Prototype Medicare Resource Utilization Report Based on Episode Groupers

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Thomas MaCurdy, Ph.D.
Nick Theobald, Ph.D.
Jason Kerwin
Ken Ueda

CMS Project Officer
Frederick Thomas, Ph.D.

Acumen, LLC

Acumen, LLC

500 Airport Blvd., Suite 365

Burlingame, CA 94010

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EXECUTIVE SUMMARY

In response to rapidly rising Medicare costs, the Centers for Medicare and Medicaid Services (CMS) have undertaken efforts to stem this increase by exploring a variety of value-based purchasing (VBP) initiatives aimed at containing costs while improving the quality of care for Medicare beneficiaries. There are wide variations in patterns of practice within and across regions, indicating differences in resource utilization (as generally measured by cost), but, as research has shown, these differences do not necessarily correlate with quality of care. To advance policymakers' understanding of the nature and extent of variation in practice patterns, CMS and other government agencies have evaluated alternative approaches for comparing relative resource use for various types of medical care. A key initial goal of these efforts consists of providing feedback and education to encourage cost-efficient practice by physicians and hospitals, with the potential follow-on goal of developing pay-for-performance systems that reward health care professionals for cost-effective medical care.

As part of the initial goal of providing feedback to providers, the objective of this study is to develop a prototype resource utilization report (RUR) for physicians participating in the Medicare FFS (fee-for-service) system, based on claims data from the Parts A and B programs. The purpose of the RUR is to rate individual providers' performance relative to others in their peer group by summarizing the costs of care provided by each physician responsible for guiding patients' medical treatments. By providing such information, RURs may assist in the education of healthcare professionals about their role in Medicare resource use. Such a tool could assist physicians to reduce their utilization of resources without sacrificing the quality of patient care.

The steps in creating RURs for Medicare physicians involve answering a set of questions that establish the process of assigning cost efficiency "scores" to providers and ranking them in meaningful comparison groups:

(1) *How should Medicare costs be apportioned into episodes of care?*
(2) *Which providers are eligible for the assignment of costs?*
(3) *How should episode costs be attributed to eligible physicians?*
(4) *How many episodes are required to develop a score for a physician treating a specific illness?*
(5) *What is the relevant peer group for a provider?*

(6) *What adjustments should be incorporated in scoring to account for sickness of patients and other ancillary factors influencing cost?*

(7) *What is an RUR score for a physician?*

(8) *How should scores for different types of episodes be aggregated into a single score for physicians?*

(9) *Are individual physicians scored similarly across different RUR scoring regimes?*

In the sections below, we describe our approach to answering these nine questions that take us through the process of creating episodes of care from claims data, attributing costs to providers, identifying comparison groups, and developing an RUR scoring methodology.

1. How should Medicare costs be apportioned into episodes of care?

To attribute costs of care to individual providers, Medicare payments must be first grouped into episodes of care. Such episodes are meant to capture all costs (or claims) for treating a particular illness or condition for a patient, from the time of an initial diagnosis by a clinician to the end of services for that health condition. To build episodes from claims data for this study, we use two commercially available software packages, the Symmetry ETG and Medstat MEG groupers. We apply these software algorithms to create episodes of care from claims data for beneficiaries in the state of Oregon in the calendar year 2003. The populations of episodes produced by the two groupers represent the units of analysis for physician profiling. Both groupers map claims to episodes, but they take different approaches to using information on claims and have different disease classifications to define an episode. In allocating claims into health-related episodes, Medstat categorizes 560 Medical Episode Groups (MEGs), and including severity levels, Symmetry categorizes 679 Episode Treatment Groups (ETGs). As a result, the two populations of episodes consist of different aggregations of claims and costs. This report presents an overview of how each grouper allocates Medicare claims into episodes of care.

2. Which providers are eligible for the assignment of costs?

Once episodes have been created, we need to identify the providers to whom these episodes of care can be attributed. This entails first identifying individual providers who treat Medicare patients; for this report, providers who treat Oregon beneficiaries. In the 2003 claims data, physician identifiers lack the ability to identify a physician uniquely. We choose Tax IDs as the most reliable identifier. There are many instances wherein a Tax ID represents a practice instead of a single physician, and also corresponds to more than one specialty.

Once a pool of providers has been established, the next task requires formulating a rule for attributing the episode of care to a provider. Since Part B (PB) claims are most often filed by physicians, research in this field often uses these claims for attributing costs of an episode to a physician. PB claims for evaluation and management (E&M) services are also commonly used, as they indicate a provider who is directing the course of care for treating a patient's condition(s). In this study, we identify the pool of eligible providers to be those who filed PB claims that were assigned to complete episodes by a grouper. Of the nearly 10,000 Oregon providers eligible to receive Medicare Payments in 2003, nearly 40 percent have a PB claim in 2003 for Oregon beneficiaries.

3. How should episode costs be attributed to eligible physicians?

Generally speaking, care for a patient's episode is primarily influenced by just one provider, as indicated by a majority of episodes constructed from PB claims submitted by a single provider. In such instances, attributing episode costs is straightforward since only one candidate physician shows up as participating in the episode of care. However, depending on episode types, between 10 and 26 percent of episodes have PB claims from more than one physician. Such episodes require rules for attribution to a single provider. We evaluate two plurality-based rules for determining attribution: one assigns responsibility for episode care to the provider with the most PB costs (PBmax), and another assigns responsibility to the provider with the most E&M charges (EMmax). The effects of these attribution rules on the coverage of costs and eligible providers are similar across episodes produced by the Medstat and Symmetry groupers. Under the PBmax attribution rule, roughly 80 percent of episodes and 90 percent of episode costs are attributed to 90 percent of eligible providers. Under the EMmax attribution rule, approximately 60 percent of episodes and 80 of episode costs are attributed to 60 percent of eligible providers. Not surprising, the choice of attribution rule can affect which provider is assigned an episode. For instance, we find cases where surgeons filing expensive PB claims are attributed episodes under the PBmax rule, whereas internal medicine or family practice providers filing the bulk of E&M claims are attributed the same episodes under the EMmax rule. On average, 25 percent of episode costs originate from attributed providers' PB claims. Because scores are intended to reflect resource use by the provider attributed with episode costs, they

must take into account that a large portion of resources devoted to treating episodes are potentially incurred by a non-attributed provider.

4. How many episodes are required to develop a score for a physician treating a specific illness?

Each provider's measure of cost or resource utilization should be based on enough episodes of comparable types to present a legitimate picture of their practice. In selecting the required number of episodes needed to develop a score, one must consider the tradeoff between reliability in computing scores and the number of providers who qualify to be scored. If the minimum number is set too low, a provider's score will be more sensitive to an outlier episode. On the other hand, if this threshold is set too high, it reduces the number of providers for whom a score can be calculated and additionally lowers the share of episode costs evaluated by the scoring.

According to our analysis, requiring that providers be attributed at least 10 episodes before they qualify for scoring means that about 60 percent of the eligible pool would receive a score under the PBmax rule and 50 percent under the EMmax rule. Requiring further that these episodes be of the same type implies that 40-50 percent of providers would receive a score covering 50-60 percent of the costs under the PBmax rule, with the values realized in these ranges depending on whether one uses Symmetry or Medstat attributed episodes. The ranges drop to 30-40 percent of eligible providers and 40-50 percent of costs under the EMmax rule. If one raises the minimum number of episodes to 30, at least 70 percent of providers would not receive a score under either attribution rule or grouper, and more than 60 percent of total episode costs would be left unassigned.

5. What is the relevant peer group for a provider?

The specification of a peer group determines size of the group, whether providers are evaluated within or across specialties, and whether physicians are compared for treating episodes of a common type. Computing cost efficiency scores for the same episode type measures costs for similar forms of medical treatments, and further restricting comparisons to be done within specialties adds to the similarity of the services allotted to treat health conditions. A peer group specification defines two quantities: (i) how many episodes of a designated variety must be

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attributed to a provider before this physician is included in the group, and (ii) how many providers must be present in the group before scores are assigned to its members. Increasing either of these numbers reduces the share of providers and medical costs evaluated by RUR scores. A further specification of the peer group requires members to be of the same specialty. Implementing this restriction creates a more homogeneous peer group but decreases the share of providers receiving profiles.

Our analysis explores the consequences of considering several alternative specifications of peer groups. Under the PBmax rule, requiring at least 10 providers of the same specialty each of which have been attributed at least 10 episodes of the same type implies that 35-45 percent of eligible providers would receive RUR scores and scored services would cover between 35-45 percent of Medicare costs. (These ranges come about due to differences across the Symmetry or Medstat grouper.) Under the EMmax rule, these ranges uniformly drop by about 10 percentage points. Overall, EMmax-attributed episodes are more sensitive to increases in peer group restrictions than PBmax.

6. What adjustments should be incorporated into scoring to account for sickness of patients and other ancillary factors influencing cost?

The purpose of profiling physicians is to assess a provider's cost efficiency in treating patients. One key challenge, though, is how to distinguish between factors influenced by a physician's behavior and circumstances affecting medical costs beyond the control of the provider. Comparing costs for care linked to episodes of the same type done by physicians in the same specialty in part compensates for this distinction. However, some differences in cost still exist within these categories, reflecting a patient's pre-existing health status and cost factors external to a provider's decisions. Any measure of cost efficiency, then, must recognize and account for these differences. Otherwise, physicians will be penalized for treating more severe case mixes or cases in areas with more expensive resource prices.

We introduce a regression methodology to purge differences in episode costs caused by factors other than the provider's efficiency. This is done by regressing the costs for a specific episode type on a set of explanatory variables capturing aspects of patient risk factors and differentials in costs related to alternative medical specialties. We use the estimation output from this regression model to calculate an adjusted cost figure for each provider, normalized to the

average cost corresponding to a baseline risk group for the episode type. In this analysis, we control for geographic variation in costs, to a great extent, by focusing on a single state. Our regression approach offers a flexible framework for capturing patient risk factors and regional cost structures through the incorporation of different variables in statistical relationships.

7. What is an RUR score for a physician?

An RUR is intended to provide a physician with information on his or her cost efficiency, as well to help stakeholders evaluate the performance of physicians. We present efficiency scores for each episode type for all providers assignable to a peer group. This score evaluates the provider's cost by benchmarking it to the average costs of physicians in the same specialty treating the same type of episodes for baseline cases. With the benchmark score being equal to 1, a provider's individual score can be interpreted as the percentage difference in costs relative to the baseline value. For example, a score of 1.2 for pneumonia episodes indicates that a provider uses 20 percent more resources on average compared to other providers in the same specialty for the benchmark case; a score of 0.8 implies a 20 percent savings relative to the benchmark level of resources. While this score offers an ease of interpretation, there are limitations in its ability to evaluate providers. As the score is specific to an episode type, it cannot assess a provider's overall efficiency across episodes. In addition to being episode-type specific, the score is also specific to a specialty, thus limiting the ability to compare costs across specialties. While not done here, scores could be adapted to allow for assessments across specialties assuming the appropriate empirical controls could be included to make the forms of care comparable across specialties.

8. How should scores for different types of episodes be aggregated into a single score for physicians?

Providers often receive multiple episode-specific RUR scores, and stakeholders typically wish to have an overall evaluation of a physician's cost efficiency. We compute such measures for providers by computing weighted averages of the scores earned on each attributed episode type. To investigate the potential sensitivity of evaluations to different weighting schemes, we consider two variants: our primary scheme weights scores based on the average costs for the specialty by episode type, and our secondary scheme allows weights to vary based on the individual experiences of an evaluated provider. We find little differences in overall scores

produced by these two weighting schemes; however, these alternatives do induce somewhat different incentives encouraging providers to adjust their behavior to improve their overall evaluation. The baseline value for the overall score equals 1, and, as in the case of the episode-specific scores, an individual's aggregated score measures the provider's percentage differences in costs relative to the benchmark for contemporary peers. Since this cost measure does not hold the practice experience of providers constant, it may have somewhat limited applicability in comparing scores across physicians either within or across specialties.

9. Are individual physicians scored similarly across different RUR scoring regimes?

RUR scores often vary depending to the attribution rule and the peer-group specification used to construct them. Switching between the PBmax and EMmax attribution rules can lead to substantial differences in RUR scores for a notable number of providers.   In particular, with a base value in the overall score equal to 1, one-fifth of providers experience larger than a 0.25 point change in their scores considering Symmetry episodes, and more than a 0.38 change using Medstat-attributed episodes. Switching from the PBmax to the EMmax attribution causes 3.5 percent of providers to move from below average to above average cost scores for Symmetry episodes; another 3.5 percent change from below average to above average. For Medstat episodes, over 6 percent of providers change from above average to below average scores, and another 3 percent change from below average to above average. Similar findings arise when peer group specifications increase the number of attributed episodes and providers required for score assignment.

Even larger differences occur when comparing RUR scores across groupers. Using PBmax-attributed episodes, one-fifth of providers experience nearly 0.5 point change in their scores, with the largest change as high as 3.88 points. Scores for 6 percent of providers change from indicating below average to above average resource use when switching from the Symmetry grouper to Medstat, and another 11 percent of providers change from showing above average resource use to below average. Similar patterns between the groupers arise when using EMmax rules for attribution.

LIST OF TABLES AND FIGURES

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1   INTRODUCTION

This study develops a prototype of a resource utilization report (RUR) for physicians participating in the Medicare FFS (fee-for-service) system, based on claims data from the Parts A and B programs.[1] The primary purpose of a RUR is to summarize the costs of care provided by each physician responsible for guiding patients' medical treatments, rating individual performance relative to others in their peer group. Through affording providers such information, RURs may assist in the education of healthcare professionals about their role in Medicare resource use. Such a tool could encourage physicians to reduce their utilization of resources without sacrificing the quality of patient care.

The steps in creating RURs for Medicare physicians require answering several key questions that determine the process of assigning cost efficiency "scores" to providers and ranking them in meaningful comparison groups. As a framework for this paper, we review the nine questions that must be answered in moving from claims to RUR scores for physicians.

