule: the volume and intensity of physician services provided to Medicare beneficiaries would increase by 0.1 percent, but in order to prevent an increase in expenditures as a result of this volume and intensity response, an offsetting 0.1 percent reduction is made to the conversion factor.

RVU = relative value units.
OBRA = Omnibus Budget Reconciliation Act.
VPS = volume performance system.

Exhibit A

In Chapter 1 we briefly discussed how the updates and targets are calculated. This exhibit contains a detailed explanation of how the update and Sustainable Growth Rate were calculated for 2002. However, it is important to note that the system of updates and targets used in Medicare has changed over time, so the calculation of the updates and SGR in 2002 is somewhat different from the procedures used between 1993 and 1998. The MVPS was used prior to 1998: it set targets based on historical cost increases and compared target growth two years prior to actual growth in setting the performance update factor. The BBA 1997 created the SGR which uses GDP growth in setting targets and compares cumulative growth in expenditures to a cumulative target. The BBA also limited the performance adjustment factor to a range between negative 7 and positive 3 percent. Finally, various changes were introduced by the Balanced Budget Reconciliation Act 1999 including a shift to a calendar year rather than a fiscal year timeframe and mandated retrospective corrections of estimates made before the beginning of the year to reflect actual data.