METHODOLOGY AND PROCESS SPECIFICATIONS FOR THE PHYSICIAN QUALITY REPORTING SYSTEM GROUP PRACTICE REPORTING OPTION QUALITY AND RESOURCE USE REPORTS

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I. INTRODUCTION

A. Background

In an effort to enhance the quality and efficiency of health care services provided to Medicare beneficiaries, the Centers for Medicare & Medicaid Services (CMS) is developing and implementing a set of value-based purchasing (VBP) initiatives across many health care settings, including physician practices. To support these initiatives, CMS has been developing physician resource use and quality measures, evaluating physicians on their comparative quality and resource use, and educating physicians about the efficient use of resources. These efforts support expanded provider feedback reports detailing physician quality and cost performance, and performance-based payment.

As part of its VBP initiatives, for the past several years, CMS has been disseminating a limited number of confidential reports to physicians and medical group practices that include measures of resource use and quality. CMS has pursued a phased approach to physician feedback reporting as a way to expand understanding of policy issues related to measuring physician-driven costs of care and quality. In the first phase of the approach, CMS distributed and tested approximately 300 resource use reports that included individual physician-level cost measures (in 2009). The physician feedback program was expanded under Section 3003 of the 2010 Affordable Care Act, which required the Secretary of Health and Human Services to provide confidential information to physicians and groups of physicians about the quality of care furnished to Medicare beneficiaries compared to the cost of that care. In the second phase of the approach, CMS distributed a larger number of reports in fall 2010, to both individual physicians (about 1,700) and group practices (36), and expanded these reports to include selected quality measures. In the third, and current, phase of the program, CMS continues to test the design, content, and performance indicators included in physician feedback reports.

The physician feedback program, also addresses Section 3007 of the 2010 Affordable Care Act, which directs the Secretary to develop and implement a budget-neutral payment system that will employ a value-based payment modifier (VBM). The VBM will be used to adjust Medicare physician fee schedule payments based on the quality and cost of care physicians deliver to Medicare beneficiaries. The Secretary will phase in the payment modifier over a two-year period, beginning in 2015, with the initial performance period proposed to be 2013. In 2015 and 2016, specific physicians and/or groups of physicians that the Secretary determines appropriate will see their fee-for-service (FFS) payments adjusted under the VBM. Beginning in 2017, all physicians paid under the Medicare physician fee schedule will be affected by the VBM. Toward this end, the current Phase III physician feedback reports are being disseminated to a much larger number of physicians and medical group practices than in earlier phases, and include some performance measures that may be used for the VBM

B. Combining the Physician Feedback Report Program with the Physician Quality Reporting System

In 2006, the President signed the Tax Relief and Health Care Act that authorized the establishment of the Physician Quality Reporting System, under which eligible health care professionals who voluntarily report quality-measurement data for services provided to Medicare beneficiaries are eligible to earn an incentive payment. In 2010, this program was expanded to

allow for a new group practice reporting option (GPRO I) under which the group practice as a whole reports quality-measurement data and is eligible to earn an incentive payment. CMS anticipates future combining of clinical quality measures and resource use measures into performance reports for individual physicians and medical group practices.

CMS chose the 35 large medical group practices—each with 200 or more individual eligible professionals (identified by individual National Provider Identifiers (NPIs)) who had reassigned their billing rights to the medical group practice's Tax Identification Number (TIN) that took part in the 2010 GPRO program—to receive the Phase III 2010 feedback reports. The reports are known as the 2010 GPRO I Quality and Resource Use Reports, or QRURs. Included in these reports are: (1) resource use measures, derived primarily from 2010 Medicare administrative claims, and (2) quality measures for which the group practices submitted data to CMS under the Physician Quality Reporting System's 2010 GPRO I reporting option. Each of the 35 medical practice groups reported the portion of their Medicare patients (represented by a sample) who received 26 recommended core clinical interventions. The 26 National Quality Forum-endorsed quality measures target high-cost chronic conditions (diabetes mellitus, heart failure, coronary artery disease, and hypertension) and preventive care. The GPRO tool, used to collect clinical information for the 26 measures, is virtually identical to the data collection tool that was employed in a CMS demonstration project, the Physician Group Practice demonstration. A similar tool is proposed for collecting quality measure data for the new Medicare Shared Savings Program.

Using the GPRO tool, CMS provided each GPRO I practice with pre-populated data for a sample of the practice's beneficiaries. The group practice was then required to populate the remaining data fields necessary for capturing clinical information for each (consecutively assigned) Medicare beneficiary comprising a sample of 411 beneficiaries for each of the four disease modules and preventive care measures. In cases where fewer than 411 beneficiaries were eligible for a specific measure, the group practice was required to report on 100 percent of measure-eligible beneficiaries.

C. Purpose of Document

This document provides details on the methodology and processes used to produce the 2010 Phase III physician feedback reports for groups of physicians that chose to participate in the GPRO I option of the 2010 Physician Quality Reporting System. A brief overview of the methodology is in Section II and a detailed methodology, describing each step of the process for calculating the performance measures included in the 2010 GPRO I QRUR is in the sections following. Appendix A contains a list of acronyms.

II. OVERVIEW OF METHODOLOGY

The process for producing the feedback comprises four primary steps. Greater detail on each of these steps is provided in Section III of this document:

Step 1. Obtain and develop data analysis files

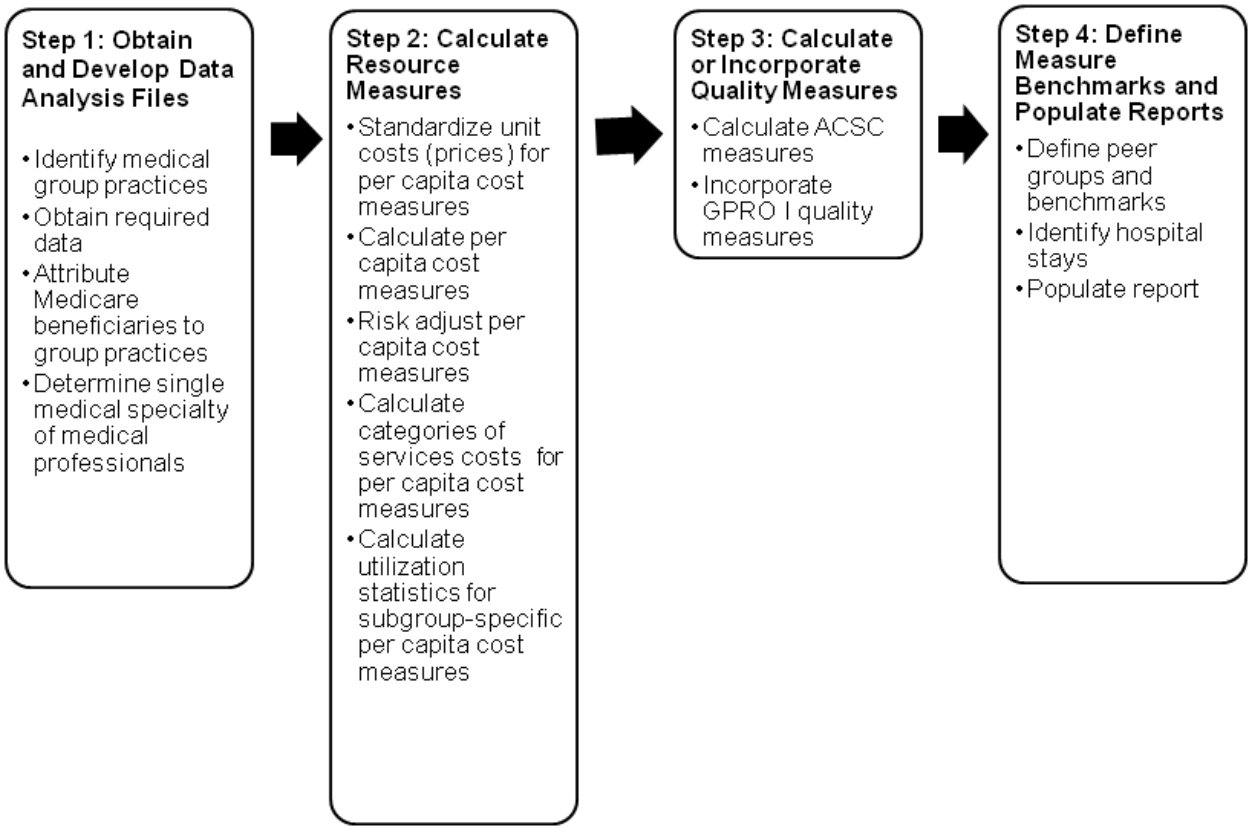
Step 2. Calculate resource use measures

Step 3. Calculate or incorporate quality measures

Step 4. Define measure benchmarks and populate reports

Figure 2.1 outlines the process, with each step briefly described in this section. Additional details for each step are provided in Sections III-VI of the document.

Figure 2.1 Flowchart for 2010 GPRO I QRUR Processing System



A. Develop Data

1. Identify Medical Group Practices

Thirty five medical group practices that participated in the GPRO I option of the Physician Quality Reporting System in 2010 were selected to receive a 2010 GPRO I QRUR.

2. Obtain Required Data

Several datasets were used to calculate the performance measures included in the 2010 GPRO I/QRURs:

- For the per capita cost measures, the associated type of service costs and utilization measures, and the ambulatory care sensitive condition (ACSC) measures, 2010 Medicare Parts A and B FFS claims were the primary data source. Data from the CMS Chronic Condition Warehouse (CCW) Beneficiary Annual Summary File were used to identify beneficiaries who, in 2009, had any of the four conditions of interest selected by CMS: chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), diabetes, or heart failure.
- **For the quality indicators,** the measures are based on the information each participating medical group practice submitted to CMS through the GPRO tool under the 2010 GPRO I Physician Quality Reporting System.

3. Attribute Medicare Beneficiaries to Group Practices

Beneficiaries were linked to individual medical groups by looking at 2010 Medicare administrative claims. Under the GPRO I program, Medicare beneficiaries were attributed to the single medical group practice that billed for at least two office or other outpatient Evaluation and Management (E&M) services and a larger share of E&M services for the beneficiary (as measured by Medicare allowed charges) than any other physician practice, based on 2010 Carrier (Part B) Medicare claims with dates of service from January 1, 2010 and processed by approximately October 31, 2010. The same attributed beneficiaries were used in calculating beneficiary costs and ACSC measures that are displayed in the 2010 GPRO I QRURs. Beneficiaries who were not enrolled in both Medicare FFS Parts A and B for all 12 months of 2010, who received hospice services in 2010, or who did not have Medicare as their primary payer, were not attributed to any medical group practice. Thus beneficiaries who were Medicare eligible for only part of 2010 are not included in group-specific reports.

4. Determine the Medical Specialty of Medical Professionals

The single medical specialty of physicians was determined from 2010 Medicare Carrier claims data, based on the most frequent two-digit CMS medical specialty code listed on a provider's claims for which he/she was the performing physician. A single medical specialty designation is required to partition E&M services and procedures provided to a medical group's patients by broad medical specialty categories.

B. Calculate Resource Use Measures

1. Standardize Unit Costs (Prices) for Per Capita Cost Measures

Prior to calculation of any resource use measures for the 2010 GPRO I QRURs, unit costs (prices) for the 2010 Medicare claims were standardized to equalize the costs associated with a specific service provided in a given health care setting (for example, home health versus outpatient hospital), regardless of when and where it was provided, and regardless of differences in Medicare payment rates among the same class of providers (for example, prospective payment hospitals versus critical access hospitals). Costs shown in the 2010 GPRO I QRURs were standardized to allow for comparisons of costs for an individual group practice to the average costs across all GPRO I practices, which may practice in locations or settings where reimbursement rates are higher or lower.

2. Calculate Per Capita Cost Measures

Resource use can be defined in many ways, including: per capita costs, service–specific costs or utilization, or episode-based costs. The primary measure of resource use in this report is per capita costs. Using price-standardized claims, total per capita costs were initially calculated as the average (mean) of a group practice's 2010 Medicare Parts A and B payments per attributed beneficiary. The 2010 per capita cost measures includes all costs incurred in all health care settings (except for Medicare Part D outpatient prescription drug costs and hospice costs

because hospice patients were excluded from the reports) for all beneficiaries assigned to the GPRO practice who were enrolled in both Parts A and B of original FFS Medicare for all of 2010.

As well as calculating an overall per capita cost measure, per capita costs were calculated for several chronic condition-specific subgroups of Medicare beneficiaries attributed to the GPRO practice who were diagnosed as having one or more of the following chronic conditions in 2009: COPD, CAD, diabetes, or heart failure.[1]

3. Risk Adjust Per Capita Cost Measures

Total per capita costs and subgroup-specific per capita costs were risk adjusted to take into account differences in patient age, sex, reason for Medicare eligibility, Medicaid eligibility, and medical histories that can be expected to affect future medical costs, regardless of the care provided. A beneficiary's medical history was measured by his/her 2009 hierarchical conditions category (HCC) score. For medical group practices that have a higher than average proportion of patients with serious medical conditions or other higher-cost risk factors, risk adjusted per capita costs are lower than unadjusted costs (because costs associated with higher-risk patients are adjusted downward). For medical group practices that treat comparatively lower-risk patients, risk adjusted per capita costs are higher than unadjusted costs (because costs for lower-risk patients are adjusted upwards).

[1] At the time the reports were prepared, 2010 chronic condition information was not available so the 2009 status of beneficiaries was used.

Each subgroup-specific per capita cost measure for the chronic conditions, as well as the total per capita cost measure, was separately risk adjusted. That means that risk adjustment varies depending on the composition of the beneficiary subgroup for whom per capita costs are displayed in the reports.

4. Calculate Categories of Services Costs

After risk adjustment of per capita costs, total per capita costs are partitioned into discrete categories based on services incurred in different settings (for example, hospitals versus skilled nursing facilities [SNFs]) and services of different types of providers (for example, primary care physicians versus surgeons). Classifying total per capita costs in this way can help illuminate cost drivers and make the information provided in the 2010 GPRO I QRURs more actionable.