1.1   Defining Episodes of Care and Attribution Rules

The first set of questions involves defining episodes of care and attributing these episodes to providers. One must initially take up the key question:

(1) *How should Medicare costs be apportioned into episodes of care?*

While Medicare payments do not necessarily reflect the cost of treating a patient, they do represent the costs borne by the program. As such, they serve as the measure of cost for the purposes of attribution and subsequent profiling. However, patients often experience several conditions simultaneously, so the challenge becomes how to distribute the cost of services reflected in claims into episodes of care that can be appropriately attributed to the healthcare professionals responsible for the care. To build episodes from claims, this study relies on two commercially available software packages: the Symmetry ETG and Medstat MEG groupers. These groupers seek to organize administrative medical claims into episodes of medical treatment for specific categories of illnesses. In grouping claims into health-related episodes, Medstat categorizes 560 Medical Episode Groups (MEGs), and including severity levels, Symmetry categorizes 679 Episode Treatment Groups (ETGs). In an earlier report, we

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[1] While prescription drugs are considered as part of a patient's treatment, Part D is not included in this exercise.

extensively evaluated the functionality of the Symmetry and Medstat groupers in constructing episodes of care. This study builds on this previous analysis by introducing the extra steps involved in linking episodes to providers and in assigning scores based on the resources expended in these episodes.

Prior to attribution, one faces the problem of identifying a candidate pool of healthcare professionals that can be assigned to the care and, in turn, the costs of an episode. This leads to asking:

(2) *Which providers are eligible for the assignment of costs?*

Since physicians play major roles in guiding patients' medical treatments, they are typically viewed as managing care for patients by hospitals and other forms of institutions. As Medicare reimburses physicians for their services through Part B (PB), PB claims grouped to episodes of care are often used to identify the candidate pool of providers for answering question (2).[2] The issue then becomes:

(3) *How should episode costs be attributed to eligible physicians?*

Many assignment rules have been proposed in the literature. Some assignment rules are based on the number of submissions of Part B claims that cover services representing health management functions. Others are based on dollar amounts, reflecting the idea that providers supplying the most costly services exert the greatest influence in guiding care. This study considers several approaches for assigning episode costs to providers and compares how these different approaches alter findings.

1.2 Selecting Comparison Groups and Methods of Scoring Resource Utilization

Given the attribution of episodes and their costs to providers, one then encounters the following questions in creating a score:

(4) *How many episodes are required to develop a score for a physician treating a specific illness?*

(5) *What is the relevant peer group for a provider?*

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[2] We use the term providers often to refer to physicians, as PB claims and other data sources cannot reliably distinguish between an individual physician and a group. As such, the term provider covers both a physician and a group practice.

The selected peer group determines whether physicians are evaluated within or across specialties, and whether providers are compared for treating the same episode type (i.e., similar forms of health services). The choice of the number of episodes determines how involved a physician must be in providing care to justify receiving a score about relative resource efficiency.

The case mix of care served by physicians typically differs in its intensity and complexity, and this is true even after restricting episodes to the same category of illness and confining providers to the same specialty. This brings up the question:

(6) *What adjustments should be incorporated in scoring to account for the sickness of a patient and other ancillary factors influencing an episode's cost?*

Addressing this topic deals with the challenge of the risk adjustment of health-care costs for an episode, for which many approaches can be found in the literature. Although our analysis implements only a few methods, its framework can incorporate a rich array of alternatives.

Given the information produced by the above decisions, one has the necessary foundation for addressing the central question motivating this study:

(7) *What is an RUR score for a physician for an episode type?*

Our analysis develops scores structured similarly to those quantities assigned by CMS in its application of risk adjustment in the setting of Medicare's premiums for managed care plans; like these quantities, our RUR scores are normalized to 1 with a score higher than 1 measuring the relative amount of resources expended above the average level and a score below 1 indicating lower than average resource use. Specifically, we develop a score that identifies the relative difference in resources used by a provider to treat a specific episode type. To enforce comparability across providers, we initially introduce measures for these scores that evaluate relative cost efficiencies within specialties for the same type of episode. Consequently, to create an overall score for a provider, we encounter the question:

(8) *How should scores for different types of episodes be aggregated into a single score for physicians?*

There are several methods to constructing an aggregate score. One is to take a simple average of a provider's episode-specific scores, giving each score equal weight regardless of number of episodes of each type or the resource level required to treat episode types. A second

approach is to take a weighted average that takes into account the resources used for each episode to create a score. Alternative schemes for weighting episode-specific scores accentuate different aspects of providers' activities and cost structure. We provide one scheme that establishes weights that are a function of the total cost of an average provider case load for an episode type.

Finally, this report entertains several alternative sets of answers to questions cited above in order to analyze a variety of approaches for assigning resource utilization scores to Medicare providers. One naturally wants to know:

(9) *Are individual physicians scored similarly across different RUR scoring regimes?*

Our results reveal substantial variation occurs in the rating of physicians in response to altering the decisions outlined above in creating an RUR. Ratings are sensitive to changes such as switching the commercial grouper used in constructing episodes, along with what precise specification one adopts in running each grouper.

The body of this report is divided into five sections. Section 2 starts with question (1) cited above, drawing heavily on the results presented in our previous report describing the functionality of the Symmetry and Medstat groupers. Section 3 addresses questions (3) and (4), considering attribution methods based on the amounts of Part B and E&M (evaluation and management) claim costs linked to episodes. Section 4 answers questions (4) and (5), showing the portion of Medicare providers and associated costs covered as one varies the characteristics of peer groups and requirements regarding the extent of physicians' experience in providing the type of care under consideration. Section 5 takes on questions (6), (7) and (8), introducing a regression framework to adjust RUR scores for differences in providers' case mix, specialty, and type of treated illness. Finally, Section 6 presents an overall summary of findings and demonstrates the high sensitivity of the ratings assigned to Medicare providers arising from the adoption of different RUR regimes.

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Resource Utilization Reports (RURs) compare across health care professionals attributed with costs of treating patients for similar medical conditions. To answer our first question – *How should Medicare costs be apportioned into episodes of care?* – we rely on two commercial software packages, the Symmetry ETG and Medstat MEG groupers.[3] Using Medicare claims as inputs, we use these groupers to create episodes of care for a sample of Medicare beneficiaries to which we assign costs derived from claim payments. The specific configurations and input files used to create the episodes analyzed in this report are described in detail in MaCurdy et al. (2008)—a previous report by the authors that evaluates the functionality of the Symmetry and Medstat groupers; much of the material in the following discussion draws extensively on this previous report.

To demonstrate how the episode grouping is accomplished, this section briefly reviews the data structures in Medicare claims, their use in grouper software, and the resulting division of costs into episodes of care. The specific data and episodes summarized in this section, and used later when discussing the development of RURs, come from Medicare claims for the state of Oregon in the calendar year 2003, with some corresponding data added for the years 2002 and 2004 to construct complete episodes for 2003.

2.1 Application of Medicare Claims to Episodic Groupers

The episode groupers use specific data elements from Medicare claims to create episodes of care. In this subsection we review the information needed by groupers to build episodes of care as it relates to the sample used in this study. We then consider some of the particular features of Medicare claims that impact this analysis.

2.1.1 Information Used to Build Episodes of Care

Episodes of care are meant to capture all claims for a patient who is treated for a particular illness or condition from the time of an initial diagnosis by a clinician to the end of services for that health condition. Thus, an episode is a group of diagnosis-related claims, the

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[3] INGENIX Symmetry Episode Treatment Groups Version 7.0.1 and Thomson Reuters Medical Episode Grouper Version 7.1.0.

first of which often occurs when a patient visits a doctor's office or a hospital. All claims associated with that diagnosis are aggregated, until there are no additional claims for the same episode type for a given period of time – in other words, "a clean period." The aggregation of claims into an episode allows one to measure the elapsed time from diagnosis to last treatment for an acute episode, the procedures provided, and the cost to treat a given episode of a specific disease or condition. The groupers use claim information similarly to construct measures of care for chronic conditions, but since chronic conditions are not episodic, the groupers define chronic episodes as care given within a certain period; the standard period for a chronic episode is one year.

Algorithms that construct episodes of care extract specific data items from claims, including:

- Diagnosis codes
- Procedure and/or revenue center codes
- Start and end dates
- Costs
- Patient characteristics

Episode grouping software must process the information for these items for seven different types of Medicare claims: inpatient (IP), outpatient (OP), skilled nursing facility (SNF), hospice (HS), home health (HH), Part B or carrier (PB), and durable medical equipment (DME).

Table 2.1 lists the different types of Medicare claims, distinguishes which claim types are defined as institutional, and shows the share of claims and share of costs accounted for by each of these seven claim types. The sample summarized in this table includes all claims available in 2003 for 100 percent of Medicare beneficiaries aged 65 and older who resided in the state of Oregon in 2003 and who were continuously enrolled in the FFS portions of Part A and B programs while alive. This includes more than 7 million claims representing almost $791 million in Medicare costs. Institutional claims (IP, OP, SNF, HH and HS) represented just 11.3 percent of all Oregon claims in 2003, but they accounted for 63.5 percent of the costs of Medicare.

Table 2.1: Medicare Claims and Costs by Claim Type for All Claims in 2003

	Claim Type	Institutional	Total # of Claims	% of Claims	Total Cost of Claims	% of Costs
IP	Inpatient	Y	45,328	0.65%	$308,158,841	38.97%
OP	Outpatient	Y	709,964	10.14%	$106,602,393	13.48%
SNF	Skilled Nursing Facility	Y	11,463	0.16%	$43,174,810	5.46%
HH	Home Health	Y	18,941	0.27%	$37,662,160	4.76%
HS	Hospice	Y	1,971	0.03%	$6,591,969	0.83%
PB	Part B or Carrier	N	5,768,727	82.40%	$256,135,766	32.39%
DME	Durable Medical Equipment	N	444,132	6.34%	$32,405,985	4.10%
	Total	--	7,000,526	100.00%	$790,731,924	100.00%

2.1.2 Differences between Institutional and Non-institutional Claims

The key elements on claims that groupers use to create episodes of care are diagnosis and procedure codes. However, due to different Medicare payment rules across different health care settings (i.e., inpatient, skilled nursing facility, home health, etc.), there is considerable variability in the kinds of procedure codes that show up across the different Medicare claim types. Additionally, payment policies affect the sorts of data elements reported on the various categories of claims, which in turn further complicates the interpretation of diagnoses and procedures across claim categories. For non-institutional claims (PB and DME), there is always a link between a line diagnosis code and a procedure code, as Medicare will not pay for a procedure unless it is for an allowed diagnosis. Institutional claims, though, often represent a bundle of services that can encompass a set of diagnoses. As a result, the structure of institutional claims often does not link diagnoses and procedures. Furthermore, payments for most institutional claims cannot be directly linked to procedures, creating a challenge for cost allocation.

Medicare pays PB and DME claims by the service. As a result, each line item on these non-institutional claims represents a distinct service for a distinct diagnosis with a separate payment for each item. We treat these line items, then, as individual inputs, as they are not necessarily related to other services on the claim, and they provide complete information for grouping and cost allocation. This construction allows for a clear link between diagnosis and a procedure. And critical for attribution and physician profiling, there is a direct link between services rendered and costs, as each line item identifies the payment for the service. PB and DME claims do differ, though, in that they use different procedure codes. Line items in PB

claims usually list Current Procedural Terminology (CPT) codes, but may list Health Care Common Procedure Coding System (HCPCS) instead. DME claims list HCPCS codes.

However, there is no such consistent link between diagnoses, procedures and costs on institutional claims. Further, as care in different institutional settings is paid for using different rules, each institutional claim type uses procedure codes differently. Institutional claims always have revenue center codes, the number of which is practically unlimited,[4] and they sometimes list HCPCS/CPT codes. IP claims list ICD-9 procedure codes when a DRG is also defined by a procedure, but it is rare for these claims to have HCPCS/CPT codes. This can pose a problem as Symmetry does not use ICD-9 procedure codes for grouping, so instead must rely on revenue center codes. Medstat, on the other hand, does not use revenue center codes, but can use ICD-9 procedure codes. However, both ICD-9 and revenue center codes do not provide the detail of HCPCS/CPT codes in defining procedures. Most HS and SNF claims list only revenue center codes, with only about 20 percent of SNF and 7 percent of HS claims listing ICD-9, HCPCS or CPT codes. By contrast, most OP, HH and IP claims also list procedure codes from one or more HCPCS/CPT codes. OP claims typically list CPT codes, but more than one-third also record HCPCS, and HH claims rely almost entirely on HCPCS. The maximum number of observed ICD-9 procedure codes on the claims that use them (IP, OP and SNF) is six. Non-institutional claims, by contrast, rely only on HCPCS/CPT codes.

Crucially, payment policies vary by Medicare claim type, and this variation affects cost allocation rules. Whereas non-institutional claims are paid according to the procedure code appearing on a line item that is allocated to a distinct episode, institutional claims are paid as aggregate payments. IP, OP and HH claims are paid using a prospective payment system (PPS), while SNF and HS claims are paid per diem. Aggregate IP payments are based on Diagnosis-Related Groups (DRGs), which draw on diagnosis, procedure and patient information.[5] OP payments are based on Ambulatory Payment Classifications (APCs), while HH payments are made for 60-day intervals. Payments for institutional and non-institutional claims thus differ dramatically: whereas non-institutional claims are paid by procedure, institutional claims are

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[4] Some IP claims list more than 130 revenue center codes, and some OP and HH claims list more than 350.
[5] DRGs also include payments for special hospital attributes or programs such as Disproportionate Hospital Share (DSH; for hospitals whose patient base is heavily low-income) and Indirect Medical Education (IME; for approved teaching hospitals). We partially netted these policy adjustments out of the amount paid on each IP claim by removing the capital portion of an IPPS payment so as not to penalize providers who use institutions that receive such payments.

paid on an aggregate basis no matter how many procedures are listed. So, whereas non-institutional payments can readily be allocated to a single episode, costs from institutional claim may more appropriately be allocated across multiple episodes. The challenge arises from the difficulty of disaggregating institutional claim payments in a manner that reflects resource use for treating these different episodes.

The use of aggregate payments for institutional claims is a central element of Medicare reimbursement policy. By design, the claims data do not offer a clear strategy to disaggregate these payments.[6] If it were always appropriate to allocate all procedures within a claim to the same episode, the presence of aggregated payment amounts for institutional claims would not matter. However, because institutional claims typically have multiple diagnoses, procedures, or revenue center codes, it is conceivable – indeed, likely– that the services reflected in these codes may be assignable to more than one episode. Aggregate payments thus pose a serious problem for groupers, which rely on costs to measure the resources utilized for each episode.

2.1.3 Duplicate and Denied Claims

Our analysis includes all "final action" claims. For institutional claims, the final action claims are claims that Medicare has reimbursed and thus have an associated Medicare payment. However, non-institutional claims may include denied line items, representing services not reimbursed by Medicare for a variety of reasons (e.g., billing for a medically unnecessary service, billing for a service not covered by Medicare, or submitting a duplicate line-item). Even though denied line items have zero costs, the presence of these claims may change the way claims are grouped into episodes, and thus, indirectly affect episode costs. For the purpose of the grouper analysis, we exclude all duplicate line items but keep those that are denied for other reasons. We exclude duplicate line items because they merely represent a previous encounter in the data.[7] The denied non-duplicate line items, on the other hand, represent an encounter with a healthcare professional which potentially provides clinical information useful in grouping.

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[6] Hospitals do provide revenue center level charge information for IP claims. The total charges created from the sum of revenue center charges have historically been used by CMS to weight DRGs. But whether IP revenue center charges should be used to allocate payments across episodes is unclear, largely because they are not disease-specific (e.g., charges for room and board).
[7] Excluding duplicated claims produces virtually identical grouping results compared to using all claims. However, excluding all denied claims introduces noteworthy changes in the grouping results. These results can be supplied upon request.

2.2 "Complete" Episodes

The data we input into the groupers constitutes all Medicare claims data for 100 percent of continuously-enrolled, fee-for-service Oregon beneficiaries in the entire 2002-2004 period. To use the groupers to attribute episodes to physicians, and especially, to use them to attribute costs, it is critical to concentrate on completed episodes. We use complete episodes to ensure that the attribution of an episode to a given provider will not change when more claims are added to the data. In addition, the length and the final cost of an episode can both only be determined for complete episodes.

Episodes are determined to be complete if we observe an appropriate clean period ahead of the initial date on the claims and also observe an appropriate clean period after the final date on the claims. Clean periods, or intervals during which there are no claims associated with a given episode type, are used by the groupers to determine whether two claims are close enough together in time to be considered part of the same episode. Each episode type (ETG for Symmetry and MEG for Medstat) has an associated clean period that is set by the groupers in consultation with physicians. These clean periods range from 0 days to 999 days. Acute episode types have shorter clean periods; chronic episode types have longer clean periods.

With a three-year window of data, it is not possible to determine whether we are missing claims for episodes near the beginning or end of the time period covered by our data. In other words, episodes with start dates close to January 1, 2002 or with end dates close to December 31, 2004 could have claims that would have been counted in the episode if our data had covered a longer period. Episodes with claims not included because of the time cutoffs are not complete in the clinical sense, or administratively, in that they do not include all clinical and cost information. Therefore, for inclusion in the sample of 2003 Complete Episodes, we require acute episodes to begin at least a full clean period after January 1, 2002 and end at least a full clean period before December 31, 2003.

This focus on clean periods does not fit well with the concept of a chronic condition. With a three year window of data, it is extremely difficult for chronic episodes to be deemed complete (since they need clean periods of 180 to 365 days[8]). Recognizing this, it is common

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[8] For Medstat, all chronic episode types have an associated clean period of 999 days. Such diseases effectively have a 365-day clean period, because Medstat uses an annual cutoff for chronic episodes. Thus, claims occurring one

when using episode groupers to set annual measures for chronic diseases, rather than limit the analysis to episodes that are complete using definitions based on clean periods. Following this convention, we rely on calendar year measures of chronic episodes. Hence, for inclusion in our sample, we require chronic episodes to originate from claims filed only between January 1, 2003 and December 31, 2003.

To develop a sample of episodes that comprises a representative composition of medical treatments that have run their course for any designated time horizon, one must go beyond the notion of complete episodes as defined by the grouping algorithms which only signals that treatment has been finalized. In addition to being complete from a grouper perspective, one must also select episodes in a way to avoid oversampling systematically long and costly episodes. We create such as a sample by requiring grouper-complete episodes also to satisfy the following two conditions:

- Episodes must have started beyond a clean period after January 1, 2002, with the clean period varying with an episode's assigned illness classification. This criterion ensures each episode has a well defined start within our 2002-2004 sample horizon.

- Episodes must end during 2003.

We term the sample of episodes meeting these conditions as the group of 2003 Complete Episodes. This sample provides a collection of finalized episodes of care that is representative of the cost and duration of treatment in the year 2003. Sections 5.2 and 7.2 of our previous report on grouper functionality (MaCurdy et al., 2008) discuss the properties of 2003 Complete Episodes further and elaborate the advantages of using this sample for attribution exercises.

2.3 Characteristics of Episodes Created by the Symmetry Grouper

In this subsection, we begin by describing how Symmetry Episode Treatment Groups (ETGs) are defined. Next, we review several critical features of the Symmetry grouper program, and briefly describe our implementation of Symmetry's software to construct the population of episodes analyzed in subsequent sections investigating the impacts of different attribution rules. Finally, we describe the characteristics of Symmetry episodes for 2003 Oregon beneficiaries.

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year apart should always be grouped to different episodes. For this reason, and to make completeness statistics of chronic episode types more comparable between the two groupers, we use 365-day clean periods for these MEGs.

2.3.1 Key Features of ETG Episodes of Care

Symmetry Episode Treatment Groups (ETGs) group all related medical services, regardless of the setting in which they are delivered. ETGs combine claims of many types to build episodes that begin with the start of treatment and continue until there is an absence of treatment. Each base ETG belongs to a specific Major Practice Category (MPC), with each MPC representing a body system and/or specialty area. "Severity levels" add an additional level of granularity to a subset of ETGs; at the request of the vendor, we define "ETG" in this report to mean the combination of a base ETG and a severity level for the subset where severity levels are applicable. A base ETG can have up to 4 levels of severity.

In addition to diagnoses, Symmetry's grouping process uses both procedure codes and revenue center codes. As noted above, the listing of codes varies across claim types. Whereas OP, HH, DME, and PB claims report HCPCS/CPT procedure codes for payment, IP, SNF, and HS claims supply only revenue center codes on a consistent basis. OP and HH claims report both revenue center and HCPCS/CPT (as opposed to ICD-9) procedure codes. Consequently, the ETG grouper must rely primarily on revenue center codes to group IP/SNF/HS claims, and procedure codes to group DME and PB claims; it can use either or both types of codes to group OP and HH claims. Regarding diagnoses, Symmetry's input files accept fewer codes than are often available on Medicare claims. The ETG grouper's input records can incorporate a maximum of 4 diagnosis codes. Given that many IP, SNF, and HH claims have more than 4 codes, some diagnosis information must be ignored.

Symmetry inputs a claim as a set of service-level records. Medicare's non-institutional claims separate into individual line items, each of which has a single associated diagnosis and procedure code. As such, line items from PB and DME claims conform directly to Symmetry's service-level standard for inputs. Medicare's institutional claims, on the other hand, report multiple revenue center codes, with some having complementary procedure codes. For each institutional claim, we construct a service-level input record for every revenue code on the parent claim and include accompanying HCPCS/CPT procedure codes if available. All service input records include up to the first four diagnosis codes from the parent claim, with one diagnosis designated as the principal diagnosis. Each institutional claim, then, has as many input records as it has revenue center codes. By using disaggregated institutional claims, Symmetry's grouper can and often does link the separate services from a single parent claim to different episodes.

Significantly, though, Symmetry offers no guidance for assigning costs to episodes comprised of claims that link to multiple episodes. In our assignments of episodes, we implement a plurality rule to assign a whole claim and its associated cost to a single episode. This rule assigns the cost of the parent claim to the episode assigned with the most service records from a parent claim. In the case of a tie, the parent claim cost is distributed equally among episodes tied with the highest assignments.

2.3.2 Distributional Properties of Symmetry Episodes

There are numerous options for using the Symmetry software for episodes, including different settings and structures for the input file. The episodes analyzed below are constructed using the Symmetry software with the settings and input file structure designated as the "Baseline" specification described in MaCurdy et al. (2008). The sample summarized below comprises the set of Complete Episodes for 2003.

Table 2.2 presents summary statistics describing the episodes created by the ETG grouper. Symmetry grouped the Medicare claims for Oregon beneficiaries into 1,028,237 episodes, with 49.9 percent classified as chronic episodes and 50.1 percent categorized as acute. Chronic episodes account for more than two thirds of total costs (70 percent). The last column presents the share of all claims costs that Symmetry does not group into episodes, and shows that ungrouped claims account for only 4.4 percent of the total claims costs.

Table 2.2: Summary Statistics and Episode Costs for 2003 Complete Episodes, Symmetry

Total # of 2003 Complete Episodes	% Chronic Episodes	% Acute Episodes	Total Cost of 2003 Complete Episodes	% Cost of Chronic Episodes	% Cost of Acute Episodes	Share of all 2003 Costs Left Ungrouped
1,028,237	49.9%	50.1%	$728,175,858	70.0%	30.0%	4.4%

Table 2.3 reports the mean, standard deviation, and distribution of episodes and costs per beneficiary. The first row shows the distribution of the number of episodes incurred by beneficiaries, and the following two rows distinguish between beneficiaries' chronic and acute episode. The final row presents the distribution of per-beneficiary costs. On average, a beneficiary experiences six complete episodes. The average number of acute and chronic episodes is 3 each. The mean total cost of complete episodes per beneficiary is $3,998. Costs sometimes run much higher, with the 98th percentile at $32,129.

Table 2.3: Number and Total Cost of 2003 Complete Episodes per Person, Symmetry

Variable	Summary Statistics								
	10%	25%	50%	75%	90%	95%	98%	Mean	STD
# of Episodes per Person:	2	3	5	8	10	12	15	6	4
Chronic	1	1	3	4	5	6	7	3	2
Acute	0	1	2	4	6	8	9	3	2
Total Cost per Person	$89	$325	$1,018	$3,346	$11,103	$19,464	$32,129	$3,998	$8,622

Table 2.4 presents the mean, standard deviation, and percentile distribution of costs and durations of chronic and acute episodes in 2003. As grouped by Symmetry, the average chronic episode cost is $993, while the average cost for acute episodes is $424. Chronic episodes last an average of 111 days, with 2 percent lasting at least 349 days. Acute episodes last an average of 19 days, with 2 percent of these episodes lasting at least 168 days.

Table 2.4: Costs and Length Percentiles for 2003 Complete Episodes, Symmetry

Episode Category	Attribute	Summary Statistics								
		10%	25%	50%	75%	90%	95%	98%	Mean	STD
Chronic	Cost per Episode ($)	$21	$56	$127	$416	$1,628	$4,280	$11,681	$993	$3,750
	Length per Episode (days)	1	1	57	214	303	333	349	111	120
Acute	Cost per Episode ($)	$0	$30	$60	$156	$550	$1,291	$4,653	$424	$2,082
	Length per Episode (days)	1	1	1	17	57	95	168	19	44
All	Cost per Episode ($)	$8	$38	$84	$269	$994	$2,843	$7,999	$708	$3,045
	Length per Episode (days)	1	1	5	91	250	306	338	65	101

Table 2.5 presents statistics describing the distribution of costs per episode for all ETGs and for the top five acute and the top five chronic ETGs, identified on the basis of the total costs of all episodes by ETG. This table reports means, standard deviations, and percentiles of costs by ETG. The final two columns list the fraction of costs represented by most expensive 2 and 5

Table 2.5: Cost Shares of High-Cost 2003 Complete Episodes, Symmetry

ETG: Description	Total Cost of All Episodes in ETG	Summary Statistics								Fraction of Cost in Top 2% of Episodes of this ETG	Fraction of Cost in Top 5% of Episodes of this ETG
		10%	25%	50%	75%	90%	95%	Mean	Std Dev		
Top 5 Acute ETGs by Cost											
713103L2: Closed fracture or dislocation - thigh, hip & pelvis, SL2	$13,159,458	$62	$635	$11,129	$18,456	$24,169	$28,913	$11,564	$10,178	7.3%	15.5%
437400L4: Bacterial lung infections, SL4	$7,314,616	$64	$197	$1,676	$5,354	$8,419	$13,728	$3,846	$6,012	16.0%	28.9%
475600L1: Non-malignant neoplasm of intestines & abdomen, SL1	$5,539,505	$198	$439	$604	$747	$1,023	$1,344	$892	$2,711	32.3%	39.3%
522300L2: Cholelithiasis, SL2	$5,261,833	$158	$638	$2,399	$6,428	$10,545	$13,041	$4,199	$4,522	9.6%	19.3%
476300L1: Bowel obstruction, SL1	$4,479,528	$52	$187	$958	$4,114	$9,073	$15,996	$3,412	$6,720	19.2%	34.8%
Top 5 Chronic ETGs by Cost											
386500L2: Ischemic heart disease, SL2	$32,777,213	$43	$145	$569	$2,364	$11,168	$23,796	$3,717	$8,644	24.5%	48.4%
386500L1: Ischemic heart disease, SL1	$29,373,524	$26	$74	$240	$990	$3,617	$11,483	$1,863	$5,247	33.7%	57.8%
351700L1: Cataract, SL1	$23,441,354	$0	$49	$69	$242	$1,599	$2,797	$459	$878	15.0%	34.0%
386500L3: Ischemic heart disease, SL3	$21,824,601	$170	$967	$7,758	$18,110	$31,435	$39,149	$12,186	$15,192	12.2%	22.8%
316000L2: Cerebral vascular accident, SL2	$20,813,618	$38	$124	$437	$2,281	$7,637	$12,332	$2,667	$6,111	25.5%	43.4%
All Chronic and Acute ETGs	$728,175,858	$8	$38	$84	$269	$994	$2,843	$708	$3,045	49.7%	69.5%

percent of episodes within each ETG. The distributions exhibit substantial dispersion in costs across episodes within ETGs, even when ETGs are split by severity level, as we do in this report. The cost of episodes at the 90th percentile – both chronic and acute – frequently exceeds the cost of episodes at the 10th percentile by two orders of magnitude. The table further reveals that the highest-cost episodes account for large shares of total ETG costs. The last row and column show that 69.5 percent of these costs are incurred by the most expensive 5 percent of episodes. The top 5 percent of episodes in the acute ETGs presented account for 15.5 percent to 39.3 percent of all costs in that ETG. The distribution is even wider for the most expensive chronic ETGs, where episodes at the 90th percentile cost nearly 200 times more than episodes at the 10th percentile. For these chronic ETGs, the top 5 percent of episodes accounts for 22.8 percent to 57.8 percent of the costs of that ETG. Overall, Table 2.5 demonstrates that considerable variation exists in the costs of individual episodes within an ETG.

2.4 Characteristics of Episodes created by the Medstat Grouper

In this subsection, we begin by describing how Medstat Medical Episode Grouper (MEG) defines episodes of care. Next, we review several critical features of the Medstat grouper program, and briefly describe our implementation of Medstat's software used to construct the population of episodes analyzed in subsequent sections investigating the impacts of different attribution rules. Finally, we describe the characteristics of Medstat episodes for the Oregon 2003 sample.