5. Calculate Utilization Statistics for Subgroup-Specific Per Capita Cost Measures

The 2010 GPRO I QRURs display selected utilization statistics for the four chronic condition-specific subgroup per capita cost measures, again to help providers pinpoint where their treatment patterns might differ substantially from those of peers. The following utilization statistics are provided for each set of attributed beneficiaries identified as having COPD, CAD, diabetes, or heart failure in 2009:

- Number of beneficiaries attributed to the medical group practice
- Number of inpatient acute hospital admissions per 1,000 attributed beneficiaries
- Number of hospital emergency department (ED) visits (that did not lead to an inpatient hospital admission) per 1,000 attributed beneficiaries

C. Calculate Quality Measures

1. Calculate Ambulatory Care Sensitive Condition (ACSC) Measures

ACSCs are conditions for which good outpatient cares can prevent complications or more serious disease; they include heart failure, COPD, urinary tract infection, bacterial pneumonia, diabetes, and dehydration. For group practices, the 2010 GPRO I QRURs include selected ACSC measures that can be seen as a measure of both quality of care and resource use. High or increasing rates of hospitalization for ACSCs in a defined patient population may indicate inadequate access to high-quality ambulatory care. ACSC rates for groups were calculated from 2010 Medicare administrative claims data.

2. Incorporate GPRO I Quality Measures

The quality measures included in the 2010 GPRO I QRUR, reflecting care for beneficiaries with diabetes, heart failure, CAD, and hypertension, as well as preventive care measures, are the same quality indicators the group practice submitted to CMS for the 2010 GPRO I Physician Quality Reporting System. The same underlying population of beneficiaries attributed to a GPRO I practice was used for calculating the denominators of the resource use and ACSC measures included in the report. However, while all the attributed beneficiaries of a medical group practice were used to calculate the cost and utilization measures, only a sample of these beneficiaries was used to calculate the GPRO I quality measures.

D. Define Benchmarks and Populate Reports

1. Define Peer Groups and Benchmarks

For each measure calculated for these reports— per capita costs, costs by categories of services, subgroup-specific per capita costs, utilization rates for subgroups, ACSC rates, and GPRO I quality indicators—a given group practice's performance on the measure was compared with the performance of all 35 GPRO I practices. A group practice's performance was compared with the average (mean) performance among the 35 GPRO I practices for most comparative displays. In some exhibits in the report, the group practice's performance was also compared with the 10th, 50th, and 90th percentile practice's performance.

2. Identify Hospitals That Treated GPRO I Beneficiaries

The reports display a list of hospitals that treated beneficiaries attributed to the GPRO I practice in 2010. Hospitals listed in the reports represent at least 10 percent of all hospital stays by the beneficiaries attributed to the group practice in 2010.

3. Populate Report

The final step in the process of producing the reports involves populating them.

The next section of this document provides greater detail on each of the report production steps for those who want more in-depth understanding of the methodologies used to produce the information displayed in the 2010 GPRO I QRURs.

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III. DATA DEVELOPMENT

A. Identify Medical Group Practices

The 2010 GPRO I QRURs were prepared for the 35 medical group practices that participated in the group practice reporting option of the Physician Quality Reporting System in 2010. Participating group practices had to meet the following criteria:

- A "group practice" under the 2010 GPRO option consisted of a physician group practice, as defined by a single TIN, with at least 200 or more individual eligible professionals (as identified by individual NPIs) who had reassigned their billing rights to the TIN. To participate in the 2010 GPRO option, a group practice had to submit a self-nomination letter to CMS and be selected to participate.
- Potential GPRO participants had to comply with the definition of "group practice" as stated above and with the following requirements:
  - Have an active Individuals Authorized Access to CMS Computer Services (IACS) user account
  - Agree to attend and participate in all mandatory training sessions
  - Have billed Medicare Part B on or after January 1, 2009 and prior to October 29, 2009
  - Provide an electronic file (such as, a Microsoft® Excel file) with the self-nomination letter that includes the group practice's TIN and the individual NPI numbers, name of the group practice, and names of all eligible professionals who will be participating as part of the group practice (that is, all individual NPI numbers, which are established Medicare providers and associated with the group practice's TIN)
  - Provide a single point of contact for handling administrative issues as well as a single point of contact for technical support purposes
  - Have technical capabilities, at a minimum: standard PC image with Microsoft® Office and Microsoft® Access software installed; and minimum software configurations
  - Be able to comply with a secure method for data submission
  - Provide CMS access (if requested) to review Medicare beneficiary data on which 2010 GPRO submissions are founded

B. Obtain Required Data

The following Medicare data sources were used to calculate resource use measures (per capita cost, subgroup-specific per capita cost, types of service costs, utilization), ACSC rates, and GPRO I quality measures for attributed Medicare beneficiaries. More detailed descriptions of data sources are available in Appendix B.

- 2010 Denominator File (derived from Medicare Enrollment Database) was used to identify specific characteristics of GPRO I-attributed beneficiaries.
- 2010 Standard Analytic Files (SAFs) were used to construct the resource use and ACSC measures and identify medical professional specialties. SAFs contain administrative claims information collected by Medicare to pay for health care services provided to a Medicare beneficiary in original FFS Medicare. SAFs are available for each institutional (inpatient, outpatient, SNF, hospice, or home health agency) and non-institutional (physician and durable medical equipment [DME] providers) claim type.
- Quality indicators submitted to the 2010 GPRO I Physician Quality Reporting System, reflecting care for beneficiaries with diabetes, heart failure, CAD, hypertension, as well as preventive care measures, were included in the reports
- Chronic Condition Warehouse (CCW), Beneficiary Annual Summary File, was used to identify beneficiaries who, in 2009, had any of the four conditions of interest selected by CMS: COPD, CAD, diabetes, or heart failure. Subgroup-specific per capita cost measures were constructed for each of these chronic conditions. At the time the reports were prepared, CCW indicators were not yet available for 2010.
- CMS Hierarchical Condition Category (HCC) scores were used in risk-adjusting 2010 per capita costs for the 2010 GPRO I QRURs.

C. Attribute Medicare Beneficiaries to Group Practices

CMS assigned Medicare beneficiaries to the 35 medical group practices that participated in the GPRO I option of the Physician Quality Reporting System in 2010. Medicare beneficiaries were attributed to the single medical group practice (identified by a unique TIN) that billed for at least two office or other outpatient E&M services (listed in Table D.1 in Appendix D) and a larger share of E&M services for the beneficiary (measured by Medicare allowed charges) than any other physician practice, based on 2010 Carrier (Part B) Medicare claims (i.e., the plurality of E&M services).[2]

Beneficiaries who did not have complete Medicare FFS claims for Parts A and B for calendar year 2010 (as of May 2010 or September 2010, depending on the beneficiary characteristic of interest in the following list) were not attributed to any GPRO I practice for the purpose of calculating GPRO I quality measures. Thus, beneficiaries were excluded if, for any months from January 1, 2010 through May 31, 2010 or through September 30, 2010, any of the following situations applied to them: they were enrolled in Part A only or Part B only; they were enrolled in Medicare managed care; they were age 65 or older and still working; they resided outside the United States; they were enrolled in hospice; they were included in any Medicare FFS demonstration; they became newly eligible for Medicare benefits on or after

[2] Total Part B allowed charges were used as the tie-breaker in cases of an E&M services tie between practices.

January 1, 2010; or the beneficiary died in 2010. Steps for identifying and excluding part-year beneficiaries are described in Appendix C.[3]

The same "base" population of beneficiaries attributed to a GPRO I medical group practice was used for calculating the denominators of the cost, utilization, and ACSC measures included in this report, with three exceptions:

1. The population of beneficiaries included in the cost, utilization, and ACSC measure calculations was based on more updated CMS enrollment files than the GPRO I quality measures, so that beneficiaries with indication of incomplete claims (see list above) for *all 12 months of 2010* were excluded from the calculations.
2. Beneficiaries who did not have any Medicare allowed charges in the six claim types used to calculate the resource use, utilization, or ACSC measures in this report were excluded.
3. While all the attributed beneficiaries of a medical group practice were used to calculate the cost and utilization measures, only a sample of these beneficiaries was used to calculate the GPRO I quality measures. Each GPRO I group practice was required to report clinical data for at least the first 411 beneficiaries on their list of beneficiaries drawn for all attributed beneficiaries that CMS determined met criteria for specific measures. If the group practice had fewer than 411 attributed beneficiaries, clinical indicators had to be submitted for 100 percent of beneficiaries.

D. Determine the Specialty of Medical Professionals

Some medical professionals list different specialties on different claims, such as general practitioner versus endocrinologist, depending on the treatment provided to a given patient or at a given practice site. A single medical specialty designation is required to categorize costs by broad medical specialty in the type of services drilldown table. To determine a medical professional's single medical specialty in 2010, the majority of a medical professional's medical specialty code (HCFA Specialty) identified on claims in the 2010 Carrier SAF for which the medical professional was a performing NPI was used. Medical specialty was determined at the NPI-TIN level; that is, a medical professional billing under two different medical group practices might list his/her medical specialty differently for bills filed under each practice. The following steps were used to determine NPI-TIN medical specialty:

Step 1: De-duplicate 2010 Carrier SAF line-item records by considering both the performing NPI-TIN and the medical professional's specialty (HCFA_SPECIALTY).

Step 2: Count up a given medical professional's specialty for which it is a performing NPI for a given TIN on a 2010 Carrier line item. For example, if a performing NPI has five line items on a single Carrier claim with the same medical specialty and TIN, this would be collapsed

[3] The 2010 inpatient hospital claims included a small amount of encounter data, which were excluded according to CMS' instructions.

to one record. However, if the performing NPI has five line items with four having the same specialty and one having a different specialty for the same TIN, this would be collapsed to two records.

Step 3: Assign the majority medical specialty among the medical professional's de-duplicated medical specialty records to the performing NPI for the given TIN, with one exception: if the majority medical specialty = 99 (unknown physician specialty) or is missing for a given medical professional, assign the next most frequent medical specialty for that medical professional if there is one. (For example, performing NPI has 10 records, 9 of which=99 but one of which=01, then assign HCFA medical specialty=01.)

A variable, *Physician Stratification Category* was defined that collapsed medical specialties into five mutually exclusive broad categories: (1) primary care physicians, (2) surgeons, (3) medical specialists, (4) other, and (5) NA. A medical professional's *Physician Stratification Category* was based on his or her majority medical specialty code shown in Table D.2 in Appendix D.

IV. CALCULATE RESOURCE USE MEASURES

The first step in calculating per capita cost measures was to drop all claims with a missing, zero, or negative claim payment amount (institutional claims: PMT_AMT) or line-items with a missing line-item payment amount (Carrier/DME claims: LINEPMT).

A. Standardize Unit Costs (Prices) for Per Capita Cost Measures

Geographic variations in Medicare payments to providers can reflect factors unrelated to the care provided to patients. All unit costs have been standardized such that a given service is priced at the same level across all providers within the same facility type or setting as defined in Appendix E, regardless of geographic location or differences in Medicare payment rates among facilities. *Unit costs* refer to the total reimbursement paid to providers for services delivered to Medicare beneficiaries. These can include discrete services (such as physician office visits or consultations) or bundled services (such as hospital stays). For most types of medical services, Medicare adjusts payments to providers to reflect differences in local input prices (for example, wage rates and real estate costs). The costs reported in the 2010 GPRO I QRURs are price standardized to allow comparisons to peers who practice in locations or facilities where reimbursement rates are higher or lower. Price standardization is performed prior to the risk-adjustment process.

Standardized pricing programs were run on the six Medicare claims types used in the 2010 GPRO I QRURs, described below (hospice claims were not used). The procedures for creating standardized unit costs borrowed heavily from previous work by the Medicare Payment Advisory Commission (MedPAC) and were developed in consultation with MedPAC staff, Dan Dunn of Ingenix, and others.[4] In general, four aspects of the Medicare payment system were standardized:

1. ***Payment adjustments based on annual updates to payment rates.*** Medicare's annual updates in payment rates are common to nearly all Medicare payment systems. Part B drugs are the only exception. They are priced on a quarterly basis, based on average sales prices.
2. ***Payment adjustments based on the geographic location in which the service is provided.*** Nearly all payment systems make adjustments to reflect geographic differences in the cost of labor and other inputs to the production of medical services. In other cases, there are special payment rules for rural providers and those in designated provider shortage areas. In addition, some services are priced at the Medicare administrative contractor (MAC) level, with each MAC serving different geographic areas. Service costs were standardized to reflect such differences.

[4] A brief description of the procedures MedPAC used to create standardized unit costs is contained in the June 2006 "Report to Congress: Increasing the Value of Medicare," page 25.

4. ***Payment adjustments for different levels of payment associated with different payment systems for classes of providers.*** In some instances, designated classes of providers of a given type are singled out to be paid on a basis different from that of most other providers. For example, most acute care hospitals are paid on a prospective diagnosis-related group (DRG) basis. Critical Access Hospitals (CAHs), however, are paid retrospectively on a cost basis. Standardization was done so that all classes of providers within the same facility type or setting (as defined in Appendix E) were assigned identical unit costs for any given service.
5. ***Payment adjustments for provider-specific differences in payment.*** In some cases, specific facilities receive differential payments by virtue of their case mix, function, or costs. Examples are disproportionate share and graduate medical education payments to hospitals. Standardization was done so that all providers of a given type within a given payment system face the same unit cost structure.

1. General Approaches for Standardizing Unit Costs of Services

Methods by which payments to providers are determined vary depending on the type of provider and require distinct approaches to creating standardized unit costs. A key dividing line is between those systems that pay providers retrospectively (for example, FFS) according to a fee schedule, and those that pay prospectively, where Medicare pays providers a fixed, or quasi-fixed, sum for a bundle of services determined by patient condition or diagnosis (for example, hospital DRG payments). There are also a couple of hybrid payment systems, discussed in detail below. General approaches to creating standardized unit costs in retrospective and prospective payment systems are described first and details about specific payment systems are provided.

a. Create Standardized Unit Costs for Retrospective Payment Systems[5]

Medicare pays retrospectively for physician services, clinical laboratory services, Part B drugs, ambulance services, and DME. Professional and ambulance services are paid according to fee schedules, where fees are adjusted by geographic practice cost indices (GPCIs) to account for differences in the cost of inputs; Part B drugs are paid mostly according to the average sales price; DME is paid according to state fee schedules while clinical lab prices are set by carriers, subject to national limits. In two payment systems, the Medicare program sets prospective per-diem rates for SNF and psychiatric facility services, but then pays retrospectively according to length of stay. These payment systems are characterized as hybrids. Depending on the presence of a national fee schedule and other data-related factors, standardized unit costs were set to fee-schedule values (actual allowed charges for which geographic adjusters have been netted out) or based on average allowed charges in 2010. Standardized unit costs for hybrid systems were based on the average per diem payment multiplied by length of stay.

[5] Note that beneficiaries receiving hospice services in 2010 were not included in the 2011 QRURs, which negated any need to price standardize 2010 hospice claims.

b. Create Standardized Unit Costs for Prospective Payment Systems

The majority of Medicare costs are for services such as hospital care and home health that are paid through prospective payment systems. With the exception of Part B services, the Medicare payment is based on average costs across patients with a given diagnosis or functional presentation, not on the actual costs expended for that patient. For example, for inpatient hospital care, the general approach is to construct a standardized price for each DRG by averaging total payments (including indirect medical education, disproportionate share hospital, and outlier adjustments) in each DRG across a nationally representative sample of beneficiaries.

Specific approaches for each of Medicare's 16 unique payment systems are provided in Appendix B. Table D.3 in Appendix D summarizes the Medicare payment factors and pricing differentials standardized on for each of the 16 Medicare payment systems that exist for different classes of providers or services.

2. Adjust Standardized Prices Based on Empirical Comparisons of Standardized Price to Actual Medicare Price

After running each standardized pricing program described above and in Appendix E, adjustments were made to the standardized price by calculating the ratio of total Medicare payment (allowable charges in the case of Part B claims) to standardized price, and setting the standardized price equal to the actual Medicare payment if the ratio fell in the top or bottom 1 percent. The limits for this ratio were determined through examination of a univariate distribution of the ratio.

B. Calculate Per Capita Cost Measures

The 2010 per capita cost measure includes those beneficiaries who were enrolled in both Parts A and B of original FFS Medicare for all of calendar year 2010. Per capita cost measures were calculated using 2010 Medicare Part A (Hospital Insurance) and Part B (Medical Insurance) claims for all FFS Medicare beneficiaries attributed to the GPRO I group practices. This subset of all Medicare beneficiaries who received medical care from the GPRO in 2010 is referred to as "attributed" beneficiaries for cost measures in the 2010 GPRO I QRURs. Attributed beneficiaries should not be confused with the smaller sample of beneficiaries who are represented in the GPRO I quality measures displayed in the report.

Part D (Outpatient Prescription Drug) claims were excluded from the 2010 cost measure calculations because not all beneficiaries have Medicare Part D and some who do not have it instead may have creditable prescription drug coverage through other insurance sources or the retiree subsidy, for which Medicare does not have claims data.

Medicare costs were obtained from 2010 administrative claims data using inpatient hospital, outpatient hospital, SNF, home health, DME, and Medicare Carrier (non-institutional provider) claims. Hospice costs are not included in the per capita cost calculations because hospice patients were excluded from the reports. To the extent that Medicare claims include such information, costs are comprised of payments to providers from Medicare, from beneficiaries (copayments and deductibles), and from third-party private payers.

Calculate GPRO 2010 price-standardized per capita costs (which are not yet risk-adjusted) based on all beneficiaries assigned to a given GPRO practice as follows:

1. Sum over a given beneficiary's 2010 standardized payment variables, respectively, for all 12 months of 2010 across all six Medicare claims types to create calendar year 2010 annual beneficiary price-standardized costs.
2. For a given GPRO practice, sum 2010 annual beneficiary price-standardized costs for all attributed beneficiaries; this is the numerator of the practice's per capita cost measure.
3. For a given GPRO practice, count the number of attributed beneficiaries; this is the denominator of the practice's per capita cost measure.
4. For a given GPRO practice, divide the numerator of the per capita cost measure by the denominator of the per capita cost measure; this equals the GPRO's price-standardized per capita cost measure.

C. Calculate Subgroup-Specific Per Capita Cost Measures

Subgroup-specific per capita cost measures were calculated for Medicare FFS beneficiaries attributed to the GPRO I medical group practices who were diagnosed as having one or more of the following chronic conditions in 2009: COPD, CAD, diabetes, or heart failure. The data for identifying beneficiaries with one of these conditions in 2010 are described in Section III.B. At the time the 2010 GPRO I QRURs were prepared, CCW indicators were not yet available for 2010.

The subgroups are not mutually exclusive, which means that a beneficiary's costs may be included in the per capita costs for more than one condition subgroup. The subgroup per capita cost calculation represents the average price-standardized costs of treating Medicare beneficiaries who have a specific condition. However, it does not reflect the average cost of treating the condition itself, because all Medicare costs for each beneficiary are included in the total (not just costs related to treatment for the chronic condition of interest).

1. Identify Subgroups Based on CCW Flags

The 2009 CCW flags were extracted from CMS' BASF for all beneficiaries attributed to the GPRO I medical group practices. The BASF contains summarized clinical information for all beneficiaries, and is constructed each year based on the specified reference period for each condition.

There are three chronic condition variables for each CCW indicator, with values that signify whether the pattern of utilization (i.e., FFS claims) indicated the presence of the condition for the beneficiary during the surveillance period ending with the last month of the reference period (e.g., December 2009 for the yearly indicators in the 2009 BASF). Note that claims prior to the reference year may have been examined to make this determination if the CCW definition was a two- or three- year condition (e.g., diabetes, heart failure). The yearly indicator for each CCW indicator was used, which denotes whether the chronic condition definition was met during the respective period ending December 31, 2009.

The yearly CCW indicator has four indicator values:

- 0: Neither claims nor coverage met
- 1: Claims met, coverage not met
- 2: Claims not met, coverage met
- 3: Claims and coverage met

An indicator value of "3" means that the pattern of utilization indicates the beneficiary was being treated for the condition, and the beneficiary had Medicare Part A and B FFS coverage—and no Medicare Advantage coverage—for the entire reference period or until death (i.e., the reference period can be anywhere from one to three years, depending on the condition of interest). The value of "1" means that the pattern of claims indicates the beneficiary is being treated for the condition; however, the beneficiary was not covered for the full reference period. This limited reference period could be due to new enrollment into the Medicare program (i.e., beneficiaries who became newly eligible), a break in Part A or Part B entitlement, or one or more months of Medicare Advantage coverage during the reference period. The other two potential values in this field (2 or 0) indicate absence of the condition during the reference period. Those numbered 2 had Medicare Part A and Part B FFS coverage throughout the full reference period; those numbered 0 did not. In both cases, there were no claims to indicate current treatment for the particular condition. For the 2010 GPRO I QRURs, beneficiaries with a value or 1 or 3 for the 2009 CCW flag were identified as having the particular chronic condition.

Based on CMS' conditions of interest, the following flags from the BASF were used:

- HF: Heart Failure End Year Flag
- COPD: Congestive Obstructive Pulmonary Disease End Year Flag
- DIAB: Diabetes End Year Flag
- IHD : Ischemic Heart Disease End Year Flag (this flag represents CAD)

2. Calculate 2010 Subgroup-Specific Price-Standardized Per Capita Costs

Calculate GPRO I price-standardized, but non-risk-adjusted, per capita costs for each subgroup of beneficiaries attributed to the GPRO I group practice who had the given chronic condition as follows:

Step 1: For a given GPRO practice, sum 2010 annual beneficiary price-standardized costs for all attributed beneficiaries with the chronic condition (CCW flag = 1 or 3); this is the numerator of the subgroup-specific per capita cost measure.

Step 2: For a given GPRO practice, count the number of attributed beneficiaries with the chronic condition (CCW flag = 1 or 3); this is the denominator of the subgroup-specific per capita cost measure.

Step 3: For a given GPRO practice, divide the numerator of the subgroup-specific per capita cost measure by the denominator of the subgroup-specific per capita cost measure; this equals the GPRO's price-standardized subgroup-specific per capita cost measure.

D. Risk Adjust Costs for Overall and Subgroup-Specific per Capita Cost Measures

Physiologic differences among patients can affect their medical costs, regardless of the care provided. For peer comparisons, medical group practices' per capita costs (see Section IV.B) and chronic condition subgroup-specific per capita costs (see Section IV.C) were risk-adjusted based on the unique mix of Medicare patients the group practice treated during 2010.

For the 2010 GPRO I QRURs, CMS' HCC model that assigns ICD-9 diagnosis codes (each with similar disease characteristics and costs) to 70 clinical conditions was used to capture medical condition risk.[6] HCC risk scores also incorporate patient age, sex, reason for Medicare eligibility, and Medicaid eligibility. The risk adjustment model also included the beneficiary's 2009 end stage renal disease (ESRD) status. A statistical risk adjustment model estimates the independent effects of risk scores on beneficiary price-standardized total costs for 2010 and adjusts these costs for each beneficiary prior to calculating price-standardized risk-adjusted per capita cost measures for the group practice. To ensure that extreme outlier costs do not have a disproportionate effect on the cost distributions, costs below the 1st percentile are eliminated from the cost calculations, and costs above the 99th percentile are rounded down to the 99th percentile.

1. Estimate Risk-Adjustment Model

Step 1: Beneficiaries who did not have a 2009 Community or New-Enrollee HCC score provided by CMS were dropped from the model.

Step 2: Identify the top 1.0 percent and bottom 1.0 percent of the distribution of 2010 beneficiary price-standardized total costs.

Step 3: For beneficiaries with costs in the top 1 percentile of the distribution, change their cost to the 99th percentile cost.

Step 4: Drop from the model any beneficiaries whose costs are in the bottom 1 percentile of the cost distribution.

[6] The HCC model uses diagnoses identified for a patient within a given year to predict health risks for the following years along with potential resource utilization. The model consists of cost groups, or diagnoses, that are grouped into the 70 HCCs. These are groups of similar diagnoses that CMS has deemed risk factors for patients. Each HCC has a specific weight and specific reimbursement tied to it from which a Medicare Advantage Contractor is paid. Medicare Advantage plans receive a base payment for each of their enrollees, or patients, and then in addition to that base payment can receive additional reimbursement based upon the HCCs identified for that enrollee within a given year. A patient might have multiple HCCs identified during one patient encounter. However, the same HCC is not reimbursed twice (or however many times a patient may be seen within the year) with the same diagnosis or set of related diagnoses that fall into that HCC.

Step 5: For each of the four chronic condition subgroup per capita costs reported in the 2010 GPRO I QRURs, perform the same Winsorization, using only records for beneficiaries with the relevant condition.

Step 6: Estimate a model for overall 2010 beneficiary price-standardized Winsorized total costs, and separately for each subgroup-specific condition as a function of the community HCC score, community HCC score squared, new-enrollee HCC score, new-enrollee HCC score squared, and a flag for ESRD, where:

Community HCC Score

For each Medicare beneficiary enrolled in Medicare FFS for all of 2009, the HCC model generates a 2009 HCC risk score based on the presence of these conditions in 2009—and on sex, age, original reason for Medicare entitlement (either age or disability), and Medicaid entitlement—as predictors of costs in 2010 based on beneficiary morbidity.

New Enrollee HCC Score

HCC risk scores for beneficiaries enrolled in Medicare FFS for only part of 2009 are based only on sex, age, original reason for Medicare entitlement (either age or disability), and Medicaid entitlement status.

ESRD Flag

The ESRD indicator was obtained from the 2009 Medicare Denominator File.

Step 7: Save the predicted costs and residuals from the regressions in Step 6.

Step 8: Calculate the overall mean cost for all beneficiaries used in the model, and by subgroup condition.

Step 9: Output residual, predicted, and actual costs by beneficiary, and aggregate mean costs, overall and by subgroup condition.

Step 10: Adjusted per capita cost for the GPRO practice equals the (aggregate mean cost * (mean actual cost for the GPRO's attributed beneficiaries /mean predicted cost for the GPRO's attributed beneficiaries) , overall and by subgroup condition.

Step 11: Perform the Step 10 calculation for all of a GPRO's attributed beneficiaries and for the GPRO's attributed beneficiaries with a specified chronic condition for each of the four subgroup conditions.

2. Calculate the Amount by Which the GPRO's Subgroup Per Capita Costs Are Higher (or Lower) than Mean Subgroup Per Capita Costs for Peer Group

Step 1: Calculate the mean GPRO practice subgroup-specific per capita costs by summing subgroup-specific per capita costs for a given chronic condition across all 35 GPRO medical group practices and dividing this number by 35.

Step 2: For each chronic condition subgroup, calculate the difference between a GPRO's subgroup-specific per capita costs and the mean GPRO practice subgroup-specific per capita costs.

E. Calculate Per Capita Costs for Categories of services

The goal of separating per capita costs into categories of services is to provide medical group practices with details on how their costs of delivering specific health care services compare with those of their peers. Note, however, that different categories of service can be complements or substitutes. Displaying costs by categories of services provides greater detail on where providers may be able to improve the efficiency of care. This section describes how category-specific costs were calculated and risk-adjusted. It also describes the calculations for the number and percentage of a group's attributed patients who received specific types of services in 2010. Finally, it describes calculation of the mean number of medical professionals who treated the group practice's attributed Medicare beneficiaries in 2010, and the mean percentage of these medical professionals who did not bill under the GPRO practice's TIN in 2010.

CMS chose service categories that (1) correspond to the organization of Medicare claims, and (2) capture distinct types of services that medical professionals may be able to influence either directly through their own practice patterns (for instance, E&M services) or indirectly through referral patterns or improved outpatient care (which can prevent certain types of hospitalizations). Table D.4 in Appendix D displays how costs by categories of services were displayed in the 2010 GPRO I QRUR.