2.4.1 Key Features of MEG Episodes of Care

Medstat's grouper assigns each episode to a MEG (disease/condition classifications) along with a main disease stage and detailed disease sub-stages. There are a total of 560 MEG classifications, 1883 combinations of MEGs and main disease stages, and 4727 combinations of MEGs and detailed disease stages.[9] Medstat recommends classifying episodes into MEGs as the relevant categories for attributing incidents of care to providers. A primary use of disease stages arises in adjusting episode costs within MEGs. We use three of the four main disease stages (Stage 4: Death is excluded) as risk controls for adjusting episode costs prior to the assignment of Resource Utilization Report (RUR) scores.

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[9] These figures reflect the number of MEGs in version 7.1 of the Medstat grouper. The recently released version 7.25 adds 12 additional MEGs, for a total of 572.

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Medstat's grouping relies almost entirely on diagnosis information. Medstat primarily uses procedure codes to identify whether a claim can start an episode. If the procedure codes on a claim all identify x-ray or lab services, then the claim is not allowed to start an episode. It does use procedure codes, though, to establish whether there is a service associated with the principal diagnosis and for identifying claims. Medstat inputs up to four diagnosis codes, with one being the principal diagnosis. In the case where no procedure codes on an institutional claim logically pair with the principal diagnosis code, Medstat searches the remaining diagnoses codes to find a logical pairing with a listed procedure. If Medstat pairs a secondary diagnosis with a procedure code, it uses this diagnosis code for episode assignment.

Crucially, Medstat offers no means to treat a parent institutional claim as an aggregate of services linkable to more than one episode. Instead, the cost of a claim is allocated to one and only one episode, even if the claim cost covers multiple services treating a range of episodes.

2.4.2 Distributional Properties of Medstat Episodes

As with the Symmetry grouper, the Medstat grouper offers numerous options for using the software to construct episodes. The episodes analyzed below are constructed using the Medstat software with the settings and input file structure designated as the "All Services Admissions Build" specification described in MaCurdy et al. (2008). The sample summarized below comprises the set of Complete Episodes for 2003.

Table 2.6 presents summary statistics describing the episodes created by the MEG grouper. Medstat grouped the Medicare claims for Oregon beneficiaries into 975,096 episodes, with 41.8 percent classified as chronic and 58.3 percent categorized as acute. Chronic episodes accounted for slightly less than half of total costs (45 percent). The last column presents the share of all claims costs that were not grouped into episodes by Medstat; ungrouped claims accounted for 7.4 percent of the total cost of all claims in 2003.

Table 2.6: Summary Statistics and Episode Costs for 2003 Complete Episodes, Medstat

Total # of Episodes	% Chronic Episodes	% Acute Episodes	Total Cost of 2003 Complete Episodes	% Cost of Chronic Episodes	% Cost of Acute Episodes	Share of all 2003 Costs Left Ungrouped
975,096	41.8%	58.3%	$693,629,614	45.0%	55.0%	7.4%

Table 2.7 reports the mean, standard deviation, and distribution of episodes and costs per beneficiary. The first row shows the distribution of the number of episodes incurred by beneficiaries, and the following two rows distinguish between beneficiaries' chronic and acute episode. The final row presents the distribution of per-beneficiary costs. The average beneficiary experiences six complete episodes. The average of acute and chronic episodes is 3 for both classifications. Across all episodes in the period, the mean total episode cost per beneficiary is $3,995. Costs sometimes run much higher, with the 98th percentile at $31,904.

Table 2.7: Number and Total Cost of 2003 Complete Episodes per Person, Medstat

Variable	Summary Statistics								
	10%	25%	50%	75%	90%	95%	98%	Mean	STD
# of Episodes per Person:	2	3	5	8	10	12	14	6	3
Chronic	1	2	3	4	5	6	6	3	2
Acute	0	1	3	4	7	8	10	3	3
Total Cost per Person	$94	$341	$1,049	$3,355	$10,913	$19,329	$31,904	$3,995	$8,641

Table 2.8 presents the mean, standard deviation, and percentile distribution of costs and durations of chronic and acute episodes in 2003. As grouped by Medstat, the average chronic episode costs $766, while the average acute episode costs $672. Chronic episodes last an average of 120 days, with 2 percent lasting at least 341 days. Acute episodes last an average of 23 days, with 2 percent lasting at least 252 days.

Table 2.8: Costs and Length Percentiles for 2003 Complete Episodes, Medstat

Episode Category	Attribute	Summary Statistics								
		10%	25%	50%	75%	90%	95%	98%	Mean	STD
Chronic	Cost per Episode ($)	$17	$41	$105	$268	$931	$2,924	$10,154	$766	$3,252
	Length per Episode (days)	1	1	92	224	292	320	341	120	117
Acute	Cost per Episode ($)	$13	$38	$69	$219	$975	$2,721	$7,441	$672	$3,026
	Length per Episode (days)	1	1	1	17	61	116	252	23	56
All	Cost per Episode ($)	$17	$38	$81	$244	$954	$2,786	$8,351	$711	$3,123
	Length per Episode (days)	1	1	3	90	243	293	333	63	99

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Table 2.9 presents statistics describing the distribution of costs per episode for all MEGs and for the top five acute and the top five chronic MEGs, identified on the basis of the total costs of all episodes by MEG. This table reports total cost of all episodes for each MEG, means, standard deviations, and costs at different percentiles in the distribution. The final two columns present the share of costs captured by the most costly episodes within each MEG. As seen in the case of Symmetry episodes, the distributions reveal substantial dispersion in costs across episodes within each MEG. The cost of episodes at the 90th percentile – both chronic and acute – frequently exceeds the cost of episodes at the 10th percentile by two orders of magnitude. The table further reveals that the highest-cost episodes account for large shares of total MEG costs. The last row and column show that 71.2 percent of these costs are incurred by the most expensive 5 percent of episodes. The top 5 percent of episodes in the acute MEGs presented in this table account for 18.5 percent to 44.7 percent of all costs in that MEG. The distribution is even wider for the most expensive chronic MEGs, where episodes in the 90th percentile cost nearly 200 times more than episodes at the 10th percentile. For these chronic MEGs, the top 5 percent of episodes accounts for 39.5 percent to 59.3 percent of the costs of that MEG. Overall, Table 2.9 demonstrates that considerable variation exists in the costs of individual episodes within an MEG.

Table 2.9: Cost Shares of High-Cost 2003 Complete Episodes, Medstat

| MEG: Description | Total Cost of All Episodes in MEG | Summary Statistics | | | | | | | | Share of Cost in Top 2% of Episodes of this MEG | Share of Cost in Top 5% of Episodes of this MEG |
		10%	25%	50%	75%	90%	95%	Mean	Std Dev		
Top 5 Acute MEGs by Cost											
11: **Acute Myocardial Infarction**	$33,641,189	$293	$4,990	$11,603	$19,731	$32,889	$39,815	$14,652	$14,222	9.5%	18.5%
397: **Cerebrovascular Dis with Stroke**	$22,737,517	$32	$59	$229	$4,023	$11,832	$21,613	$3,934	$9,003	24.2%	44.7%
92: **Cataract**	$22,946,025	$0	$46	$69	$373	$1,447	$1,810	$422	$766	15.1%	33.0%
426: **Complications of Surgical and Medical Care**	$20,676,572	$38	$86	$521	$5,597	$13,728	$20,628	$4,629	$9,517	20.8%	36.9%
510: **Pneumonia: Bacterial**	$19,422,436	$36	$64	$206	$4,503	$6,920	$11,264	$2,743	$5,955	22.3%	38.4%
Top 5 Chronic MEGs by Cost											
374: **Osteoarthritis**	$55,601,308	$38	$91	$278	$1,018	$10,267	$13,736	$2,166	$5,042	23.2%	45.1%
10: **Angina Pectoris, Chronic Maintenance**	$38,034,295	$38	$75	$187	$894	$4,039	$11,898	$1,917	$5,674	33.9%	59.3%
13: **Essential Hypertension, Chronic Maintenance**	$16,369,549	$27	$58	$111	$199	$349	$538	$256	$1,021	42.2%	51.4%
430: **Encounter for Preventive Health Services**	$14,586,561	$15	$17	$42	$100	$185	$320	$127	$605	42.8%	53.7%
500: **Chronic Obstructive Pulmonary Disease**	$14,257,838	$38	$73	$226	$1,744	$4,208	$6,323	$1,432	$3,117	23.6%	39.5%
All Chronic and Acute MEGs	$693,629,614	$17	$38	$81	$244	$954	$2,786	$711	$3,123	51.0%	71.2%

2.5 Key Features of Episodes Used in Attribution Analysis

The analysis presented in this section relies on the fact that both the Symmetry and Medstat groupers organize Medicare claims into episodes of care. We use the two populations of episodes constructed by these groupers as the units of analysis for physician profiling. The above discussion outlines the basic workings of the Symmetry and Medstat software, along with summarizing properties of the episode populations produced by the particular specifications of the ETG and MEG groupers implemented to build episodes and assign costs for the current report. The key elements required to understand upcoming sections include the following:

- The claims grouped to episodes of care for this study constitute almost $791 million in costs for Medicare in 2003. These claims were filed for beneficiaries aged 65 and older who resided in the state of Oregon in 2003 and who were continuously enrolled in the FFS portions of the Part A and B programs. The largest share of costs, 63.5 percent, come from institutional claims, even though these claims only represent 11.3 percent of all claims filed in our sample.

- Symmetry's grouping software distributes claims to episodes of care classified by Episode Treatment Groups (ETGs). This classifies health conditions into 524 Base ETG categories, of which 68 are classified as "Ungroupable." Symmetry provides the option to further stratify some Base ETGs by up to 4 severity levels, producing 679 Base ETG plus severity level disease classifications. At the suggestion of Symmetry, we use Base ETGs plus severity levels for this study.

- Medstat's grouper assigns claims into episodes of care with a Medical Episode Group (MEG) identifier. The MEG classification system consists of 555 disease categories that can be further stratified by disease stages and severity levels. In this report, we consider episodes with a common MEG to represent treatments for the same illness, and we use information about disease stages and severities as risk controls for adjusting episode costs.

- The term "episodes" in this report refers to "complete" episodes in 2003 for Oregon residents. These episodes include: (1) acute episodes that end in 2003 with an episode-specific clean period preceding the start of each episode, and (2) chronic episodes that are terminated by construction at the end of 2003. Complete episodes constitute the natural bundling of services when attributing costs to providers, for these purportedly identify a patient's finished course of care for a particular illness or condition. The use of complete episodes for attribution activities avoids the double counting of costs, and the total cost of complete episodes for a year roughly approximates the annual cost of grouped claims in the corresponding calendar years.

- Applying Symmetry's software with settings and input files designated as the "Baseline" specification in MaCurdy et al. (2008), the ETG software constructs a total of 1,028,237 episodes for Oregon residents in 2003 (i.e., complete episodes), with a total cost of $728,175,858.   Slightly more than 50 percent of these episodes are classified as acute,

with chronic episodes accounting for 70.0 percent of total episode costs. Ungrouped claims amount to 4.4 percent of total Medicare costs for Oregon residents in 2003.

- Applying Medstat's software with settings and input files termed the "All Services Admissions Build" specification in MaCurdy et al. (2008), the MEG grouper builds a total of 975,096 episodes for Oregon residents in 2003 (i.e., complete episodes), with a total cost of $693,629,614.   Over 58 percent of these episodes are classified as acute, with chronic episodes accounting for 45 percent of episode costs. Ungrouped claims amount to 7.4 percent of total Medicare costs for Oregon in 2003.

3 APPROACHES FOR ATTRIBUTING COSTS TO PROVIDERS

After episodes have been created, the next step is to attribute them to providers. This requires identifying a pool of eligible providers, and establishing decision rules for attribution. Such rules determine which providers to choose when several have participated in a patient's care. In addition, they affect the costs and number of episodes that can be attributed to providers. In Section 3.1, we address our second question – *Which providers are eligible for the assignment of costs?* – by exploring the impact of using different eligibility rules on the number of providers suitable for subsequent scoring. In Section 3.2, we address our third question – *How should episode costs be attributed to eligible providers?* – by exploring two popular approaches for choosing among candidate providers. In Section 3.3, we assess the outcomes of using the two different approaches for assigning episodes and costs to providers.

3.1 Eligible Providers for Assigning Costs

The first step in attributing an episode of care to a physician entails identifying the set of providers to whom the episodes can potentially be linked, which requires having the means to identify unique providers. In principle, providers can be identified through different ID measures (i.e., Universal Physician Identification Numbers (UPINs) or TaxIDs) either from the Medicare Physician Identification and Eligibility Registry (MPIER) or through claims. Currently available measures, though, all suffer from reliability or accuracy problems. Section 3.1.1 discusses the reliability and validity issues associated with the different provider identifiers, and it outlines our approach to addressing these problems.

In addition to identifying providers, we must establish methods for attributing care to providers. The decision is simple in most cases, as there is only a single provider associated with an episode for an overwhelming majority of episodes. However, it is not uncommon for multiple providers to be involved in treating an episode. As PB claims identify individual providers, research often uses PB claims for attributing care of an episode to a physician. PB claims for evaluation and management (E&M) services are also commonly used as they usually indicate a provider who is directing the course of care for treating a patient's condition(s). Section 3.1.2 describes the effect of choosing either one of these measures on identifying providers for attribution. Because Symmetry and Medstat group claims differently, we further explore how different provider identification methods affect the attribution of episodes in Sections 3.1.3 (Symmetry) and 3.1.4 (Medstat).

3.1.1 Candidate Pool of Providers

For this analysis, we limit our candidate pool to providers licensed to practice in Oregon in 2003. Providers could be identified via their UPINs, but many claims do not list UPINs or list them incorrectly. We have thus opted to identify the candidate pool of providers using the MPIER, which tracks providers' Tax IDs, their specialties, and the settings in which they practice. Even though Tax IDs are a more reliable method for identifying physicians, the use of MPIER poses at least two challenges for attribution. First, a Tax ID can identify both an individual and a practice. One record in MPIER represents a single provider in a single practice setting. When a physician works in a practice, that physician can have both a Tax ID for the individual and one for the practice. Also, physicians working in group practices will share the practice Tax ID with other physicians in the practice. Second, a provider who works in multiple settings will have multiple Tax IDs -- meaning that Tax IDs do not identify unique individuals. Nonetheless, because the specialty information listed on a claim might not match a provider's true specialty, MPIER (by way of linking to the Tax ID) provides a more reliable measure for matching provider information to claims.

To identify a candidate pool of providers for our sample of Oregon beneficiaries, we use Tax IDs reported in the 2003 MPIER with addresses in Oregon. This pool excludes any IDs indicated to have been terminated prior to 2002 (e.g., the physician died before 2002). These Tax IDs represent either a physician or group practice licensed in Oregon that was eligible to receive Medicare payments during the period of our 2003 Complete Episode sample. Table 3.1 shows the distribution of the number of UPINs per Tax ID in the MPIER. It reveals that 82 percent of the 9,952 Tax IDs registered to practice in Oregon in 2003 link to a single UPIN, whereas 7 percent match to 5 or more UPINs. Table 3.2 shows the distribution of the number of specialties per Tax ID. There are 89 percent of Tax IDs that list a single specialty and 2 percent that register 5 or more specialties. Because we cannot distinguish individual physicians with available identifiers, we use the term providers to indicate either the physician or practice associated with a Tax ID. At times in the text below, we sometimes loosely refer to providers as physicians.

Costs vary by specialty, and RURs often must control for these differences. Group practices whose members have the same specialty pose no problem for such adjustments. In contrast, group practices whose members have different specialties complicate the creation of

Table 3.1: Number of UPINs per Tax ID in the MPIER

# of UPINs	# of TaxIDs	% of TaxIDs
1	8,156	82%
2	630	6%
3	260	3%
4	170	2%
5+	736	7%
Max: 1693	1	0%
Overall	**9,952**	**100%**

Table 3.2: Number of Specialties per Tax ID in the MPIER

# of Specialties	# of TaxIDs	% of TaxIDs
1	8,906	89%
2	630	6%
3	156	2%
4	68	1%
5+	192	2%
Max: 53	1	0%
Overall	**9,952**	**100%**

RURs since one does not know which specialty to assign a claim. An additional problem arises since the specialty listed on the line item of the claim need not be the specialty of the provider who performed the service. A prominent example includes PB lab claims that list the specialty of the lab associated with the procedure on the claim, rather than the primary specialty of the provider registered in the MPIER who prepared the lab. Table 3.3 shows the top 10 specialties by PB claim costs. The first four columns in the table report the total PB cost and number of claims, as well as the share of PB costs and claims covered by each specialty. The last four columns present the same information but for the E&M subset of PB claims. One can see from this table that many of the specialties reported in claims are indeed associated with lab work, such as diagnostic radiology, hematology or urology. Instead of the specialty listed on the claim belonging to the physician ordering the claim, it shows the specialty associated with the lab procedure. Because RURs often make comparisons adjusting for specialties, using the specialty reported on a claim may lead to episodes not being used for RURs. Consequently, we choose to use the specialty listed in the MPIER for the Tax ID reported on the claim.

Table 3.3: Claims and Costs for Top 10 Specialties by Cost of 2003 PB Claims

Specialty	Total PB Cost	% of All PB Costs	Total PB Claims	% of All PB Claims	Total E&M Cost	% of All E&M Costs	Total E&M Claims	% of All E&M Claims
All Specialty Types	$256,135,766	100%	5,768,727	100%	$68,431,312	100%	1,598,108	100%
Internal medicine	$30,197,418	12%	1,092,978	19%	$20,294,567	30%	478,968	30%
Family practice	$16,317,186	6%	670,277	12%	$11,908,918	17%	322,095	20%
Clinical laboratory	$7,431,516	3%	630,514	11%	$34	0%	7	0%
Diagnostic radiology	$13,012,282	5%	394,046	7%	$37,874	0%	684	0%
Ophthalmology	$21,550,651	8%	282,449	5%	$2,734,102	4%	66,067	4%
Cardiology	$14,372,815	6%	282,214	5%	$3,884,249	6%	74,858	5%
Physical therapist	$5,221,014	2%	204,285	4%	$38	0%	9	0%
Chiropractic	$2,679,383	1%	177,624	3%	$0	0%	7,116	0%
Dermatology	$8,398,938	3%	156,174	3%	$1,451,507	2%	44,990	3%
Orthopedic surgery	$12,406,901	5%	147,455	3%	$2,341,438	3%	54,822	3%
Urology	$10,756,132	4%	124,340	2%	$1,722,657	3%	43,326	3%
Hematology/oncology	$10,630,200	4%	108,876	2%	$1,074,386	2%	23,402	1%

Expanding the concept of a provider to designate the combination of a Tax ID and specialty registered in the MPIER, the 9,952 Tax IDs listed in Table 3.2 translate into 12,927 Tax ID/specialty combinations. For those Tax IDs with multiple specialties, to resolve which specialty listed in the MPIER links to claims assigned to an episode we implement a hybrid approach that uses specialty information from both MPIER and claims. In cases where MPIER lists a single specialty for a given Tax ID, we simply use the specialty listed in MPIER. When MPIER lists multiple specialties for a Tax ID, we use the specialty with the most PB line-item charges in an episode attributed to the Tax ID, as long as the specialty listed on the claims is a

specialty registered in MPIER.[10] This replaces most specialties listed on claims associated with lab work. Our hybrid approach for assigning provider specialty relies on the MPIER specialties to attribute responsibility for an episode. Although this approach permits disaggregation of Tax IDs with multiple listings, it still does not identify individual physicians who work in a group practice setting.

3.1.2 Share of Providers with Any Part B or E&M Claims

As our attribution rules use either PB or E&M claims, the candidate pool must be limited to those providers that file these types of claims. Table 3.4 lists the numbers and shares of all Oregon Tax IDs in the 2003 MPIER for each TaxID category. The last column presents the totals for U.S. Tax IDs and providers in the 2003 MPIER. The table shows that of Oregon Tax IDs who are eligible to receive Medicare payments in 2003, only 36 percent file PB claims during 2003. The remaining providers who do not file PB claims may either be (i) eligible physicians who did not file a claim for an Oregon beneficiary in 2003, (ii) non-practicing physicians, or (iii) deceased providers for whom the MPIER did not list a date of death. If the pool is restricted to those who filed PB claims for E&M services, only 26 percent of Tax IDs are included from the candidate pool of providers, leaving 2,567 eligible Tax IDs.

Table 3.4: Total Numbers of Tax IDs and Specialties in the MPIER

Categories of TaxIDs & Providers	Tax IDs & Providers in 2003 OR MPIER		Tax IDs & Providers in 2003 US MPIER
	Number	**% of Total Tax IDs in MPIER**	
TaxIDs & Providers in the MPIER (OR only or entire US):			
Total TaxIDs in the MPIER	9,952	100%	963,366
Total TaxIDs with PB Claims in 2003	3,631	36%	18,115
Total TaxIDs with E&M Claims in 2003	2,567	26%	12,363
Total Providers in the MPIER (TaxID-Specialty Combinations)	12,927	N/A	1,244,894

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[10] If the specialty listed on the claim is not among the specialties listed in MPIER for the TaxID, then the claim is identified as having an unresolved specialty and is not used for attribution. To ensure that we account for all Tax IDs that showed up in the claims comprising our sample, we use the 2005 U.S. MPIER to capture those Tax IDs not yet registered in the 2003 MPIER. In principle, the MPIER does not remove providers from the registry once they are listed; it presumably tracks which ones have become deactivated. Use of the 2005 MPIER adds a few Tax ID/specialty combinations not appearing in the 2003 MPIER.

The final column in Table 3.4 shows that the majority of providers who filed claims for Oregon beneficiaries in 2003 were not licensed in Oregon. Whereas there are 18,115 total Tax IDs with PB claims in our 2003 Oregon sample, only 3,631 are licensed to practice in Oregon. Oregon providers, however, do file the preponderance of claims in our sample.

3.1.3 Share of Providers and Episodes with Claims Included in Symmetry Episodes

Filing a PB claim does not necessarily mean that a provider's claim will be included in an episode of care. Table 3.5 is structured similarly to Table 3.4, but lists the outcomes of restricting providers to those who *both* filed PB (including E&M) claims *and* filed claims that Symmetry grouped to 2003 Complete Episodes. Whereas 39 percent of providers have PB claims grouped to 2003 Complete Episodes, 29 percent of providers have E&M claims grouped to 2003 complete episodes. The table also presents equivalent statistics for providers in the entire 2003 U.S. MPIER; there are about three times as many out-of-state providers as in-state providers that have at least one claim in an episode for an Oregon beneficiary.

Table 3.5: Providers with Claims Grouped to Episodes, Symmetry

Categories of Providers	Providers in 2003 OR MPIER		Providers in 2003 US MPIER
	Number	% of Total Providers in MPIER	
Providers in the MPIER:			
Total Providers in the MPIER (TaxID-Specialty Combinations)	12,927	100%	1,244,894
Providers w/Claims in 2003 and/or in an Episode:			
At least 1 PB Claim in 2003 and/or in an Episode	5,114	40%	22,436
At least 1 PB Claim in an Episode	5,061	39%	21,727
At least 1 E&M Claim in 2003 and/or in an Episode	3,818	30%	15,573
At least 1 E&M Claim in an Episode	3,784	29%	15,472

Table 3.6 shows the effect of attribution eligibility criteria on the cost and composition of 2003 Complete Episodes. The episode category listed in each row is a subset of the episode category listed in the row above it. The table reports the numbers and costs of episodes within each category, including the percentages of all episodes and total costs. The numbers and shares of episodes with a PB claim submitted by an Oregon provider are also provided. The last two columns list the median cost and median length in days of episodes in each category. The first row of this table shows that there are a total of 1,028,237 Symmetry-produced episodes

amounting to a total cost of $728,175,858. There are 5,061 providers who have a PB claim in one of these episodes. The median cost of these episodes is $84 and the median duration is 5 days.

Nearly all episodes produced by Symmetry have at least one associated PB claim. Those episodes without PB claims are likely episodes where the grouper failed to group associated PB claims. If we restrict the sample to episodes with PB claims with positive costs (zero-cost claims can result from a claim being denied for payment by Medicare or for pre-deductible services), 13 percent of episodes are excluded. Even so, episodes with positive-cost PB claims capture 97 percent of all episode costs. Episodes with E&M claims comprise 70 percent of all episodes – 61 percent if we restrict ourselves only to positive cost E&M claims. However, 87 percent of episode costs are captured even when episodes are restricted to those with positive cost E&M claims. Episodes without grouped E&M claims either are those where the grouper failed to group E&M claims, or those where E&M claims are not commonly filed, such as chiropractor visits.

Episodes that remain as the criteria become more restrictive—e .g. moving from PBmax to EMmax or moving from including to excluding zero-cost claims—tend to be longer and more expensive than episodes that are excluded. Looking at all episodes, the median episode length is 5 days, with a median cost of $84. If we limit our analysis to episodes with positive-cost PB claims, episode length increases to 11 days, and median cost increases to $99. Further limiting our analysis to positive-cost E&M claims more than doubles the median episode length to 23 days, but only increases the median cost to $125.

Table 3.6: Characteristics of Episodes by Eligibility for Attribution, Symmetry

Episode Category	Episodes				OR Providers w/ PB Claim in an Episode		Individual Episode Characteristics	
	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)
All Episodes	1,028,237	100%	$728,175,858	100%	5,061	100%	$84	5
Episodes with at least one PB claim	974,492	95%	$708,892,924	97%	5,061	100%	$86	6
Episodes with non-zero PB cost	891,412	87%	$706,382,420	97%	4,854	96%	$99	11
Episodes with at least one E&M claim	715,716	70%	$641,345,525	88%	3,784	75%	$106	16
Episodes with non-zero E&M cost	630,164	61%	$631,552,402	87%	3,300	65%	$125	23

3.1.4 Share of Providers and Episodes with Claims Included in Medstat Episodes

Table 3.7 is structured similarly to Table 3.4, but lists the outcomes of restricting providers to those who *both* filed PB (including E&M) claims *and* filed claims that Medstat grouped to 2003 Complete Episodes. Of the 5,001 providers who filed a PB claim in 2003, 4,954 have PB claims grouped to episodes created by Medstat; of the 3,769 providers who filed an E&M claim in 2003, 3,740 providers have E&M claims grouped to 2003 Complete episodes.

Table 3.7: Providers with Claims Grouped to Episodes, Medstat

Categories of Providers	Providers in 2003 OR MPIER		Providers in 2003 US MPIER
	Number	% of Total Providers in MPIER	
Providers in the MPIER:			
Total Providers in the MPIER (TaxID-Specialty Combinations)	12,927	100%	1,244,894
Providers w/Claims in 2003 and/or in an Episode:			
At least 1 PB Claim in 2003 and/or in an Episode	5,001	39%	19,606
At least 1 PB Claim in an Episode	4,954	38%	18,827
At least 1 E&M Claim in 2003 and/or in an Episode	3,769	29%	13,701
At least 1 E&M Claim in an Episode	3,740	29%	13,587

Table 3.8 shows the effect of attribution eligibility criteria on the cost and composition of 2003 Complete Medstat-produced episodes. The episode category listed in each row is a subset of the episode category listed in the row above it. The table reports the numbers and costs of episodes within each category, including the percentages of all episodes and total costs. The numbers and shares of episodes with a PB claim submitted by an Oregon provider are also provided. The last two columns list the median cost and median length in days of episodes in each category. We see that of all episodes produced by Medstat, 96 percent have grouped PB claims, and these episodes capture 97 percent of the cost of Medstat episodes. Focusing on PB claims for E&M services, we see 74 percent of Medstat episodes, capturing 89 percent of episode costs, have at least one E&M claim. If we look only at positive-cost PB and E&M claims, 90 and 65 percent of episodes have PB and E&M claims, respectively. However episodes with positive-cost PB claims still capture 97 percent of all episode costs, and episodes with positive-cost E&M claims capture 88 percent of episode costs.

The characteristics of episodes without PB or E&M claims also differ from those including these claim types. The median cost of a Medstat episode is $81, and the median length is 3 days. When only considering episodes with at least one PB claim, the typical episode costs $80 with a median length of 4 days. As the episodes with only zero-cost PB claims tend to be single-day episodes with a single PB claim, restricting episodes to those with positive-cost PB claims doubles length to 8 days, and increases the median cost to $91. When episodes are restricted to those with positive-cost E&M claims, length increases to 14 days and cost to $109.