1. Separate Each Beneficiary's 2010 Total Per Capita Costs into Service Categories

Step 1: Categorize claims into one (and only one) service category. Use all 2010 Medicare claims (from the six claim types)[7] for all attributed GPRO beneficiaries. Each line item of a claim on the non-institutional files has a Berenson-Eggers Type of Service (BETOS) code that classifies the health service listed on the claim line into a broad, clinically-relevant category.[8] Table D.5 in Appendix D includes a list and brief description of 2010 BETOS codes. Assign each line item of a claim to a category of service based on the BETOS code. Table D.3 in Appendix D cross-walks each BETOS code to a type of service. Any service that does not fit into one of the categories listed was assigned to the "All Other Services" category.

Step 2: Calculate total costs in 2010 for each service category for each beneficiary. For each beneficiary, sum the costs in each category for claims incurred in 2010 – the numerator of the service cost. Some beneficiaries may not have been provided any services in the category in

[7] Four of the six claim types are from institutional files and have claim-level records: (1) inpatient hospital, (2) skilled nursing facility, (3) outpatient hospital, and (4) home health agencies. The other two claim types are from non-institutional files and have line-item-level records: (5) Carrier and (6) DME.

[8] Note that the 2010 outpatient hospital claims file does not have BETOS information at the line-item level. BETOS codes were therefore added to this file using a CMS crosswalk between HCPCS codes and BETOS codes.

2010 so, although these beneficiaries are included in the denominator of the type of service cost calculation, they have no costs included in the numerator of the calculation.

Step 3: Separate E&M and procedure costs by medical professional type. The E&M and procedure costs are broken out by the type of medical professional who performed the services; the types of medical professionals, defined by Physician Stratification Category (see Table D.2 in Appendix D), are primary care physicians, medical specialists, surgeons, emergency department physicians, and other professionals. Other professionals include, for example, physician assistants, nurse practitioners, clinical nurse specialists, certified nurse anesthetists, clinical social workers, clinical psychologists, dieticians, audiologists, physical therapists, and speech therapists.

Step 4: Calculate type of service cost per GPRO attributed beneficiary. Divide the total costs obtained in Step 2 for the service category by the total number of beneficiaries attributed to the GPRO, whether or not the beneficiary incurred any costs in the service category in 2010.

Step 5: Compare with peer group means. Calculate the mean of the results in Steps 2 and 3 across all 35 GPROs. Additionally, for each category of service, calculate the difference between a given GPRO's cost with the mean of the 35 GPROs' costs.

2. Risk-Adjust Costs

Service category costs were risk-adjusted as follows, using the results from the risk-adjustment model described in Section IV.D: aggregate mean cost * (mean actual cost for the GPRO's attributed patients/mean predicted cost for the GPRO's attributed patients).

3. Determine the Percentage of a GPRO's Patients Who Used a Specific Service

Step 1: Determine whether each beneficiary used a particular category of service in 2010. Create an indicator for whether a beneficiary used a particular service in 2010 among the categories listed in Table IV.1. (This table duplicates the one in the 2010 GPRO I QRURs, using illustrative data). The indicator = 1 if the beneficiary had positive costs for that category in 2010; the indicator = 0 otherwise.

Step 2: Drop beneficiaries who are not in the final cost calculations. For all categories, limit calculations to beneficiaries who are included in the total per capita cost measure calculations. The per capita cost risk-adjustment process (see Section IV.D) drops beneficiaries from the risk-adjusted per capita cost measures who: (1) do not have a 2009 HCC score, or (2) are in the lowest 1 percentile of beneficiary costs in 2010.

Step 3: Calculate the number and percentage of beneficiaries attributed to a GPRO who used each type of service in 2010. Construct a weight for each beneficiary and each category. If the beneficiary had a positive expenditure in 2010 in the service category, the beneficiary's service category weight is 1. Calculate the number and percentage of a GPRO's attributed patients who used a particular service in the year.

4. Calculate Additional GPRO-Level Summary Statistics

The following statistics were calculated for Medicare beneficiaries attributed to a GPRO:

(1) Number of beneficiaries attributed to the GPRO in 2010

(2) Average number of medical professionals in all health care settings who treated the GPRO's attributed beneficiaries in 2010, calculated as follows: using 2010 Carrier SAF claim line items, count the total number of unique NPIs who treated (were a performing NPI for) a particular beneficiary in 2010, at the unique TIN (group) level (and limited to HCFA medical specialty codes not equal to "NA" as indicated in Table D.2 in Appendix D). Next calculate the average number of medical professionals, by TIN, across all the beneficiaries attributed to the GPRO in 2010. Also, calculate the mean of the results across all 35 GPROs.

(3) Percentage of medical professionals from (2) above who were NOT affiliated with the GPRO (that is, who did not bill under the GPRO's TIN in 2010). Also calculate the mean of the results across all 35 GPROs.

Table IV.1 Medicare Patients' Per Capita Costs* for Specific Services, 2010

Service Category	ABC Healthcare Associates: Medicare Patients Using Any Service in This Category – Number	ABC Healthcare Associates: Medicare Patients Using Any Service in This Category – Percent	ABC Healthcare Associates: Per Capita Costs for Medicare Patients	Mean For GPRO I Medical Group Practices: Medicare Patients Using any Service in This Category	Mean For GPRO I Medical Group Practices: Per Capita Costs for Medicare Patients	Amount By Which Your Group's Costs Are Higher or (Lower) Than GPRO I Mean
TOTAL	**##**	**100%**	**$20,123**	**100%**	**$17,323**	**$2,800**
Evaluation and Management Services in All Settings						
All Professional Evaluation and Management Services	##	100%	$5,332	%	$3,137	$2,195
Primary care physicians	##	100%	$1,847	%	$859	
Medical specialists	##	65%	$2,100	%	$1,288	
Surgeons	##	40%	$885	%	$743	
Emergency department physicians	##	22%	$500	%	$247	
Other professionals**	##	%	$	%	$	
Procedures In All Settings						
All procedures	##	65%	$362	%	$453	($91)
Primary care physicians	##	42%	$181	%	$146	
Medical specialists	##	38%	$95	%	$162	
Surgeons	##	56%	$54	%	$74	
Emergency department physicians	##	18%	$32	%	$71	
Other professionals**	##	%	$	%	$	
Hospital Services						
Inpatient Hospital Facility Services	##	44%	$2,535	%	$1,207	$1,328
Outpatient and Emergency Services	##	30%	$3,361	%	$2,136	$1,225
Clinic or Emergency Visits			$1,052	%	$910	
Procedures			$989	%	$526	
Laboratory tests			$704	%	$421	
Imaging services			$616	%	$279	
Services In Ambulatory Settings						
All Ancillary Services	##	80%	$3,984	%	$3,622	$362
Laboratory tests			$1,851	%	$1,441	
Imaging services			$1,339	%	$1,435	
Durable medical equipment			$794	%	$746	
Post-Acute Care						
All Post-Acute Services	##	20%	$1,167	%	$1,945	($778)
Skilled nursing facility			$502	%	$884	
Psychiatric or rehab facility			$317	%	$501	
Home health			$112	%	$197	
Other Services						
All Other Services***	##	100%	$3,381	100%	$4,823	($1,442)

* In calculating service-specific per capita costs, the numerator is the total costs for a category of service used by attributed patients; the denominator is the total number of Medicare patients attributed to a medical group practice, not just those who used the service.

** Other Professionals include, for example, physician assistants, nurse practitioners, clinical nurse specialists, certified nurse anesthetists, clinical social workers, clinical psychologists, dieticians, audiologists, physical therapists, and speech therapists. (See Appendix D for specialty codes included.)

*** Includes services not captured in other categories, such as anesthesia, ambulance services, chemotherapy, other Part B drugs, orthotics, chiropractic, enteral and parenteral nutrition, vision services, hearing and speech services, and influenza immunizations.

F. Calculate Utilization Statistics for Subgroup-Specific Per Capita Cost Measures

To provide more detail on the subgroup-specific per capita costs for the selected four chronic conditions displayed in the 2010 GPRO I QRURs (COPD, CAD, diabetes, and heart failure), utilization statistics are provided for each measure as follows:

(1) The number of beneficiaries attributed to the GPRO practice who had the chronic condition in 2010

(2) The number of inpatient acute hospital admissions (including readmissions) per 1,000 beneficiaries attributed to the GPRO practice who had the chronic condition in 2010 (whether or not hospital admissions were for that chronic condition)

(3) The number of hospital ED visits (that did not lead to an inpatient admission) per 1,000 beneficiaries attributed to the GPRO practice who had the chronic condition in 2010 (whether or not ED visits were related to that chronic condition)

Hospital utilization statistics include all inpatient admissions and ED visits incurred by beneficiaries with a given chronic condition, whether or not such utilization was directly related to the specific condition of interest.

1. Calculate Inpatient Hospital Admission Rate

Step 1: For all beneficiaries attributed to the GPRO group with a given CCW flag in 2009 (chronic condition as defined in Section III.B), sum the number of hospitalizations in acute care hospitals identified in the 2010 Inpatient Hospital SAF for all beneficiaries with the condition. This is the numerator for the rate.

Step 2: Count the number of beneficiaries attributed to the GPRO group with a given CCW flag (chronic condition). This is the denominator for the rate.

Step 3: Divide the numerator in Step 1 by the denominator in Step 2 to calculate the inpatient hospital admission rate for beneficiaries with the given chronic condition.

Step 4: Add a peer group comparison for hospital utilization for each chronic condition subgroup by calculating the mean of the results in Step 3 across all 35 GPRO groups.

2. Calculate Hospital Emergency Department Visit Rate

The method for identifying ED visits that did not result in a hospital admission was derived from Research Data Assistance Center (ResDAC)[9] guidance provided at http://www.resdac.org/tools/TBs/TN-003_EmergencyRoominClaims_508.pdf (accessed July 5, 2011):

- For those Medicare beneficiaries seen in the ED but NOT admitted to the hospital, services and costs are found in the CMS Outpatient Hospital SAF
- To find these claims in the Outpatient Hospital SAF, use revenue center code values of 0450-0459 and 0981
- The revenue center codes on the Outpatient Hospital SAF are called REVCNTR01-REVCNTR58

Step 1: For all beneficiaries attributed to the GPRO group with a given CCW indicator in 2009 (chronic condition), sum the number of ED visits identified in the 2010 Outpatient SAF as specified by ResDAC. This is the numerator for the rate.

Step 2: Count the number of beneficiaries attributed to the GPRO group with a given CCW flag (chronic condition). This is the denominator for the rate.

Step 3: Divide the numerator in Step 1 by the denominator in Step 2 to calculate the hospital ED visit rate for beneficiaries with the given chronic condition.

Step 4: Add a peer group comparison for ED utilization for each chronic condition subgroup by calculating the mean of the results in Step 3 across all 35 GPRO groups.

[9] ResDAC is a CMS contractor that provides free assistance to academic, government and non-profit researchers interested in using Medicare and/or Medicaid data for their research. ResDAC is staffed by a consortium of epidemiologists, public health specialists, health services researchers, biostatisticians, and health informatics specialists from the University of Minnesota (see http://www.resdac.org/, accessed July 6, 2011).

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V. CALCULATE OR INCORPORATE QUALITY MEASURES

A. Calculate Ambulatory Care Sensitive Condition (ACSC) Measures

The Agency for Healthcare Research and Quality (AHRQ) developed a set of Prevention Quality Indicators (PQIs) that includes measures of potentially avoidable hospitalizations for "ambulatory care-sensitive conditions." These are conditions for which good outpatient care can prevent complications or more severe disease. The measures rely on hospital discharge data but are not intended as measures of hospital quality. Rather they reflect access to high quality ambulatory care within a larger system of care.

The 2010 GPRO I QRURs include rates of short-stay hospital admissions for Medicare beneficiaries attributed to GPRO practices, calculated from 2010 Medicare Inpatient Hospital claims data, for the following six ACSCs:

(1) Heart failure (HF)

(2) Bacterial pneumonia

(3) Urinary tract infection (UTI)

(4) COPD

(5) Dehydration

(6) Diabetes–a composite measure, based on short term diabetes complications; uncontrolled diabetes; long term diabetes complications; and lower extremity amputation for diabetes

For the three acute conditions (pneumonia, UTI, and dehydration) the ACSC rate is calculated as the number of hospitalizations for beneficiaries attributed to the GPRO practice who were identified as having been hospitalized for that condition in 2010 (the numerator), divided by the sum of *all beneficiaries attributed to the GPRO* (the denominator). For the three chronic conditions (HF, COPD, and diabetes), the ACSC rate is calculated as the number of hospitalizations for that condition in 2010 (the numerator), divided by the sum of *attributed beneficiaries identified as having the condition* based on the CCW chronic condition indicator in 2009 (the denominator).

1. Description of PQIs/ACSCs[10]

The PQIs are a set of measures that can be used with hospital inpatient discharge data to identify quality of care for "ambulatory care-sensitive conditions." AHRQ distributes a free PQI software tool for free, which can be applied to any hospital inpatient administrative data. The

[10] This section was derived from http://www.qualityindicators.ahrq.gov/modules/pqi_overview.aspx, accessed July 5, 2011.

PQIs are part of a set of AHRQ Quality Indicators developed by investigators at Stanford University and the University of California under a contract with AHRQ.

AHRQ notes that even though PQI indicators are based on hospital inpatient data, they provide insight into the community health care system or services outside the hospital setting. For example, patients with diabetes may be hospitalized for diabetic complications if their conditions are not adequately monitored or if they do not receive the patient education needed for appropriate self-management. AHRQ further notes that the PQIs can be used as a "screening tool" to help flag potential health care quality problem areas that need further investigation; provide a quick check on primary care access or outpatient services in a community by using patient data found in a typical hospital discharge abstract; and, help public health agencies, State data organizations, health care systems, and others interested in improving health care quality in their communities. For detailed specifications for each PQI, see http://www.qualityindicators.ahrq.gov/modules/PQI_TechSpec.aspx, accessed September 2, 2011...

2. Calculate ACSC Hospitalization Rates

Step 1: Identify all 2010 beneficiaries attributed to a given GPRO

Step 2: Identify all short-stay hospital claims for beneficiaries identified in Step 1 for a given GPRO, using the 2010 Medicare Inpatient Hospital SAF

Step 3: Apply the AHRQ PQI software programs to short-stay hospital claims identified in Step 2 for the given GPRO to identify hospitalizations for each ACSC condition below (that is, for each PQI condition), based on diagnostic and procedure information on the claims. (The PQI software has distinct programs that identify hospitalizations for each particular ACSC condition; see http://www.qualityindicators.ahrq.gov/Downloads/Software/SAS/V42/pqi_sas_documentation_v42.pdf , accessed July 5, 2011; tapq# refers to numerator ("top"), (ambulatory care sensitive condition, pq indicator, the indicator number).)

- HF (tapq08)
- Bacterial pneumonia (tapq11)
- UTI (tapq12)
- COPD (tapq05)
- Dehydration (tapq10)
- Diabetes (including) (tapq01, tapq03, tapq14, tapq16)
    - Uncontrolled diabetes
    - Short term diabetes complications
    - Long term diabetes complications
    - Lower extremity amputation

Step 4: Sum the number of hospitalizations for each condition for a given GPRO across all its attributed beneficiaries (the numerator for the ACSC rate).

Step 5: For the three chronic conditions (HF, COPD, and diabetes), divide the Step 4 numerator by the number of 2010 beneficiaries attributed to the GPRO with the CCW flag indicating the chronic condition (the denominator for the ACSC rate). (Note that the count of hospitalizations for the diabetes ACSC is calculated by summing the numerator counts for each of the four PQIs focused on diabetes into one composite: uncontrolled diabetes, short term complications, long term complications and lower extremity amputation.) For the three acute conditions (bacterial pneumonia, UTI and dehydration), divide the Step 4 numerator by the total number of 2010 beneficiaries attributed to the GPRO (the denominator for the ACSC rate).

Step 6: Express ACSCs as rates per 1,000 attributed beneficiaries (either attributed beneficiaries with the given condition for the three chronic conditions, or all attributed beneficiaries for the three acute conditions).

B. Incorporate GPRO I Quality Indicators

Group practices participating under the GPRO I reporting option were required to report a total of 26 quality measures endorsed by the National Quality Forum targeting high-cost chronic conditions and preventive care. The measure specifications were grouped into four disease modules: diabetes mellitus (eight measures); heart failure (seven measures); CAD (four measures), and hypertension (three measures). In addition, there were four preventive care measures. Descriptive text and specifications for Physician Quality Reporting Initiative Group Practice Reporting Option (GPRO) Disease Modules and Preventive Care Measures can be found on the following CMS websites:

- 2010 GPRO Narrative Measure Specifications: http://www.cms.gov/PQRS//Downloads/2010_GPRO_NarrativeSpecifications_111009.pdf
- 2010 GPRO Requirements for Submission of 2010 PQRI: http://www.cms.gov/PQRS//Downloads/GPRO_SelfNominationRequirements_02-26-2010.pdf

CMS pre-populated a database with a sample of Medicare beneficiaries who had been attributed to the GPRO practice and the quality measure specifications. The database served as a data collection and reporting tool for groups. Data collected reflected services furnished to a sample of Medicare beneficiaries during calendar year 2010. Each GPRO practice was required to report clinical data for at least the first 411 beneficiaries on their list of attributed beneficiaries who met eligibility criteria for each set of measures. If the group practice had fewer than 411 beneficiaries for whom a particular measure applied, clinical data had to be submitted for 100 percent of the beneficiaries who did meet criteria for the measure.

The 2010 GPRO QRURs provide denominator counts and performance rates for each of 26 measures for each of the 35 GPRO participating practices. Each GPRO practice's performance rate for a given measure is compared to the mean (non-weighted) performance rate among all 35 GPRO groups, as well as to the 10th, 50th, and 90th percentile performance rates based on ranking the 35 groups from lowest to highest performance on the quality measure.

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VI. DEFINE MEASURE BENCHMARKS AND POPULATE REPORTS

A. Define Peer Groups and Benchmarks

1. Calculate Simple Mean (Average) Benchmarks

Step 1: For a given measure, sum the measure across all 35 GPRO practices.

Step 2: Divide the sum in Step 1 by 35.

2. Calculate 10th, 50th, and 90th Percentile Benchmarks

Step 1: For a given measure, rank the 35 GPRO practices from lowest to highest performer (for example, for per capita costs, rank groups from those with the lowest per capita costs for attributed beneficiaries to the highest cost group practice).

Step 2: Calculate the 10th, 50th, and 90th percentile outcomes for the given measure across GPRO practice rankings from Step 1.

B. Identify Hospitals That Treated GPRO Beneficiaries

The 2010 GPRO I QRURs include a listing of hospitals that account for at least 10 percent of all hospital stays by the practice's attributed beneficiaries in 2010.

Step 1: Identify all 2010 hospitalizations (stays) for all beneficiaries attributed to a given GPRO in the 2010 Inpatient Hospital SAF. (Note that a beneficiary can have more than one hospital stay in 2010.)

Step 2: Count the total number of hospital stays across all beneficiaries attributed to the GPRO.

Step 3: Identify the hospital's provider identification (ID) number for each of the stays identified in Step 2. Create a flag that "links" the hospital ID to the GPRO practice.

A file provided by the Iowa Foundation for Medical Care (IFMC) (All_Provider_Table_20110506_v2.xls, dated May 6, 2011) was also used for hospital identification that contains information on whether a hospital changed IDs because it converted from acute care to Critical Access Hospital (CAH) status during 2010, as well as information on hospitals' open or closed status in 2010. From this file, we used the provider ID (PROVIDERID), the hospital name (PROVIDERNAME), the original provider ID for those that converted (OLD_PROVIDERID) and the provider ID for CAH conversions (DISPLAYID) to combine hospital stays for converted hospitals under one hospital ID.

Step 4: Combine IDs for the special units in hospitals noted below with IDs for their main hospital. There is a special numbering system for units of hospitals that are excluded from CMS's prospective payment system and hospitals with SNF swing-bed designation. An alpha

character in the third position of the provider number identifies the type of unit or swing-bed designation as follows:

M = Psychiatric unit in CAH

R = Rehabilitation unit in CAH

S = Psychiatric unit (excluded from PPS)

T = Rehabilitation unit (excluded from PPS)

U = Swing-bed hospital designation for short-term hospitals

V = Alcohol drug unit (prior to 10/87 only)

W = Swing-bed hospital designation for long-term care hospitals

Y = Swing-bed hospital designation for rehabilitation hospitals

Z = swing bed designation for CAHs

Step 5: Count the total number of beneficiary hospital stays, by hospital ID, for each GPRO practice.

Step 6: For each hospital ID, divide the total number of hospital stays for the hospital ID (from Step 5) by the total number of hospitals stays across all beneficiaries attributed to the GPRO practice (from Step 2).

Step 7: If a hospital ID's percentage from Step 6 is at least 10 percent, create a flag for the hospital ID equal to 1; if the hospital ID percentage is less than 10 percent, the flag equals 0.

Step 8: For hospitals with flag = 1 from Step 7, match their hospital ID with the HQI_HOSP.csv table within the Hospital Compare Database (variables used were hospital ID (PROVIDER_NUMBER) and hospital name (HOSPITAL_NAME)) (downloaded from CMS' Hospital Compare website, http://www.medicare.gov/Download/downloaddb.asp > Hospital Compare, accessed on July 6, 2011), to find the hospital's name.

Step 9: If the hospital's ID is not located in the Hospital Compare Database, identify the hospital's name through a match with the IFMC file in Step 3 used for cross-referencing converted hospitals.

Step 10: For the given GPRO, list each hospital's name identified under steps 8 and 9.

C. Populate 2010 GPRO I Quality and Resource Use Reports

The final step in the process of producing the 2010 GPRO I QRURs involves populating the reports. A report was prepared for and disseminated to all of the 35 medical group practices participating in the GPRO I option of the 2010 Physician Quality Reporting System.

APPENDIX A

LIST OF ACRONYMS

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ACSC	ambulatory care sensitive condition
AHRQ	Agency for Healthcare Research and Quality
APC	ambulatory payment classification
ASC	ambulatory surgical center
BASF	Beneficiary Annual Summary File
BETOS	Berenson-Eggers Type of Service
CAH	critical access hospital
CBSA	core-based statistical area
CCW	Chronic Condition Warehouse
CMG	case-mix group
CMS	Centers for Medicare & Medicaid Services
COLA	cost-of-living adjustment
COPD	chronic obstructive pulmonary disease
DME	durable medical equipment
DRG	diagnosis-related group
DSH	disproportionate-share hospital
ED	emergency department
E&M	evaluation and management
ESRD	end-stage renal disease
FFS	[Medicare] fee-for-service
GAF	geographic adjustment factor
GEM	Generating Medicare Physician Quality Performance Measurement Results
GPCIs	geographic practice cost indices
GPRO	Group Practice Reporting Option
HCC	hierarchical condition category
HCFA	Health Care Financing Administration
HCPCS	Healthcare Common Procedure Coding System
HF	heart failure
HHRG	home health resource group
HMO	health maintenance organization
IACS	Individuals Authorized Access to CMS Computer Services

ICD-9	International Classification of Diseases–9th Revision
ID	Identification
IFMC	Iowa Foundation for Medical Care
IME	indirect medical education
IRF	inpatient rehabilitation facility
LTC	long-term care
MAC	Medicare administrative contractor
Med PAC	Medicare Payment Advisory Commission
MMA	Medicare Modernization Act of 2003
NCH	[Medicare] National Claims History
NLA	national limitation amount
NPI	national provider identifier
NQF	National Quality Forum
OPPS	outpatient prospective payment system
PACE	Program of All-Inclusive Care for the Elderly
PLI	professional liability insurance
PPS	prospective payment system
PQIs	prevention quality indicators
QRUR	Quality and Resource Use Report
ResDAC	Research Data Assistance Center
RUG	resource utilization group
RVU	relative value unit
SAFs	[Medicare] Standard Analytical Files
SNF	skilled nursing facility
TIN	tax identification number
UTI	urinary tract infection
VBM	value-based payment modifier
VBP	value-based purchasing

APPENDIX B

DESCRIPTION OF DATA SOURCES

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Medicare Denominator File

The Medicare Denominator Files contain demographic and enrollment information about each beneficiary enrolled in Medicare during a calendar year. The information in the Denominator File is "frozen" in March of the following calendar year. Some of the information includes the beneficiary unique identifier, state and county residence codes, ZIP code, date of birth, date of death, sex, race, age, monthly Medicare entitlement indicators, reasons for entitlement, whether or not the beneficiary's state of residence paid for the beneficiary's Medicare Part A or Part B monthly premiums ("state Buy-In" indicator), and monthly Medicare managed care enrollment indicators.

Medicare SAFs

SAFs contain information collected by Medicare to pay for health care services provided to a Medicare beneficiary enrolled in original FFS Medicare. SAFs are available for each institutional (inpatient, outpatient, SNF, hospice, or home health agency) and non-institutional (physician and DME providers) claim type. The record unit of SAFs is the claim (some episodes of care may have more than one claim).

Under Medicare procedures, when an error is discovered on a claim, a duplicate claim is submitted indicating that the prior claim was in error; a subsequent claim containing the corrected information can then be submitted. The SAFs contain only the *final action* claims (developed from the Medicare National Claims History database), or non-rejected claims for which a payment has been made, after all disputes and adjustments have been resolved and details clarified.

The geographic scope of the SAFs is national. ZIP code is the finest level of geographic detail available in the file. Data are submitted continually from the Medicare Administrative Contractors (MACs) to CMS, but SAFs are produced by calendar year. The end date of the claim determines in which calendar year SAF the claim is included. Providers submit claims to the fiscal intermediary or Carrier for processing and payment. The MAC forwards all claims to CMS. Annual files are created each July for services incurred in the prior calendar year and processed through June of the current year (18-month window). The current year's data are created after six months and then updated quarterly and finalized after 18 months.

GPRO I Quality Indicators

The quality measures included in the GPRO I QRUR, reflecting care for beneficiaries with diabetes, CHF, CAD, and hypertension, as well as preventive care measures, are the same indicators the group practice submitted to the 2010 GPRO I Physician Quality Reporting System. The same population of beneficiaries attributed to a GPRO I practice is used in the denominators of the cost, utilization, and quality measures included in this report. However, while all the attributed beneficiaries of a medical group practice are used to calculate the cost and utilization measures, only a sample of these beneficiaries is used for the GPRO I quality measures. Each GPRO practice is required to report clinical data for at least the first 411on their list of attributed beneficiaries, drawn from all attributed beneficiaries that CMS has determined meet criteria for specific measures. If the group practice has fewer than 411beneficiaies that meet the measure

criteria, clinical indicators must be submitted for 100 percent of attributed beneficiaries that meet the measure criteria.

Chronic Condition Warehouse (CCW) Beneficiary Annual Summary File

CMS launched the CCW database in response to the Medicare Modernization Act of 2003 (MMA). Section 723 of the MMA outlined a plan to improve the quality of care and reduce the cost of care for chronically ill Medicare beneficiaries. An essential component of this plan was to establish a data warehouse that contains Medicare claims data and assessments, linked by beneficiary, across the continuum of care. The CCW contains FFS institutional and non-institutional claims, assessment data, and enrollment/eligibility information for 100 percent of the Medicare FFS population from 2005 forward. The 21 CCW conditions, defined by CMS, make it easy to select a study population with a condition of interest. Medicare claims-based utilization information is used to make the chronic condition determinations (i.e., an indicator that the beneficiary received a service or treatment for the condition of interest). For definitions of chronic conditions, see http://www.ccwdata.org/cs/groups/public/documents/document/ccw_userguide.pdf (accessed July 4, 2011).

Hierarchical Condition Category (HCC) Scores

Clinical (case-mix) differences among patients can affect their medical costs, regardless of the care provided. For peer comparisons, a GPRO practice's per capita costs and subgroup-specific per capita costs were risk-adjusted based on the unique mix of patients the group practice treated during a given period. For the 2010 GPRO I QRURs, we used the CMS-HCC model that assigns *International Classification of Diseases*–9th Revision (ICD-9) diagnosis codes (each with similar disease characteristics and costs) to 70 clinical conditions. The CMS-HCC risk-adjustment model is used to adjust payments for Part C benefits offered by Medicare Advantage plans and Program of All Inclusive Care for the Elderly organizations to aged/disabled beneficiaries. The CMS-HCC model incorporates prior year diseases and demographic and insurance factors. There are separate sets of coefficients for beneficiaries in the community, beneficiaries in long-term care institutions, new Medicare enrollees, and beneficiaries with ESRD in dialysis, transplant, and functioning-graft status (both community and institutional).