Table 3.8: Characteristics of Episodes by Eligibility for Attribution, Medstat

Episode Category	Episodes				OR Providers w/ PB Claim in an Episode		Individual Episode Characteristics	
	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)
All Episodes	975,096	100%	$693,629,614	100%	4,954	100%	$81	3
Episodes with at least one PB claim	939,307	96%	$675,841,679	97%	4,954	100%	$80	4
Episodes with non-zero PB cost	874,944	90%	$674,403,527	97%	4,772	96%	$91	8
Episodes with at least one E&M claim	722,813	74%	$616,908,845	89%	3,740	75%	$93	9
Episodes with non-zero E&M cost	637,374	65%	$608,526,885	88%	3,621	73%	$109	14

3.2 Attribution Rules for Allocating Episode Costs to Providers

Care of most patients' episodes is influenced by just one provider, as indicated by the overwhelming majority of episodes having PB (including E&M) claims from only a single provider. However, between 10 and 26 percent of episodes have PB (including E&M) claims from more than one provider. As a result, rules must be established for attributing episode care to a single provider. Below we evaluate two plurality-based attribution rules: one that assigns responsibility for episode care to the provider with the most PB costs (PBmax), and one that assigns responsibility to the provider with the most E&M charges (EMmax). Section 3.2.1 describes the PBmax rule, and section 3.2.2 describes the EMmax attribution rule. Sections 3.2.3 and 3.2.4 discuss the application of the PBmax rule to Symmetry and to Medstat, respectively. Sections 3.2.5 and 3.2.6 discuss the application of the EMmax rule to Symmetry and Medstat, respectively. We also consider a third rule, EM35, which attributes episodes to the provider with 35 percent or more of E&M dollars, but we do not discuss the implications of using this rule because the results for EM35 closely mirror those for EMmax.

3.2.1 PBmax Attribution Rule

The PBmax rule attributes the care of an episode to the provider with the most payments from PB claims for an episode. For a majority of episodes, there is only a single provider with PB claims grouped to an episode, but in many cases there will be PB claims from more than one provider. We establish an algorithm that first identifies the provider with the most payments from a PB claim. If there are no positive costs on PB claims assigned to an episode, then the episode is not attributed to a provider. In the case where the payments from PB claims to two or more providers are equal, then the next rule applied breaks the tie between the providers by attributing the episode the provider with the highest costs from E&M claims. Our algorithm consists of several rules, based on PB and E&M claim costs and then PB and E&M numbers, applied only when the previous rule fails to establish a provider responsible for care of an episode.

3.2.2 EMmax Attribution Rule

The EMmax attribution rule uses PB claims for E&M services for attribution, as these claims reflect the management of an episode. This attribution algorithm is similar to the PBmax rule, but starts by attributing the episode to the provider with the most E&M charges. When there is a tie in E&M costs among providers, it is broken by attributing the episode to the provider with the highest PB costs. If both E&M and PB costs are tied among providers, then the algorithm moves to numbers of E&M claims followed by numbers of PB claims.

3.2.3 Assignment of Symmetry Episodes Based on Maximum PB Costs

Table 3.9 shows the effect of using different attribution rules on the number of providers eligible for RURs. The last column shows the share of all providers with at least one PB claim in 2003 who are eligible for RURs. For each attribution rule, the table also presents the number and share of providers who satisfy the attribution rule for a minimum number of episodes. As noted earlier, a third rule, EM35, which attributes episodes to the provider with 35 percent or more of E&M dollars, produces results that closely mirror those for EMmax. The PBmax rule attributes Symmetry-produced episodes to 92 percent of providers. Only 73 percent of providers are attributed with directing care for 5 or more episodes. If we consider only those providers with 30 or more episodes, this figure drops to 49 percent.

Table 3.9: Shares of Providers Covered by Different Attribution Rules, Symmetry

Attribution Rule and Number of Episodes	Number	% of All Providers
PB Max attribution rule:		
<u>**Providers with attributed episodes of any type:**</u>		
Providers satisfying attribution rule for at least 1 episode	4,640	92%
Providers satisfying attribution rule for at least 5 episodes	3,673	73%
Providers satisfying attribution rule for at least 10 episodes	3,220	64%
Providers satisfying attribution rule for at least 20 episodes	2,772	55%
Providers satisfying attribution rule for at least 30 episodes	2,458	49%
E&M Max attribution rule:		
<u>**Providers with attributed episodes of any type:**</u>		
Providers satisfying attribution rule for at least 1 episode	3,197	63%
Providers satisfying attribution rule for at least 5 episodes	2,686	53%
Providers satisfying attribution rule for at least 10 episodes	2,434	48%
Providers satisfying attribution rule for at least 20 episodes	2,169	43%
Providers satisfying attribution rule for at least 30 episodes	1,970	39%
E&M 35% Attribution rule:		
<u>**Providers attributed episodes of any type:**</u>		
Providers satisfying attribution rule for at least 1 episode	3,189	63%
Providers satisfying attribution rule for at least 5 episodes	2,679	53%
Providers satisfying attribution rule for at least 10 episodes	2,427	48%
Providers satisfying attribution rule for at least 20 episodes	2,166	43%
Providers satisfying attribution rule for at least 30 episodes	1,964	39%

Table 3.10 presents summary statistics for Symmetry episodes according to whether they are attributed under the PBmax and EMmax rules and the characteristics of the attributed providers. Its structure parallels Table 3.6, but it has an additional column containing the share of all episode costs contained in the attributed providers' PB claims. The first row shows that the PBmax rule attributes 80 percent of Symmetry episodes to Oregon providers, accounting for 89 percent of costs. Another 6 percent of episodes are attributed to non-Oregon providers, and the remaining episodes (not shown in the table) were assigned to no provider because they included no positive-cost PB claims. A large proportion of episodes are assigned to Tax IDs with multiple specialties. For 489,930 of these episodes we can find a specialty using the hybrid rule, while 3,365 have an unresolved specialty, and cannot be used because the specialty listed on the provider's PB claim(s) does not match any specialties listed for the Tax ID in MPIER.

Table 3.10: Characteristics of Episodes by Attribution Criteria, Symmetry

Episode Category	Episodes				OR Providers w/ PB Claim in an Episode		Individual Episode Characteristics		Attributed Providers' Share of Episode Costs
	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
PB Max Attributed Episodes									
Attributed to OR providers									
With identifiable MPIER specialty	817,496	80%	$651,351,951	89%	4,640	92%	$100	11	24%
More than one specialty	489,930	48%	$464,455,718	64%	1,962	39%	$111	15	22%
With unresolved specialty	3,365	0%	$1,469,830	0%	98	2%	$44	8	21%
Attributed to non-OR providers	57,287	6%	$50,418,898	7%	9,919	N/A	$102	10	22%
More than 1 Provider w/PB claims	277,665	27%	$545,653,564	75%	4,176	83%	$388	75	19%
E&M Max Attributed Episodes									
Attributed to OR providers									
With identifiable MPIER specialty	592,513	58%	$588,313,981	81%	3,197	63%	$124	24	19%
More than one specialty	385,458	37%	$428,891,645	59%	1,692	33%	$132	27	18%
With unresolved specialty	3,053	0%	$891,192	0%	99	2%	$38	2	21%
Attributed to non-OR providers	53,053	5%	$45,941,420	6%	9,814	N/A	$96	7	20%
More than 1 Provider w/E&M claims	112,985	11%	$376,950,585	52%	2,753	54%	$661	126	12%

Table 3.10 also shows that only 24 percent of episode costs originate from attributed providers' PB claims. In other words, a substantial portion of costs are not directly charged by the providers who are actually attributed with the care of episodes. While managing providers have some influence over costs that they do not directly charge (for example, by ordering tests, or referring the patient to a different provider), most of the remaining costs result from the basic severity of the episode, or from the cost of services provided by other health care providers. Because RUR scores are intended to reflect resource use by the provider charged with the attribution of episode costs, they must take into account that a large portion of resources devoted to treating episodes are potentially incurred by a non-attributed provider.

A closer examination of specific episode types shows variation in the share of episodes that become attributed to providers using the PBmax rule. Table 3.11 presents the shares of episodes and episode costs that are attributed using the PBmax rule to Oregon providers for each of the ten most expensive ETGs. For each ETG listed, the table also shows the total number of episodes and their associated costs, along with the share of episodes that have a positive-cost PB claim. The far right columns contain the shares of per-episode costs that are covered by an attributed provider's PB claim(s) at different percentiles of the distribution. Of the ten most expensive ETGs, the PBmax rule attributes between 78.4 and 92.5 percent of episodes to Oregon providers; severity level (SL) 2 cerebral vascular accident episodes show the lowest attribution rate of the top 10 and SL 3 ischemic heart disease episodes show highest attribution rate. Of the top 10 ETGs, attributed episodes capture between 87.8 and 96.6 percent of total episode costs. Further, within ETGs there is considerable variation in the costs directly attributable to the assigned provider, as measured by the costs originating from the provider's PB claims. For a quarter of SL 2 cerebral vascular accident episodes, only up to 8 percent of costs originate from the PB claims filed by the assigned provider. But in 10 percent of SL 2 cerebral vascular accident episodes, all costs originate from the assigned provider's PB claims. A similar pattern holds for SL 1 ischemic heart disease: In 25 percent of episodes, only 17 percent or less of costs are directly attributable to the assigned provider. But in another 25 percent of episodes, all costs are directly attributable to the assigned provider's PB claims. In three quarters of all SL 4 ischemic heart disease episodes, only 11 percent or less of costs are directly attributable to the assigned provider; in 90 percent of these episodes, less than 38 percent of costs originate from the assigned provider's PB claims. As severity level decreases for ischemic heart disease episodes, we see that a provider's PB claims represent a greater percentage of episode costs, with

Table 3.11: PBmax Attribution for Top-10-Cost ETGs

ETG: Description		All Episodes			Episodes Attributed to OR providers		Percentiles of Shares of Per-Episode Cost Contributed by PB Claims of Attributed Provider						
		Total Number	Total Cost	% with > $0 of PB	% of Episodes	% of Costs	10th	25th	50th	75th	90th	95th	98th
All ETGs		1,028,237	$728,175,858	86.7%	79.5%	89.4%	17%	47%	100%	100%	100%	100%	100%
386500L2:	Ischemic heart disease, SL2	8,818	$32,777,213	90.7%	81.6%	88.7%	5%	10%	34%	76%	100%	100%	100%
386500L1:	Ischemic heart disease, SL1	15,766	$29,373,524	87.4%	79.1%	88.9%	7%	17%	53%	100%	100%	100%	100%
351700L1:	Cataract, SL1	51,020	$23,441,354	87.0%	83.0%	96.6%	39%	61%	100%	100%	100%	100%	100%
386500L3:	Ischemic heart disease, SL3	1,791	$21,824,601	96.6%	88.2%	88.8%	3%	5%	8%	26%	75%	100%	100%
316000L2:	Cerebral vascular accident, SL2	7,805	$20,813,618	86.2%	78.4%	87.8%	3%	8%	21%	65%	100%	100%	100%
386500L4:	Ischemic heart disease, SL4	849	$15,151,353	98.9%	92.5%	93.6%	3%	5%	7%	11%	38%	66%	91%
712208L2:	Joint degeneration, localized - back, SL2	4,718	$13,230,706	96.2%	88.5%	90.6%	11%	16%	27%	60%	100%	100%	100%
713103L2:	Closed fracture or dislocation - thigh, hip & pelvis, SL2	1,138	$13,159,458	97.4%	92.1%	95.1%	3%	4%	7%	21%	100%	100%	100%
712202L2:	Joint degeneration, localized - knee & lower leg, SL2	5,816	$11,927,358	91.1%	83.6%	90.6%	10%	31%	82%	100%	100%	100%	100%
388100L2:	Hypertension, SL2	35,234	$9,462,447	87.0%	78.3%	84.5%	20%	50%	86%	100%	100%	100%	100%

100 percent of costs originating from the provider in at least 25 percent of attributed SL 1 ischemic heart disease episodes, with shares just above half of episode cost for at least 50 percent of these cases. In three quarters of SL 1 cataract episodes, though, at least 61 percent of costs originate from the assigned provider's PB claims, and in half of the attributed cataract episodes, all costs are directly attributable to the assigned providers.

If we examine episode attribution by specialty, we see that the share of attributed episodes varies among the top 12 specialties with the most E&M claims filed. Table 3.12 shows the number of providers within each specialty who have a PB or E&M claim in an episode, and of the providers with a PB claim in an episode, the share with a minimum number of episodes attributed to them.   The table shows that at least one Symmetry-produced episode is attributed to between 85 and 95 percent of providers within the top 12 specialties with the most E&M claims filed. Seventy-three percent of family practice and internal medicine specialists are given attribution for 30 or more episodes of any type, and 62 percent of general surgeons have 30 or more attributed episodes. However, only about a quarter of all chiropractors are attributed with 30 or more episodes. These figures, though, do not restrict attribution by episode type, so even if a provider is attributed with 30 or more episodes, it does not guarantee that a provider is eligible for RURs for specific episode types.

Table 3.12: PBmax Attribution for Top Specialties by E&M Claims in Episodes, Symmetry

Specialty	# Providers with Claims in Episodes		% Providers w/ Minimum Number of Attributed Episodes				
	# w/≥1 PB Claim	# w/≥1 E&M Claim	≥1	≥5	≥10	≥20	≥30
All Specialties	5,061	3,784	92%	73%	64%	55%	49%
Chiropractic	579	368	92%	69%	52%	34%	23%
Family practice	470	448	94%	86%	81%	77%	73%
Internal medicine	404	383	95%	85%	79%	73%	70%
Nurse practitioner	279	235	92%	72%	62%	53%	45%
Optometry	257	217	93%	79%	71%	60%	53%
Clinical psychologist	173	16	90%	18%	9%	5%	1%
Physician assistant	165	137	85%	62%	53%	44%	33%
Obstetrics/gynecology	164	148	88%	79%	68%	58%	49%
Psychiatry	163	64	91%	46%	29%	16%	10%
Physical therapist	160	16	93%	81%	66%	54%	41%
General surgery	160	142	89%	77%	73%	66%	62%
Orthopedic surgery	154	144	94%	86%	84%	80%	76%

3.2.4 Assignment of Symmetry Episodes Based on Maximum E&M Costs

Compared to PBmax, EMmax attributes far fewer episodes to providers. This is because fewer providers file E&M claims (as shown in Table 3.10). Table 3.9 shows that EMmax attributes episodes to only 63 percent of providers who filed PB claims in 2003. If we limit ourselves to providers with 30 or more attributed episodes, this figure shrinks to 39 percent.