CMS calculated and provided the Community and New Enrollee HCC scores that were used in risk-adjusting 2010 per capita costs for the 2010 GPRO I QRURs. The ESRD and institutional scores were not used. Because the ESRD model is concurrent, an ESRD indicator (yes/no) was used instead of the ESRD score. By including the ESRD indicator in the adjustment model, we could estimate the prospective impact of ESRD on costs. Because institutionalization during the year is endogenous, no adjustment was made for institutional status; in addition, the effect of institutionalization on costs is small, on average, once the HCC score is included in the risk-adjustment model.

APPENDIX C

STEPS FOR IDENTIFYING AND EXCLUDING 2010 PART-YEAR MEDICARE BENEFICIARIES

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When beneficiaries were attributed to GPRO I practices in October 2010 for the purpose of submitting quality indicator information for the Physician Quality Reporting System, the most recent Medicare beneficiary enrollment ("Denominator") file did not yet have full 12-month information on the part- or full-year status of all beneficiaries, particularly for October-December 2010; for some variables, data were complete only through June 2010. In producing the 2010 GPRO I QRURs, more up-to-date information was available, using Denominator File data extracted in April 2011. Therefore, about 5,000 additional beneficiaries who did not have full-year status in 2010 were identified and dropped from the analytic file used for producing the cost, utilization, and ACSC measures included in the reports,. Part-year versus full-year status for 2010 was determined through the following steps:

Step 1: For all beneficiaries, use the 2010 Denominator File to set indicators that identify whether the beneficiary had incomplete calendar year FFS claims in 2010 for at least one of the following reasons:

a) *The beneficiary died during the year.* If a death date was present in the Denominator File (not equal to missing) on or between 1/1 and 12/31 of the calendar year, and the death verification switch indicated that the death had been verified (a value of "V"), the month of death was used to determine the number of months of potential FFS eligibility during the calendar year (that is, the beneficiary might have been alive but had been in a Medicare Advantage plan, which also in part determines the length of time the beneficiary was in Medicare FFS for the calendar year).

b) *The beneficiary was enrolled in a Medicare managed care plan at least one month during the calendar year.* Using the Health Maintenance Organization (HMO) Indicator field in the Denominator File, the HMO flag was set to 0 for the given month if the beneficiary had a value of 1, 2, A, B, or C for the month; the HMO flag was set to 1 for the given month if the beneficiary had a value of 0 or 4 for the month. Codes for the HMO Indicator field are as follows:

0 = NOT A MEMBER OF HMO
1 = NON LOCK-IN, HEALTH CARE FINANCING ADMINISTRATION (HCFA) TO PROCESS PROVIDER CLAIMS
2 = NON LOCK-IN, GROUP HEALTH ORGANIZATION TO PROCESS IN-PLAN PART A AND IN-AREA PART B CLAIMS
4 = FEE-FOR-SERVICE PARTICIPANT IN CASE OR DISEASE MANAGEMENT DEMONSTRATION PROJECT (EFFECTIVE 2005 FORWARD)
A = LOCK-IN, HCFA TO PROCESS PROVIDER CLAIMS
B = LOCK-IN, GROUP HEALTH ORGANIZATION TO PROCESS IN-PLAN PART A AND IN-AREA PART B CLAIMS
C = LOCK-IN, GROUP HEALTH ORGANIZATION TO PROCESS ALL PROVIDER CLAIMS

c) *The beneficiary gained or lost Part A or B entitlement during the calendar year.* Using the Buy-In Indicator field in the Denominator File, the Buy-In flag was set to 0 for the given month if the beneficiary had a value of 0, 1, or 2 for the month; the Buy-In flag

was set to 1 for the given month if the beneficiary had a value of 3, A, B, or C in the month.[11] Codes for the Buy-In Indicator are as follows:

0 = NOT ENTITLED
1 = PART A ONLY
2 = PART B ONLY
3 = PART A AND PART B
A = PART A, STATE BUY-IN
B = PART B, STATE BUY-IN
C = PARTS A AND B, STATE BUY-IN

Step 2: For each beneficiary, create a part-year variable that counts the number of months in 2010 the beneficiary was still alive and in which the HMO flag *and* the Buy-In flag (not the Buy-In indicator) = 1.

For example, if the beneficiary was in Medicare FFS in January-February 2010 (and had both Parts A/B entitlement and was alive), then enrolled in an HMO plan from March-April 2010, then transferred back to Medicare FFS May-July 2010, then died in mid-August, the 2010 part-year flag for this beneficiary would equal 6.

Step 3: Using the part-year variable, calculate a weight for each beneficiary equal to the month count from Step 2, divided by 12. (In the example above, the beneficiary's weight would be 6/12). If a beneficiary's part-year weight is less than 1, the beneficiary and his/her claims were dropped from the 2010 analysis file for the 2010 GPRO I QRURs. Only CMS beneficiaries with full year status in Parts A and B FFS Medicare were included in the report.

[11] Beneficiaries with a value of A or B were considered to have both Part A and Part B coverage because, in order for a state to "buy in" to Part A for a Medicare beneficiary (that is, pay the Part A premium for the beneficiary because the beneficiary is not automatically eligible for "premium free" Part A coverage), the beneficiary must already be enrolled in Part B. The same is true for Part B; that is, if the person is not enrolled in premium free Part A or is not paying Part A premiums, the person is not eligible for state payment of his/her Medicare Part B premium. Therefore, if a state "bought in" to either Part A or Part B for the beneficiary, the beneficiary also has the other part of Medicare.

APPENDIX D

SUPPLEMENTARY TABLES

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Table D.1. Medicare Part B Evaluation & Management Service Codes Included in Beneficiary Attribution Criteria

Included	Codes	Labels*
Office or Other Outpatient Services	99201	New Patient, Brief
	99202	New Patient, Limited
	99203	New Patient, Moderate
	99204	New Patient, Comprehensive
	99205	New Patient, Extensive
	99211	Established Patient, Brief
	99212	Established Patient, Limited
	99213	Established Patient, Moderate
	99214	Established Patient, Comprehensive
	99215	Established Patient, Extensive
Excluded		
Hospital Inpatient Services		
Nursing Facility Services		
Care Plan Oversight Services		
Home Care Services		
Domiciliary, Rest Home, or Custodial Care Services		
Consultations		
Emergency Department Services		
Patient Transport		
Critical Care Services		
Neonatal Intensive Services		
Newborn Care		
Special Evaluation and Management Services		
Other Evaluation and Management Services		
Preventive Medicine Services		
Case Management Services		
Prolonged Services		
Hospital Observation Services		

Source: RTI International.

***** Labels are approximate. See American Medical Association, Current Procedural Terminology for detailed definitions.

Table D.2. CMS [HCFA] Code Provider Specialty Table

CMS [HCFA] Specialty Code/Provider Specialty	Physician Stratification Category
01 = General Practice	Primary Care Physicians
02 = General Surgery	Surgeons
03 = Allergy/Immunology	Medical Specialists
04 = Otolaryngology	Surgeons
05 = Anesthesiology	Other
06 = Cardiology	Medical Specialists
07 = Dermatology	Medical Specialists
08 = Family Practice	Primary Care Physicians
09 = Interventional Pain Management	Medical Specialists
10 = Gastroenterology	Medical Specialists
11 = Internal Medicine	Primary Care Physicians
12 = Osteopathic Manipulative Therapy	Medical Specialists
13 = Neurology	Medical Specialists
14 = Neurosurgery	Surgeons
15 = Speech Language Pathologists	Other
16 = Obstetrics/Gynecology	Surgeons
17 = Hospice And Palliative Care	Medical Specialists
18 = Ophthalmology	Surgeons
19 = Oral Surgery (Dentists Only)	Surgeons
20 = Orthopedic Surgery	Surgeons
21 = Unassigned	Na
22 = Pathology	Other
23 = Unassigned	Na
24 = Plastic And Reconstructive Surgery	Surgeons
25 = Physical Medicine And Rehabilitation	Medical Specialists
26 = Psychiatry	Medical Specialists
27 = Geriatric Psychiatry	Medical Specialists
28 = Colorectal Surgery (Formerly Proctology)	Surgeons
29 = Pulmonary Disease	Medical Specialists
30 = Diagnostic Radiology	Other
31 = Intensive Cardiac Rehabilitation	Other
32 = Anesthesiologist Assistant	Other
33 = Thoracic Surgery	Surgeons
34 = Urology	Surgeons

Table D.2 *(continued)*

CMS [HCFA] Specialty Code/Provider Specialty	Physician Stratification Category
35 = Chiropractor, Licensed	Other
36 = Nuclear Medicine	Other
37 = Pediatric Medicine	Other
38 = Geriatric Medicine	Primary Care Physicians
39 = Nephrology	Medical Specialists
40 = Hand Surgery	Surgeons
41 = Optometrist	Other
42 = Certified Nurse Midwife	Other
43 = Certified Registered Nurse Anesthesiologist	Other
44 = Infectious Disease	Medical Specialists
45 = Mammography Screening Center	Other
46 = Endocrinology	Medical Specialists
47 = Independent Diagnostic Testing Facility	NA
48 = Podiatry	Other
49 = Ambulatory Surgical Center	NA
50 = Nurse Practitioner	Other
51 = Medical Supply Company With Certified Orthotist	NA
52 = Medical Supply Company With Certified Prosthetist	NA
53 = Medical Supply Company With Certified Prosthetist-Orthotist	NA
54 = Medical Supply Company For DMERC	NA
55 = Individual Certified Orthotist	Other
56 = Individual Certified Prosthetist	Other
57 = Individual Certified Prosthetist-Orthotist	Other
58 = Medical Supply Company With Registered Pharmacist	NA
59 = Ambulance Service Supplier (Private Ambulance Companies, Funeral Homes, Etc.)	NA
60 = Public Health Or Welfare Agencies (Federal, State, And Local)	NA
61 = Voluntary Health Or Charitable Agencies (E.G., National Cancer Society, National Heart Association, Catholic Charities)	NA
62 = Psychologist (Billing Independently)	Other
63 = Portable X-Ray Supplier	NA
64 = Audiologist (Billing Independently)	Other

Table D.2 *(continued)*

CMS [HCFA] Specialty Code/Provider Specialty	Physician Stratification Category
65 = Physical Therapist (Independently Practicing)	Other
66 = Rheumatology	Medical Specialists
67 = Occupational Therapist (Independently Practicing)	Other
68 = Clinical Psychologist	Other
69 = Clinical Laboratory (Billing Independently)	NA
70 = Multispecialty Clinic Or Group Practice	Other
71 = Registered Dietician/Nutrition Professional	Other
72 = Pain Management	Other
73 = Mass Immunization Roster Billers	NA
74 = Radiation Therapy Centers	NA
75 = Slide Preparation Facilities	NA
76 = Peripheral Vascular Disease	Surgeons
77 = Vascular Surgery	Surgeons
78 = Cardiac Surgery	Surgeons
79 = Addiction Medicine	Medical Specialists
80 = Licensed Clinical Social Worker	Other
81 = Critical Care (Intensivists)	Medical Specialists
82 = Hematology	Medical Specialists
83 = Hematology/Oncology	Medical Specialists
84 = Preventive Medicine	Primary Care Physicians
85 = Maxillofacial Surgery	Surgeons
86 = Neuropsychiatry	Medical Specialists
87 = All Other Suppliers (E.G., Drug And Department Stores)	NA
88 = Unknown Supplier/Provider	NA
89 = Certified Clinical Nurse Specialist	Other
90 = Medical Oncology	Medical Specialists
91 = Surgical Oncology	Surgeons
92 = Radiation Oncology	Other
93 = Emergency Medicine	Emergency Medicine Physicians
94 = Interventional Radiology	Other
95 = Unassigned	Na
96 = Optician	Other
97 = Physician Assistant	Other
98 = Gynecologist/Oncologist	Surgeons

Table D.2 *(continued)*

CMS [HCFA] Specialty Code/Provider Specialty	Physician Stratification Category
99 = Unknown Physician	Other
A0 = Hospital	Na
A1 = Snf	Na
A2 = Intermediate Care Nursing Facility (Dmercs Only)	NA
A3 = Nursing Facility, Other (Dmercs Only)	NA
A4 = HHA (Dmercs Only)	NA
A5 = Pharmacy (Dmercs Only)	NA
A6 = Medical Supply Company With Respiratory Therapist (Dmercs Only)	NA
A7 = Department Store (For DMERC Use)	NA
A8 = Grocery Store (For DMERC Use)	NA

Source: *Medicare Claims Processing Manual*, Chapter 26 – Completing and Processing Form CMS-1500 Data Set (*Rev. 2126, 12-23-10*), 10.8.2 - Physician Specialty Codes, (*Rev. 2035, Issued: 08-27-10, Effective: 01-01-11, Implementation: 01-03-11*), 10.8.3 - Nonphysician Practitioner, Supplier, and Provider Specialty Codes, (*Rev. 2030, Issued: 08-20-10, Effective: 01-01-11, Implementation: 01-03-11 – VMS to do Analysis and Design, 04-04-11 – Final Implementation*).

[a] If Physician Stratification Category is set to NA (these are HCFA specialty codes for non-medical professionals, such as facilities or medical supply companies), any claim line items in the Carrier SAF with these codes for the performing provider are included in the "All Other Services" category in the type of services cost table, with one exception: code 49 (Ambulatory Surgical Center) claims are included in the category "Outpatient and Emergency Services" category in the cost table. If Physician Stratification Category is set to one of five categories (Primary Care Physicians, Medical Specialists, Surgeons, Emergency Medicine Physicians, or Other), any claim line items in the Carrier SAF with these codes for the performing provider are included in either the "Evaluation & Management Services in All Settings" or "Procedures in All Settings" categories in the type of services cost table, as appropriate.

Table D.3 Standardized Factors for Unit Cost (Price) Standardization Methodology

Payment System	Basic Approach	What Is Standardized?		
		Geographic Adjustments	Payment Across Classes of Providers	Provider-Specific Adjustments
Physician Services	For each service/location of service (i.e., facility/nonfacility), allowable charges adjusted to eliminate GPCI adjustments. Adjustment factors are specific to each service/location, based on the relative contribution of work, practice expense, and professional liability insurance (PLI) RVUs to total RVUs.	GPCI adjustments (to account for differences in input costs across CMS' 89 payment areas)		Non-Medicare-participating physician adjustments
		Additional payments to providers practicing in designated shortage areas (Health Professional Shortage Areas and Physician Shortage Areas), under the Medicare Incentive program		
		Payment difference across carrier regions (for Carrier-priced services)		
Anesthesiology Services	Allowable charges divided by the anesthesia conversion factor for the geographic area.	GPCI adjustments (to account for differences in input costs across CMS' 89 payment areas)		
Part B Drugs	Average per unit payment in 2010 by HCPCS code multiplied by number of units.	Payment difference across carrier regions (for Carrier-priced drugs)		
Clinical Laboratory Services	Assign National Limitation Amount (NLA) value, based on HCPCS code.	Differences across Carrier regions in fee schedule amounts are standardized		Payment is reduced if provider charges are below Carrier fee schedule amount. We eliminate this reduction.
Ambulance Services	Average payment in 2010 by ambulance HCPCS code.	Payment differences across Medicare payment areas	During PPS phase-in period, payment differences between hospital and free-standing providers	During PPS phase-in period, component of payment based on old provider-specific charge or cost-based payment.
		Rural add-on payments		Differences in average distance of trips.

Table D.3 *(continued)*

Payment System	Basic Approach	What Is Standardized?		
		Geographic Adjustments	Payment Across Classes of Providers	Provider-Specific Adjustments
Ambulatory Surgical Centers (Community Based)	Assignment of 2010 APC conversion factor times APC relative weight (with adjustments for modifiers), matched on HCPCS code.	Adjustments for local wage levels, based on hospital wage index (varies by metropolitan areas and non-metropolitan parts of a state)		
Hospital Acute Inpatient Services	Average national payment by DRG, with adjustments for departmental or hospital transfers	Adjustments for local wage rates based on hospital wage index and geographic adjustment factor (GAF)	CAHs paid on cost-basis. We assign average DRG payment, same as hospitals paid prospectively.	Disproportionate share hospital (DSH) adjustments
		Cost of living adjustments--COLA (AK and HI only)	Maryland hospitals, which are paid under the state's system and are not part of the PPS system. We assign average DRG payment, same as hospitals paid prospectively.	Indirect graduate medical education (IME) adjustments
				Hospital bad debt adjustments
Long-Term Care Hospitals	Long-term care (LTC) base rate times LTC-DRG relative weight, by LTC-DRG.	Adjustments for local wage levels, based on hospital wage index		
Inpatient Rehabilitation Facilities	Assign 2010 mean national payment per case mix group.	Adjustments for local wage levels, based on hospital wage index		DSH
		Added payment to Inpatient Rehabilitation Facilities located in rural areas		IME

Table D.3 *(continued)*

Payment System	Basic Approach	What Is Standardized?		
		Geographic Adjustments	Payment Across Classes of Providers	Provider-Specific Adjustments
Inpatient Psychiatric Facilities	Assign mean national per diem payment in 2010 for each psychiatric DRG, multiply by Length of Stay and then make adjustment to account for variable per diem adjusters.	Adjustments for local wage levels, based on hospital wage index		Differential payment depending on whether the facility has an emergency department.
		COLA adjusters		IME
		Rural location adjustments		During PPS phase-in period, component of payment based on old provider-specific charge or cost-based payment
Skilled Nursing Facilities	Assign 2010 mean national payment per Resource Utilization Group score.	Adjustments for local wage levels, based on hospital wage index	Swing beds in CAHs	
		Differential payment levels for urban and rural SNFs		
Home Health	Medicare payment amount divided by the percent attributed to labor and capital times the wage index plus the percent attributed to non-labor . When the number of visits in episode are <5, standardize unit cost based on sum of nationally set per visit amounts associated with type of visit listed in claim, consistent with payment rules.	Adjustments for local wage levels, based on hospital wage index		
Hospital outpatient services paid under Outpatient Prospective Payment System (OPPS)	Assign services paid under OPPS their relevant Ambulatory Payment Classification (APC) value (conversion value times APC relative weight). Payment discounts for multiple procedures made.	Adjustments for local wage levels, based on hospital wage index	Add on payment for sole rural hospitals	
		Hold harmless adjustments for cancer, children's, and small rural hospitals	CAHs paid on a cost basis	
			Indian health service facilities paid on a cost basis	
			Maryland hospitals paid under state's payment system	

Table D.3 *(continued)*

Payment System	Basic Approach	What Is Standardized?		
		Geographic Adjustments	Payment Across Classes of Providers	Provider-Specific Adjustments
Hospital outpatient services not covered under OPPS (e.g., therapy services, clinical lab services, ESRD, etc.)	Mean national payment by HCPCS code in 2010 is assigned, adjusted for number of units where applicable.	Adjustments for local wage levels, based on hospital wage index	Differential payments based on type of facility (e.g., hospital based vs. free-standing dialysis facilities)	
Durable Medical Equipment	Average national payment by HCPCS code-modifier code combination. Modifiers account for new vs. used equipment, rental vs. purchase.	State-level differences in payment schedules		Reductions in payment if provider charges are below state fee schedule amount

Table D.4. Category of Service Cross-Walk to BETOS Codes

Category		Claim Type(s)	Claim (or Line) Item Falls into This Category if It Meets the Following Criteria	
			Criteria 1	Criteria 2
1	E&M Services	Carrier (-Ambulatory Surgery Center [ASC] Costs)	BETOS In (All M1-M6)	AND HCFA_Specialty Code NOT in (45, 47, 49, 51-54, 58-61, 63, 69, 73-75, 87,88, and Any Specialty Code Beginning with A or B)
2	Procedures	Carrier (- ASC Costs)	BETOS In (All P1-P9)	
3	Inpatient Hospital Facility	Inpatient	All *Short-Stay* Inpatient Claims	
4	Outpatient and ER Services: Total	Outpatient+ ASC Costs from Carrier	BETOS In (M1-M6, P1-P9, T1, T2, I1-I4)	
4a	Outpatient/ER: Clinic or Emergency Visits	Outpatient + ASC Costs from Carrier	BETOS In (All M1-M6)	
4b	Outpatient/Er Procedures	Outpatient + ASC Costs from Carrier	BETOS In (All P1-P9)	
4c	Outpatient/ER: Laboratory Tests	Outpatient + ASC Costs from Carrier	BETOS In (All T1, T2)	Not Applicable
4d	Outpatient/ER: Imaging Services	Outpatient + ASC Costs from Carrier	BETOS In (All I1- I4)	
5a	Ancillary Services: Lab Tests (Independent)	Carrier	BETOS In (All T1, T2)	
5b	Ancillary Services: Imaging Services	Carrier	BETOS In (All I1-I4)	
	Ancillary Services: Durable Medical Equipment	DME	All DME Claims	
6a	Post-Acute Services: Skilled Nursing Facilities	SNF	All SNF Claims	
6b	Post-Acute Services: Psychiatric Or Rehab Facility	Inpatient	Psychiatric and Rehabilitation Facility Payments	
6d	Post-Acute Services: Home Health	Home health	All Home Health Claims	

Table D.5 2010 BETOS Codes and Descriptions

(1) EVALUATION AND MANAGEMENT

M1A = Office visits - new

M1B = Office visits - established
M2A = Hospital visit - initial
M2B = Hospital visit - subsequent
M2C = Hospital visit - critical care
M3 = Emergency room visit
M4A = Home visit
M4B = Nursing home visit
M5A = Specialist - pathology (HCPCS moved to T1G in 2003)
M5B = Specialist - psychiatry
M5C = Specialist - ophthalmology
M5D = Specialist - other
M6 = Consultations

(2) PROCEDURES

P0 = Anesthesia
P1A= Major procedure - breast
P1B= Major procedure - colectomy
P1C= Major procedure - cholecystectomy
P1D= Major procedure - turp
P1E= Major procedure - hysterectomy
P1F= Major procedure - explor/decompr/excis disc
P1G= Major procedure - other
P2A= Major procedure, cardiovascular - CABG
P2B= Major procedure, cardiovascular - aneurysm repair
P2C= Major Procedure, cardiovascular - thromboendarterectomy
P2D= Major procedure, cardiovascular - coronary angioplasty (PTCA)
P2E= Major procedure, cardiovascular - pacemaker insertion
P2F= Major procedure, cardiovascular - other
P3A= Major procedure, orthopedic - hip fracture repair
P3B= Major procedure, orthopedic - hip replacement
P3C= Major procedure, orthopedic - knee replacement
P3D= Major procedure, orthopedic - other
P4A= Eye procedure - corneal transplant
P4B= Eye procedure - cataract removal/lens insertion
P4C= Eye procedure - retinal detachment
P4D= Eye procedure - treatment of retinal lesions
P4E= Eye procedure - other
P5A= Ambulatory procedures - skin
P5B= Ambulatory procedures - musculoskeletal
P5C= Ambulatory procedures - groin hernia repair
P5D= Ambulatory procedures - lithotripsy
P5E= Ambulatory procedures - other
P6A= Minor procedures - skin

P6B= Minor procedures - musculoskeletal
P6C= Minor procedures - other (Medicare fee schedule)
P6D= Minor procedures - other (non-Medicare fee schedule)
P7A= Oncology - radiation therapy
P7B= Oncology - other
P8A= Endoscopy - arthroscopy
P8B= Endoscopy - upper gastrointestinal
P8C= Endoscopy - sigmoidoscopy
P8D= Endoscopy - colonoscopy
P8E = Endoscopy - cystoscopy
P8F = Endoscopy - bronchoscopy
P8G= Endoscopy - laparoscopic cholecystectomy
P8H= Endoscopy - laryngoscopy
P8I = Endoscopy - other
P9A= Dialysis services (Medicare Fee Schedule)
P9B= Dialysis services (non-Medicare fee schedule)

(3) IMAGING

I1A = Standard imaging - chest
I1B = Standard imaging - musculoskeletal
I1C = Standard imaging - breast
I1D = Standard imaging - contrast gastrointestinal
I1E = Standard imaging - nuclear medicine
I1F = Standard imaging - other
I2A = Advanced imaging - CAT/CT/CTA: brain/head/neck
I2B = Advanced imaging - CAT/CT/CTA: other
I2C = Advanced imaging - MRI/MRA: brain/head/neck
I2D = Advanced imaging - MRI/MRA: other
I3A = Echography/ultrasonography - eye
I3B = Echography/ultrasonography - abdomen/pelvis
I3C = Echography/ultrasonography - heart
I3D = Echography/ultrasonography - carotid arteries
I3E = Echography/ultrasonography - prostate, transrectal
I3F = Echography/ultrasonography - other
I4A = Imaging/procedure - heart including cardiac catheter
I4B = Imaging/procedure - other

(4) TESTS

T1A = Lab tests - routine venipuncture (non-Medicare fee schedule)
T1B= Lab tests - automated general profiles
T1C= Lab tests - urinalysis
T1D = Lab tests - blood counts
T1E= Lab tests - glucose
T1F= Lab tests - bacterial cultures
T1G = Lab tests - other (Medicare fee schedule)
T1H = Lab tests - other (non-Medicare fee schedule)
T2A = Other tests - electrocardiograms
T2B= Other tests - cardiovascular stress tests
T2C= Other tests - EKG monitoring
T2D = Other tests - other

(5) DURABLE MEDICAL EQUIPMENT

D1A = Medical/surgical supplies
D1B = Hospital beds
D1C = Oxygen and supplies
D1D = Wheelchairs
D1E = Other DME
D1F= Prosthetic/orthotic devices
D1G = Drugs administered through DME

(6) OTHER

O1A = Ambulance
O1B = Chiropractic
O1C = Enteral and parenteral
O1D = Chemotherapy
O1E = Other drugs
O1F= Hearing and speech services
O1G = Immunizations/vaccinations

(7) exceptions/UNCLASSIFIED

Y1 = Other - Medicare fee schedule
Y2 = Other - non-Medicare fee schedule
Z1 = Local codes
Z2 = Undefined codes

Note: For a crosswalk of HCPCS codes to BETOS codes, see http://www.cms.gov/HCPCSReleaseCodeSets/20_BETOS.asp

Source: Centers for Medicare & Medicaid Services Health Care Common Procedure Coding System, 2010.

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APPENDIX E

SPECIFIC APPROACHES FOR STANDARDIZING UNIT COSTS OF SERVICES

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Following are details on deriving standardized unit costs for each of the 16 Medicare payment systems. Discussion of Price Standardization is in Section IV.A.

Physician Services

We calculated standardized costs by using allowed charges for which the influence of Geographic Practice Cost Indices (GPCIs) is netted out. This was done by merging onto each line item the physician work, practice expense, and professional liability GPCIs by carrier and locality of each line item, weighted by the percentage of total relative value units (RVUs) associated with these three components, and dividing the allowed charge by this weighted GPCI. Allowable charges were obtained from the Carrier claims data using line-item allowable charges for up to 13 line items in a claim: LLWCHG01-LLWCHG13.