Table 3.10 shows that when EMmax is used, only 58 percent of Symmetry episodes are attributed to Oregon providers, accounting for 81 percent of episode costs. It also shows that a

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large portion of episodes are assigned to Tax IDs with multiple specialties; of these 388,511 episodes, 3,053 cannot be used because the specialty listed on the provider's PB claim(s) did not match any specialties listed for the Tax ID in MPIER. We also see that 5 percent of episodes are attributed to non-Oregon providers.

Table 3.13 is structured similarly to Table 3.11, but it shows the top 10 most expensive ETGs attributed to Oregon providers under the EMmax rule. We see lower attribution rates and much higher variation across episode types compared to attribution using PBmax. The EMmax rule attributes between 24.3 and 93.2 percent of episodes in the top 10 ETGs to Oregon providers; and whereas SL 1 cataracts have the highest attribution rate under PBmax (see Table 3.11), they have the lowest attribution rate under EMmax. This indicates that E&M claims are not filed frequently for cataract episodes. We also observe similar patterns to those observed for PBmax attributed episodes for shares of costs originating from the attributed provider across ETGs. The attributed provider's PB claim costs represent a small fraction of episode costs for SL 4 ischemic heart disease in all but a about 5 percent of these ETGs, with shares of attributed provider costs increasing as severity level for this ETG decreases.

There is also large variation of provider shares within closed fracture or dislocation of the hip/thigh/pelvis, with all costs originating from the provider's PB claims in at least 10 percent of these ETGs, but anywhere from 15 percent to nearly 0 originating from the attributed provider in 75 percent of these episodes. But while we observe similar patterns compared to PBmax-attributed episodes, provider cost shares are lower under the EMmax rule. This is a function of more high-cost providers being attributed under the PBmax rule over lower-cost providers, and the lower-cost providers being more likely to file E&M claims. For example, a patient with a cerebral vascular accident may have claims filed on his behalf by both a surgeon and the patient's GP. Under the PBmax rule, the surgeon might be attributed with the episode under the PBmax rule if the surgeon's claims are for more expensive procedures compared to E&M claims filed by the patient's GP. Because E&M claims are less expensive than surgical procedures, the share of costs from the GP who would be attributed under the EMmax rule would be lower than the share of costs from the surgeon who would be attributed the cerebral vascular accident episode under the PBmax rule.

Using EMmax also produces more variation in attribution by specialty type. Table 3.14 shows attribution by provider specialty for Symmetry-grouped episodes under the EMmax rule,

Table 3.13: EMmax Attribution for Top-10-Cost ETGs

ETG: Description		All Episodes			Episodes Attributed to OR providers		Percentiles of Shares of Per-Episode Cost Contributed by PB Claims of Attributed Provider						
		Total Number	Total Cost	% with > $0 of E&M	% of Episodes	% of Costs	10th	25th	50th	75th	90th	95th	98th
All ETGs		1,028,237	$728,175,858	61.3%	57.6%	80.8%	11%	35%	85%	100%	100%	100%	100%
386500L2:	Ischemic heart disease, SL2	8,818	$32,777,213	77.5%	71.8%	89.1%	3%	8%	26%	66%	100%	100%	100%
386500L1:	Ischemic heart disease, SL1	15,766	$29,373,524	72.3%	67.4%	88.0%	6%	14%	44%	94%	100%	100%	100%
351700L1:	Cataract, SL1	51,020	$23,441,354	25.6%	24.3%	42.2%	32%	42%	100%	100%	100%	100%	100%
386500L3:	Ischemic heart disease, SL3	1,791	$21,824,601	91.2%	84.6%	90.1%	2%	3%	7%	19%	65%	95%	100%
316000L2:	Cerebral vascular accident, SL2	7,805	$20,813,618	70.8%	66.6%	84.8%	3%	6%	16%	49%	100%	100%	100%
386500L4:	Ischemic heart disease, SL4	849	$15,151,353	97.5%	93.2%	95.9%	1%	3%	5%	10%	30%	62%	90%
712208L2:	Joint degeneration, localized - back, SL2	4,718	$13,230,706	86.8%	79.9%	88.0%	4%	10%	18%	38%	92%	100%	100%
713103L2:	Closed fracture or dislocation - thigh, hip & pelvis, SL2	1,138	$13,159,458	93.5%	88.6%	93.8%	0%	1%	3%	15%	100%	100%	100%
712202L2:	Joint degeneration, localized - knee & lower leg, SL2	5,816	$11,927,358	75.3%	68.6%	80.2%	8%	21%	74%	100%	100%	100%	100%
388100L2:	Hypertension, SL2	35,234	$9,462,447	68.8%	65.1%	75.9%	22%	47%	82%	100%	100%	100%	100%

Table 3.14: EMmax Attribution for Top Specialties by E&M Claims in Episodes, Symmetry

Specialty	# Providers with Claims in Episodes		% Providers w/ Minimum Number of Attributed Episodes				
	# w/≥1 PB Claim	# w/≥1 E&M Claim	≥1	≥5	≥10	≥20	≥30
All Specialties	5,061	3,784	63%	53%	48%	43%	39%
Chiropractic	579	368	0%	0%	0%	0%	0%
Family practice	470	448	93%	85%	81%	76%	72%
Internal medicine	404	383	91%	81%	75%	70%	69%
Nurse practitioner	279	235	77%	64%	57%	48%	42%
Optometry	257	217	81%	63%	51%	34%	25%
Clinical psychologist	173	16	4%	1%	0%	0%	0%
Physician assistant	165	137	78%	60%	50%	38%	30%
Obstetrics/gynecology	164	148	86%	77%	62%	54%	47%
Psychiatry	163	64	34%	13%	9%	7%	6%
Physical therapist	160	16	6%	4%	3%	1%	1%
General surgery	160	142	85%	75%	71%	64%	60%
Orthopedic surgery	154	144	91%	85%	82%	79%	72%

and is structured similarly to Table 3.12. Compared to PBmax, a similar number of family practice providers have at least one episode attributed to them. And while fewer providers in internal medicine, emergency medicine, and general surgery have one or more episodes attributed to them, the distribution of providers who have multiple episodes attributed to them within these specialties is similar to the distribution under PBmax. However, there are fewer providers in other specialties with multiple episodes attributed to them. Optometrists, for instance, are far less likely to have multiple episodes attributed to them under EMmax, with only about half of all optometrists attributed with 10 or more episodes. Only 25 percent of

optometrists are attributed 30 or more episodes, which is less than half the attribution rate when PBmax is used. Not a single episode is attributed to chiropractors under the EMmax rule, as chiropractors are only reimbursed for subluxation services, not E&M services.

3.2.5 Assignment of Medstat Episodes Based on Maximum PB Costs

Table 3.15 shows the effect of using different attribution rules on the number of providers eligible for RURs. The last column shows the share of all providers with at least one PB claim in 2003 who are eligible for RURs. For each attribution rule, the table presents the number and share of providers who satisfy the attribution rule for a minimum number of episodes. As noted earlier, a third rule, EM35, which attributes episodes to the provider with 35 percent or more of E&M dollars, produces results that closely mirror those for EMmax. The PBmax rule attributes

Table 3.15: Shares of Providers Covered by Different Attribution Rules, Medstat

Attribution Rule and Number of Episodes	Number	% of All Providers
PB Max attribution rule:		
Providers with attributed episodes of any type:		
Providers satisfying attribution rule for at least 1 episode	4,501	91%
Providers satisfying attribution rule for at least 5 episodes	3,603	73%
Providers satisfying attribution rule for at least 10 episodes	3,156	64%
Providers satisfying attribution rule for at least 20 episodes	2,694	54%
Providers satisfying attribution rule for at least 30 episodes	2,409	49%
E&M Max attribution rule:		
Providers with attributed episodes of any type:		
Providers satisfying attribution rule for at least 1 episode	3,126	63%
Providers satisfying attribution rule for at least 5 episodes	2,645	53%
Providers satisfying attribution rule for at least 10 episodes	2,410	49%
Providers satisfying attribution rule for at least 20 episodes	2,149	43%
Providers satisfying attribution rule for at least 30 episodes	1,961	40%
E&M 35% Attribution rule:		
Providers attributed episodes of any type:		
Providers satisfying attribution rule for at least 1 episode	3,115	63%
Providers satisfying attribution rule for at least 5 episodes	2,634	53%
Providers satisfying attribution rule for at least 10 episodes	2,402	48%
Providers satisfying attribution rule for at least 20 episodes	2,143	43%
Providers satisfying attribution rule for at least 30 episodes	1,956	39%

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Medstat-produced episodes to 91 percent of eligible providers. Only 73 percent of providers are charged with directing care for 5 or more episodes, and only 49 percent of providers are charged with directing care for 30 or more episodes.

Descriptive statistics for Medstat episodes according to PBmax and EMmax attributions are presented in Table 3.16, which has the same structure as Table 3.8, but it has an additional column containing the share of all episode costs contained in the attributed providers' PB claims. The PBmax rule attributes 81 percent of Medstat episodes to OR providers, with 90 percent of all costs attributed. Also, as seen with Symmetry episodes, a large portion of an episode's cost is potentially not incurred by the provider to which it is attributed; only 23 percent of Medstat episode costs originate from the PB claims filed by attributed providers.

Table 3.17 presents the shares of episodes and episode costs that are attributed using the PBmax rule to Oregon providers for each of the ten most expensive MEGs. For each MEG listed, the table also shows the total number of episodes and their associated costs, along with the share of episodes that have a positive-cost PB claim. The far right columns contain the shares of per-episode costs that are covered by an attributed provider's PB claim(s) at different percentiles of the distribution. We see that the PBmax rule attributes from 79.3 to 87.8 percent of Medstat-produced episodes to Oregon providers. The percentage of costs captured by attributed episodes varies from 88 percent for cerebrovascular disease to 94 percent for femur fractures. Not only is there variation in directly attributable costs across episodes, there is also substantial variation in cost shares within these episode types. For instance, only 5 percent of costs for head or neck fractures of the femur episodes are directly attributable to the assigned provider in a quarter of these episodes, and less than 18 percent of costs are directly attributable to the assigned providers for three quarters of the cases; however, in at least 10 percent of these episodes, 100 percent of costs originate from claims filed by the assigned provider. A somewhat similar pattern in cost attribution occurs for acute myocardial infarction episodes, where for 90 percent of episodes the provider's share of cost is less than 15 percent. In these episodes, it appears that a provider is either directly responsible for all costs, or almost no costs for the episode.

The share of attributed episodes varies among the top 12 specialties with the most E&M claims filed. Table 3.18 shows the number of providers within each specialty who have a PB or

Table 3.16: Characteristics of Episodes by Attribution Criteria, Medstat

Episode Category	Episodes				OR Providers w/ PB Claim in an Episode		Individual Episode Characteristics		Attributed Providers' Share of Episode Costs
	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
PB Max Attributed Episodes									
Attributed to OR providers									
With identifiable MPIER specialty	794,254	81%	$620,978,004	90%	4,501	91%	$93	8	23%
More than one specialty	496,545	51%	$442,625,072	64%	1,860	38%	$98	10	22%
With unresolved specialty	11,199	1%	$2,440,341	0%	118	2%	$17	1	30%
Attributed to non-OR providers	49,201	5%	$49,018,317	7%	9,374	N/A	$108	9	21%
More than 1 Provider w/PB claims	253,288	26%	$527,378,350	76%	3,982	80%	$358	78	17%
E&M Max Attributed Episodes									
Attributed to OR providers									
With identifiable MPIER specialty	597,850	61%	$563,814,606	81%	3,126	63%	$108	14	18%
More than one specialty	389,189	40%	$412,827,852	60%	1,604	32%	$115	16	17%
With unresolved specialty	10,943	1%	$2,429,582	0%	117	2%	$17	1	25%
Attributed to non-OR providers	45,643	5%	$44,928,121	6%	9,229	N/A	$101	7	18%
More than 1 Provider w/E&M claims	109,667	11%	$381,272,267	55%	2,683	54%	$618	105	10%

Table 3.17: PBmax Attribution for Top-10-Cost MEGs

MEG: Description	All Episodes			Episodes Attributed to OR providers		Percentiles of Shares of Per-Episode Cost Contributed by PB Claims of Attributed Provider						
	Total Number	Total Cost	% with > $0 of PB	% of Episodes	% of Costs	10th	25th	50th	75th	90th	95th	98th
All MEGs	975,096	$693,629,614	89.7%	81.5%	89.5%	19%	47%	100%	100%	100%	100%	100%
374: Osteoarthritis	25,672	$55,601,308	94.1%	87.3%	91.2%	10%	23%	58%	100%	100%	100%	100%
10: Angina Pectoris, Chronic Maintenance	19,837	$38,034,295	93.6%	86.1%	88.9%	9%	27%	72%	100%	100%	100%	100%
11: Acute Myocardial Infarction	2,296	$33,641,189	92.9%	84.8%	89.3%	3%	4%	6%	8%	15%	100%	100%
92: Cataract	54,351	$22,946,025	88.3%	84.1%	96.8%	39%	61%	100%	100%	100%	100%	100%
397: Cerebrovascular Dis with Stroke	5,780	$22,737,517	85.2%	79.3%	87.5%	2%	5%	51%	100%	100%	100%	100%
426: Complications of Surgical and Medical Care	4,467	$20,676,572	89.2%	82.6%	89.9%	3%	8%	30%	100%	100%	100%	100%
510: Pneumonia: Bacterial	7,081	$19,422,436	92.2%	86.3%	93.6%	3%	6%	32%	100%	100%	100%	100%
348: Fracture: Femur, Head or Neck	1,521	$18,774,575	93.7%	87.8%	93.5%	3%	5%	7%	18%	100%	100%	100%
13: Essential Hypertension, Chronic Maintenance	63,886	$16,369,549	90.5%	84.0%	88.6%	33%	60%	100%	100%	100%	100%	100%
6: Arrhythmias	18,239	$15,410,739	92.1%	85.2%	90.7%	11%	41%	100%	100%	100%	100%	100%

E&M claim in a PMmax-attributed Mestat episode, and of the providers with a PB claim in an episode, the share with a minimum number of episodes attributed to them. We see that 88 percent of general surgeons and 92 percent of chiropractors are attributed with at least one episode by the PBmax rule. When evaluating providers with 30 or more attributed episodes of any type, the attribution rate drops from 93 percent to 72 percent for family medicine and from 92 percent to 68 percent for internal medicine. The attribution rate drops from 88 to 64 percent for surgeons treating 30 or more episodes. However, only 23 percent of chiropractors are charged with directing care for 30 or more episodes, even though 92 percent of chiropractors

Table 3.18: PBmax Attribution for Top Specialties by E&M Claims in Episodes, Medstat

Specialty	# Providers with Claims in Episodes		% Providers w/ Minimum Number of Attributed Episodes				
	# w/≥1 PB Claim	# w/≥1 E&M Claim	≥1	≥5	≥10	≥20	≥30
All Specialties	4,954	3,740	91%	73%	64%	54%	49%
Chiropractic	578	368	92%	68%	51%	34%	23%
Family practice	475	456	93%	85%	81%	77%	72%
Internal medicine	407	387	92%	82%	76%	70%	68%
Nurse practitioner	272	231	94%	73%	63%	54%	48%
Optometry	255	218	95%	81%	73%	59%	52%
Clinical psychologist	152	15	88%	16%	6%	1%	1%
Obstetrics/gynecology	161	147	88%	79%	68%	57%	49%
Psychiatry	156	63	90%	47%	31%	17%	10%
Physician assistant	155	135	83%	65%	57%	48%	34%
General surgery	155	139	88%	78%	73%	68%	64%
Physical therapist	155	11	94%	81%	68%	55%	42%
Orthopedic surgery	154	144	92%	86%	86%	80%	77%

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were assigned to at least one episode. And only 1 percent of clinical psychologists direct care for 30 or more episodes even though 88 percent direct care for at least one episode.