We merged the 2010 RVU file to 2010 Carrier file claims data, matching on Health Care Common Procedure Coding System (HCPCS) and modifier code (using just professional, technical, and overall modifiers—26, TC, or blank). Facility and nonfacility RVUs for physician work, practice expense, and professional liability were assigned to each line item depending on whether it was provided in a facility or nonfacility setting, consistent with CMS rules. We also merged the 2010 GPCI file to the line-item claims data by carrier and locality to obtain the work, practice expense, and professional liability GPCIs. The standardized price for each line item is equal to the allowable charges divided by the weighted GPCI, where:

Weighted GPCI = sum(((work_rvu/totrvu)*wrkgpci),(nonfacil*(nfpe_rvu/totrvu)*pegpci), ((1-nonfacil)*(fpe_rvu/totrvu)*pegpci),((mp_rvu/totrvu)*mpgpci))

Work_rvu = Work RVUs for this HCPCS+modifier code from RVU file

Totrvu = Total RVUs for this HCPCS+modifier code from RVU file

Wrkgpci = Work GPCI from the GPCI file for this carrier and locality code

Nonfacil = 1 if the service did not take place in a facility (i.e., Place of service = (01, 03, 04, 09, 11, 12, 13, 14, 15, 16, 17, 20, 25, 32, 33, 49, 50, 54, 55, 57, 60, 62, 65, 71, 72, 81, 99)

Nfpe_rvu = Practice Expense RVUs for this HCPCS+modifier code for services taking place in a nonfacility

Pegpci = Practice expense GPCI from the GPCI file for this carrier and locality code

Fpe_rvu = Practice Expense RVUs for this HCPCS+modifier code for services taking place in a facility

Mp_rvu = Malpractice RVUs for this HCPCS+modifier code

Mpgpci = Malpractice expense GPCI from the GPCI file for this carrier and locality code

A number of professional services are not paid on an RVU basis, but are carrier priced (for example, new technologies). For these, we calculated the mean allowed charge for each non-RVU HCPCS code in 2010. These mean values were matched back to line-item claims by using the HCPCS code.

On June 1, 2010, CMS increased the conversion factor for physician services by 2.2 percent, from $36.0791 to $36.8729. In order to put all line-item claims on the same "equal" basis, we multiplied the standardized price for line items that occurred between January 1, 2010, and May 31, 2010, by 1.022.

Anesthesiology Services

Payments for anesthesiology services followed a different formula, where specific types of surgeries (as indicated by HCPCS codes) were assigned differing numbers of base units. In addition, the number of time units (in 15-minute increments) was added to the number of base units and the total multiplied by a regional conversion factor that accounts for local wage and other input costs. Actual payments were even more complex, because often payments to physician anesthesiologists vary depending on the number of certified registered nurse anesthesiologists they are supervising. Because of the complexities of the payment rules, which we would not always be able to replicate, we used the allowed charge divided by the local conversion factor as our standardized unit cost. This eliminates the influence of geographic adjusters.

Ambulance Services

Ambulance services are also captured by HCPCS codes. Payment often accounts for the mileage driven (with special provisions for rural providers), equipment used, and other factors. Because we did not want to measure a physician's resource use on the basis of how far his or her patients need to travel during ambulance trips, or whether patients live in urban or rural areas, we calculated national per-unit average allowed charges for each ambulance HCPCS code that appeared in the data and assigned them mean values, matching on HCPCS codes, as our standardized unit costs. We adjusted the standardized cost by checking the ratio of actual allowable charges to standardized costs and setting the standardized cost equal to allowable charges if this ratio was either no higher than 0.8 or no less than 1.5.

Clinical Laboratory Services

Clinical lab services are priced by carriers, subject to a ceiling price referred to as the National Limitation Amount (NLA). In practice, most such services are priced at the NLA. We assigned the national average allowed charge multiplied by the number of units for each HCPCS code as our standardized unit cost. For most such codes, this was equivalent to the NLA. Sometimes the units are reported in the claims data using a system different from the NLA tables. We adjusted the standardized cost by checking the ratio of actual allowable charges to standardized costs and setting the standardized cost equal to allowable charges if this ratio was less than 0.5 or greater than 1.1.

Part B Drugs

Part B drugs are priced nationally. Starting in 2009, Part B drug payments are based on average sales prices, which are updated quarterly. Consequently, we standardized unit costs for 2010 by calculating the average allowed charge by Part B drug HCPCS code in 2010 and applied these means, accounting for the number of units administered. Sometimes the units are reported in the claims data differently by different carriers. We adjusted the standardized cost for outliers by checking the ratio of actual allowable charges to standardized costs, and setting the standardized cost equal to allowable charges if this ratio was less than 0.5 or greater than 1.5.

Ambulatory Surgical Center Services

Physician services provided in Ambulatory Surgical Centers (ASCs) are billed separately from facility charges. Physician charges were handled as described above. For ASC facility charges in 2010, HCPCS codes were used to assign an Ambulatory Payment Classification (APC) to each procedure approved to be provided in an ASC. A procedure is defined as occurring in an ASC if the Place of Service = 24 and the type of service = F—ambulatory surgical center (facility usage for surgical services). The national APC payment rate was then assigned to each ASC claim, adjusting for units of service. Consistent with payment rules, the payment for second and subsequent procedures, as specified by modifier codes, was reduced by 50 percent. Sometimes the units are reported in the claims data differently by different carriers or the meaning of modifier codes is not interpreted accurately. We adjusted the standardized price by multiplying it by 1.5 when the modifier was a 50 or 51 and the ratio of actual allowable charges to standardized costs was between 1.25 and 1.75. We also adjusted the standardized price by multiplying it by 2 when the modifier was 50 and the ratio of actual allowable charges to standardized costs was between 1.75 and 2.25. In addition, we adjusted the standardized price by multiplying it by 0.5 when the modifier was 51 and the ratio of actual allowable charges to standardized costs was between 0.35 and 0.65. We also adjusted the standardized cost for outliers by checking the ratio of actual allowable charges to standardized costs, and set the standardized cost equal to allowable charges if this ratio was less than 0.6 or greater than 1.4.

Hospital Inpatient Services

Inpatient hospitals were classified as Short Term Acute Care Hospitals based on the last four characters of the PROVIDER field equal to 0001-0899 or 1300-1399. We calculated the base year average payment (from all sources) by DRG, and assigned that mean to hospital stays as our standardized unit cost. The base year average payment was calculated as: Claim payment amount + Beneficiary inpatient deductible amount + Beneficiary Part A coinsurance liability amount + Primary payer claim payment amount + Claim pass through per diem amount (PMT_AMT+DED_AMT+COIN_AMT+PRPAYAMT+PER_DIEM).

Adjustments for hospital transfers were made according to regulations in place in 2010. A transfer claim was defined as follows:

The length of stay for the claim is less than the geometric mean length of stay for that DRG *and*

a) Status code (variable STUS_CD) = 02, 05, 43, 66 *or*

b) Status code = 03, 06, 50, 51, 61, 62, 63, 64, 65 AND the DRG is a post-acute DRG as defined by CMS

Standardized costs for transfer claims were calculated as the mean per diem payment for a DRG multiplied by the length of stay in the claim. Because we wished to standardize unit costs across all short-stay hospitals, no special procedures were applied to critical access hospitals, which are paid retrospectively. We applied 2010 DRG averages to all short-stay claims. We checked the ratio of actual total payments-outlier payments to standardized costs, and set the standardized cost equal to actual total payments-outlier payments if this ratio was less than 0.5 or greater than 2.0.

Skilled Nursing Facility Services

Medicare uses a prospective system to calculate a per diem rate for SNFs, and then retrospectively pays on the basis of the length of stay. Daily rates are set according to resource utilization groups (RUGs), which are based on therapy and service use, the presence of certain medical conditions, and activities of daily living. Consequently, we melded our approach of creating standardized unit costs in prospective and retrospective payment systems by calculating the average daily rate nationally for each RUG in our base year, then multiplying these mean values by the length of stay to create the standardized unit cost. The total payment for each stay was calculated as: Claim payment amount + Beneficiary inpatient deductible amount + Beneficiary Part A coinsurance liability amount + Primary payer claim payment amount + Claim pass through per diem amount + Beneficiary blood deductible liability amount (PMT _AMT+DED_AMT+COIN_AMT+PRPAYAMT+PER_DIEM+BLDDEDAM). SNF length of stay was calculated as "the last day on the billing statement covering services rendered to the beneficiary" minus "the first day on the billing statement covering services rendered to the beneficiary" plus one (THRU_DT-FROM_DT + 1).

On October 1, 2010, the number of RUG classifications increased from 53 to 66. Therefore, we divided the 2010 data into two groups: claims occurring before October 30 and claims occurring on or after that date. Within each group, we calculated the total average daily rate for each RUG and multiplied the average daily RUG mean by the length of stay to obtain the standardized cost. We adjusted each group for outliers, setting the standardized cost equal to the payment when the ratio of payments to standardized costs was overly small or overly large. For SNF claims occurring before October 1, we set standardized cost to actual payment if the ratio of payment to standardized price was less than 0.5 or greater than 1.6. For SNF claims occurring on or after October 1, we set standardized cost to actual payment if the ratio of payment to standardized cost was less than 0.5 or greater than 2.0.

Home Health

Home health is paid a prospectively set rate per 60-day episode unit. Payment is based on 153 home health resource groups, where payment reflects the expected cost of the patient given the patient's clinical and functional presentation as well as the number of therapy visits.

Payment for home health claims was calculated as the sum over all line items (up to 45 line items) of: Revenue center payment amount + Revenue center 2nd Medicare secondary payer paid amount + Revenue center coinsurance/wage adjusted coinsurance (REVPMTii+ RMVSP1ii+RVMSP2ii+WGDJii). We calculated standardized payment by dividing the total payment for the claim by the percentage attributed to labor and capital (77.082 percent) times the wage index plus the percentage attributed to nonlabor (22.918 percent). We obtained the wage index for each provider by looking up the Core Based Statistical Area (CBSA) for each home health provider downloaded from the CMS website, and by looking up the home health wage index for each CBSA, also downloaded from the CMS website. We examined the standardized cost for outliers by checking the ratio of actual total payments to standardized costs, and set the standardized cost equal to actual total payments if this ratio was less than 0.5 or greater than 2.0.

Hospital Outpatient Services

The majority of hospital outpatient services are paid at a prospectively set rate. Specific services, as indicated by HCPCS codes, map into APCs. Payment is based on a conversion factor times relative weights assigned to each APC, with further adjustment for local input prices and other provider-specific policy adjustments. We calculated APC-specific standardized unit costs as the product of the annual conversion factor in 2010 times the APC relative weight, and assigned these values to outpatient claims, matching on the APC value. We adjusted for units based on the units and status indicator value using CMS rules.

For services and providers not covered under CMS' Outpatient Prospective Payment System (OPPS), we assigned national average payments for each HCPCS code, accounting for modifiers related to professional and technical services. The payments for each line item were calculated as: Revenue center payment amount + Revenue center cash deductible amount + Revenue center coinsurance/wage adjusted coinsurance (REVPMTAii+RVDTBLAii+WGDJAii), where ii refers to the line item number. Outpatient services can have up to 45 line items per claim. We adjusted the standardized cost by checking the ratio of actual total payments, wage-adjusted by CBSA of the provider, to standardized costs, and setting the standardized cost equal to wage-adjusted actual total payments if this ratio was less than 0.5 or greater than 1.5.

Inpatient Rehabilitation Facilities and Long-Term Care Hospitals

We classified hospitals as inpatient rehabilitation facilities (IRFs) or long-term care (LTC) facilities based on (1) the last 4 digits of the PROVIDER field equal to IRF Hospital=3025-3099 or LTC Hospital=2000-2299, or (2) third character of PROVIDER = R or T.

IRFs are paid using a prospective system in which payment is based on case-mix groups (CMGs), which capture various patient characteristics. The CMG-based standardized unit cost was calculated using the 2010 IRF base rate times the relative weight associated with the CMG. In cases where the CMG on the claim did not appear in the 2010 rate table, we set the standardized cost to be the mean of that CMG.

Medicare pays for the operating and capital costs associated with hospital inpatient stays in LTC hospitals. Medicare sets per-discharge payment rates for different CMGs called long-term care diagnosis-related groups (LTC-DRGs) based on the expected relative costliness of treatment for patients in the group. As with IRF stays, we lacked sufficient observations of LTC hospital stays in 2010 to provide reliable LTC-DRG level average costs. Therefore, we calculated the

LTC-DRG unit cost using the 2010 LTC-DRG base rate times the relative weight associated with the LTC-DRG.

We adjusted the standardized cost for both IRF and LTC hospitals by checking the ratio of actual total payments-outlier payments to standardized costs, and setting the standardized cost equal to actual total payments-outlier payments if the ratio was less than 0.5 or greater than 2.0.

Inpatient Psychiatric Facilities

An inpatient hospital was classified as a psychiatric hospital based on the last 4 digits of the PROVIDER field equal to 4000-4499 *or* third character of PROVIDER is an M or S. Inpatient psychiatric facilities are paid using a hybrid prospective/retrospective system that lends itself to the average unit cost adjusted for actual length of stay approach described above. Payment is based on a DRG-based per diem rate that is multiplied by the length of stay (with various adjustments). We calculated average per diem rates using claims from 2010 for each relevant DRG. The average was then multiplied by the length of stay associated with the claim to derive the standardized payment. We adjusted the standardized price for short stays based an empirical examination of the data. We also adjusted the standardized cost for inpatient psychiatric hospitals by checking the ratio of actual total payments-outlier payments to standardized costs, and setting the standardized cost equal to actual total payments-outlier payments if this ratio was less than 0.5 or greater than 2.0.

Durable Medical Equipment

Unit costs paid for DME are set according to state fee schedules (or at charges, if less). We calculated the average payment for each type of equipment in 2010 from the entire sample of DME claims. Payments for DME were calculated as: Line payment amount + Beneficiary Part B deductible amount + Line coinsurance amount + Line Beneficiary Primary Payer Paid Amount (LNPMTii+LDDMTii+CNMTii+LPRDMTii), where ii refers to the line item number. There are up to 13 line items in the DME claims.

Types of equipment are defined by HCPCS codes. We assigned these values to individual line item claims after matching on the HCPCS code. For some types of equipment, there are different payment rates depending on whether the equipment was purchased or rented. Consequently, for these types we calculated separate mean values and made standardized unit cost assignment accordingly. In averaging rental fees, we adjusted for varying time periods during which the equipment was rented. We adjusted the standardized cost by checking the ratio of actual total payments to standardized costs and setting the standardized cost equal to actual total payments if the ratio was less than 0.5 or greater than 1.5.