3.2.6 Assignment of Medstat Episodes Based on Maximum E&M Costs

When the EMmax rule is applied to Medstat grouper, far fewer providers are attributed with directing care for episodes. Where the PBmax rule attributes episodes to over 90 percent of providers, the EMmax rule only attributes episodes to 63 percent of providers. Only a little more than half of all providers direct care for 5 or more EMmax attributed episodes, and just 40 are charged with directing care for 30 or more episodes.

Table 3.19 presents the cost and composition of episodes in the top 10 MEGs attributed under the EMmax rule; it is structured similarly to Table 3.17. Only 61 percent of episodes, which capture 81 percent of all episode costs, are attributed to providers by the EMmax rule. Focusing on the top 10 MEGs, between 24 and 86 percent of episodes belonging to the most expensive MEGs are attributed to OR providers. And whereas cataract episodes exhibit a high attribution rate under the PBmax rule, they exhibit the lowest attribution rate under the EMmax rule.

Table 3.19 also shows that shares of episode costs directly originating from the PB claim(s) of the attributed provider can vary significantly across MEGs. MEGs with the lowest shares of directly attributable costs include acute myocardial infarctions and femur fractures, where the directly attributable cost for the median episodes is between is 5 and 2 percent respectively. Cataract episodes have the highest shares of directly attributable cost, where 100 percent of costs are directly attributable for the median episodes, and arrhythmia episodes have the next highest shares, with 85 percent of costs originating from the attributed provider's PB claims at the median. These are similar patterns as exhibited with attribution under the PBmax rule; however, EMmax-attributed providers show slightly smaller shares of episode costs. This is expected because the PBmax rule attributes episodes to those providers who file more expensive PB claims, whereas the EMmax rule will attribute episodes to those who exhibit the highest E&M costs. So, a patient's GP might file more E&M claims for a femur fracture episode, but if this episode required a surgery, and the surgery is conducted by a provider other

Table 3.19: EMmax Attribution for Top-10-Cost MEGs

MEG: Description	All Episodes			Episodes Attributed to OR providers		Percentiles of Shares of Per-Episode Cost Contributed by PB Claims of Attributed Provider						
	Total Number	Total Cost	% with > $0 of E&M	% of Episodes	% of Costs	10th	25th	50th	75th	90th	95th	98th
All MEGs	975,096	$693,629,614	65.4%	61.3%	81.3%	12%	39%	100%	100%	100%	100%	100%
374: Osteoarthritis	25,672	$55,601,308	87.6%	81.4%	87.3%	6%	14%	44%	100%	100%	100%	100%
10: Angina Pectoris, Chronic Maintenance	19,837	$38,034,295	89.2%	82.9%	89.4%	7%	22%	67%	100%	100%	100%	100%
11: Acute Myocardial Infarction	2,296	$33,641,189	89.9%	83.3%	88.5%	1%	2%	5%	7%	12%	100%	100%
92: Cataract	54,351	$22,946,025	25.5%	24.2%	34.0%	35%	45%	100%	100%	100%	100%	100%
397: Cerebrovascular Dis with Stroke	5,780	$22,737,517	81.7%	76.8%	86.2%	2%	5%	43%	100%	100%	100%	100%
426: Complications of Surgical and Medical Care	4,467	$20,676,572	69.7%	65.3%	76.0%	2%	5%	25%	100%	100%	100%	100%
510: Pneumonia: Bacterial	7,081	$19,422,436	89.7%	84.1%	93.2%	3%	6%	31%	100%	100%	100%	100%
348: Fracture: Femur, Head or Neck	1,521	$18,774,575	91.5%	85.8%	92.7%	1%	1%	2%	12%	100%	100%	100%
13: Essential Hypertension, Chronic Maintenance	63,886	$16,369,549	84.6%	80.3%	87.3%	33%	59%	100%	100%	100%	100%	100%
6: Arrhythmias	18,239	$15,410,739	77.9%	73.0%	87.1%	10%	32%	85%	100%	100%	100%	100%

than the patient's GP, then the surgeon would be attributed with the episode under the PBmax rule, but the GP would be attributed the episode under the EMmax rule.

Table 3.20: EMmax Attribution for Top Specialties by E&M Claims in Episodes, Medstat

Specialty	# Providers with Claims in Episodes		% Providers w/ Minimum Number of Attributed Episodes				
	# w/≥1 PB Claim	# w/≥1 E&M Claim	≥1	≥5	≥10	≥20	≥30
All Specialties	4,954	3,740	63%	53%	49%	43%	40%
Chiropractic	578	368	0%	0%	0%	0%	0%
Family practice	475	456	92%	84%	79%	75%	71%
Internal medicine	407	387	90%	80%	75%	70%	68%
Nurse practitioner	272	231	78%	64%	56%	49%	43%
Optometry	255	218	82%	61%	51%	34%	24%
Clinical psychologist	152	15	4%	0%	0%	0%	0%
Obstetrics/gynecology	161	147	87%	76%	61%	54%	46%
Psychiatry	156	63	33%	13%	10%	6%	5%
Physician assistant	155	135	78%	63%	53%	44%	32%
General surgery	155	139	85%	77%	73%	64%	62%
Physical therapist	155	11	4%	3%	3%	1%	1%
Orthopedic surgery	154	144	91%	84%	83%	79%	73%

Table 3.20 shows the share of providers with EMmax-attributed Medstat episodes across each of the top specialties who file E&M claims. The EMmax rule attributes episodes between 0 and 92 percent providers within each of these specialties. Family practice shows the highest attribution rate, but chiropractors, who had a high attribution rate (92 percent) under the PBmax rule, are not attributed a single episode under the EMmax rule. Some provider types appear to treat large numbers of episodes compared to others. For instance, the EMmax rule assigns

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responsibility for 30 or more episodes to 71 percent of family medicine providers and 68 percent of internal medicine specialists, but only to a quarter of optometry and 5 percent of psychiatry specialists using the same rule

3.3 Summary of Findings

This section evaluates two plurality-based rules for attributing episodes to providers: one that assigns responsibility for episode care to the provider with the most PB charges (PBmax), and one that assigns responsibility to the provider with the most E&M charges (EMmax). To be eligible for assignment, a provider must have submitted a PB or E&M claim, and have this claim grouped into at least one episode. Interesting questions arise regarding what shares of episodes, costs and providers receive assignment under these attribution rules. We learned the following:

- Of the 9,952 Oregon providers (Tax IDs) listed as eligible to receive Medicare payments during the period covering our 2003 Complete Episode sample, 36 percent submitted PB claims in 2003 and just 26 percent submitted an E&M claim. Many Tax IDs report multiple specialties indicating the presence of more than one physician associated with the Tax ID. Using the combination of Tax ID and specialty, we identified 12,927 providers practicing in Oregon (Table 3.4). The fractions of these providers submitting PB and E&M claims mirror the shares observed for Tax IDs. This group defines the pool of eligible providers under any attribution rule that relies on the contribution of PB claims.

- For the population of episodes constructed by the Symmetry grouper, our results reveal:

  - 80 percent of all episodes and 89 percent of total episode costs are attributed to OR providers using the PBmax rule; 6 percent of episodes and 7 percent of costs are attributed to out-of-state providers (Table 3.10).

  - 58 percent of the episodes and 81 percent of total episode costs are attributed to OR providers using the EMmax rule; 5 percent of episodes and 6 percent of costs are attributed to out-of-state providers (Table 3.10).

  - 92 percent of eligible OR providers receive at least one episode attribution under the PBmax rule, 64 percent receive at least 10 attributions, 55 percent at least 20, and 49 percent at least 30 (Table 3.9). Not surprisingly, rates vary across specialties, with providers in family practice, internal medicine, orthopedic surgery, and general surgery being at the top (Table 3.12).

  - 63 percent of eligible OR providers receive at least one episode attribution under the EMmax rule, 48 percent receive at least 10 attributions, 43 percent at least 20, and 39 percent at least 30 (Table 3.9). Specialties with higher assignment rates for the PBmax attribution rule also have higher rates for the EMmax rule (Table 3.14).

  - 24 percent of episode costs originate from the claims of providers attributed episodes under the PBmax rule, and just 19 percent of costs originate from the

attributed provider under the EMmax rule (Table 3.10); the remaining costs come from (i) institutional claims, (ii) DME claims, and (iii) claims from other physicians. The cost shares originating from attributed providers substantially vary both across and within episode types (Tables 3.11 and 3.13).

- For the population of episodes produced by the Medstat grouper, our results show:

  o 81 percent of the episodes and 90 percent of the total episode costs are attributed to OR providers using the PBmax rule; 5 percent of episodes and 7 percent of costs are attributed to out-of-state providers (Table 3.16).

  o 61 percent of the episodes and 81 percent of the total episode costs are attributed to OR providers using the EMmax rule; 5 percent of episodes and 6 percent of costs are attributed to out-of-state providers (Table 3.16).

  o 91 percent of eligible OR providers receive at least one episode attribution under the PBmax rule, 64 percent receive at least 10 attributions, 54 percent at least 20, and 49 percent at least 30 (Table 3.15). Not surprisingly, rates vary across specialties, with providers in family practice, internal medicine, general surgery and orthopedic surgery being at the top (Table 3.18).

  o 63 percent of eligible OR providers receive at least one episode attribution under the EMmax rule, 49 percent receive at least 10 attributions, 43 percent at least 20, and 40 percent at least 30 (Table 3.15). Specialties with higher assignment rates for the PBmax attribution rule also have higher rates for the EMmax rule (Table 3.20).

  o 23 percent of episode costs originate from the claims of providers attributed episodes under the PBmax rule, and just 18 percent of costs originate from the attributed provider under the EMmax rule (Table 3.16); the remaining costs come from (i) institutional claims, (ii) DME claims, and (iii) claims from other physicians. The cost shares originating from attributed providers substantially vary both across and within episode types (Tables 3.17 and 3.19).

4 CRITERIA FOR COMPARING ASSIGNED COSTS ACROSS PROVIDERS

Following attribution of episodes of care to providers, the next decisions for constructing RURs entail comparing experiences across contemporaries. RUR scores should not be determined by unrepresentative circumstances nor non-comparable forms of treatment; each provider's measure of resource use should be based on enough episodes of the same type to present a legitimate picture of their practice. Additionally, comparisons should include a sufficiently large number of similar providers to ensure that no single individual exerts undue influence on benchmark scores. Finally, given that costs and beneficiary risk levels vary by physician specialties, assessments should be made within comparable provider groups.

Section 4.1 addressees the fourth question posed in the Introduction – *How many episodes are required to develop a score for a physician treating a specific episode type?* – by exploring the impact of selecting cases based on restricting the pool of providers to those who treat a minimum number of episodes. Section 4.2 addresses the fifth question posed in the Introduction – *What is the relevant peer group for a provider?* – by exploring the impact of requirements on the number and categories of providers included in comparison groups. Section 4.3 presents a summary of the effects of changing specifications of peer groups on the number of providers eligible for scoring and the share of episodes and costs assigned.

4.1 Effects of Altering Number of Allotted Episodes and Providers

To be assigned a score that reflects resource utilization, a provider must first be attributed the cost of the episode. However, in order for the RUR to reflect the *average* resource use for treating a series of episodes, one must establish a minimum number of episodes for which a provider is responsible. If the minimum is set too low, a provider's score might be biased in the direction of an outlier episode; however increasing the minimum drops the number of providers for whom a score can be calculated. Additionally, since episode costs vary by episode type (e.g., the median SL 1 cataract episode costs $69 and the median SL 2 thigh, hip & pelvis dislocation or fracture costs $11,129), RUR scores should be calculated relative to the average cost of treating a particular episode type. Below we evaluate the effect of both any-type and same-type episode rules on episode and provider compositions using both the PBmax and EMmax attribution rules. This is a key distinction, as assessing relative resource use requires cost comparisons within episodes of the same type, meaning that providers must treat sufficient

numbers of a specific ETG/MEG to produce a reliable RUR score. Even overall RUR scores require comparisons within episode types as these composite scores are based on multiple ETG/MEG-specific scores. Because we wish to consider the effects of sample type rules alone, the percentages we present in this section are based on denominators of attributed episodes or of providers with at least one attributed episode, as opposed to all episodes or all providers. The denominators are also conditional on which attribution rule is being used. The denominator used for examining shares of providers consists of either all providers attributed with at least one episode under the PBmax rule or all providers with at least one EMmax-attributed episode. Episodes that are attributed to these providers serve as denominators for estimating shares of episodes and their costs. Thus, when viewing shares of episodes and providers in this section, recall that we are showing shares of a subset of all episodes and of all Oregon providers. Sections 4.1.1 and 4.1.2 discuss the effects of any-type and same-type episode rules for Symmetry-produced episodes, and Sections 4.1.3 and 4.1.4 discuss the effects of any-type and same-type episode rules for Medstat-produced episodes.

4.1.1   Share of Costs/Providers Covered by Any Episode Rule for Symmetry

The first four rows of Tables 4.1 and 4.2 show the effect of raising the minimum number of episodes a provider must treat in order to be eligible for RURs. The first row in Tables 4.1 and 4.2 correspond to figures presented in Table 3.10 for episodes attributed to Oregon providers with an identifiable specialty. It shows the number of attributed episodes and share of attributed episode costs, the number of attributed providers, and characteristics of episodes attributed under the PBmax and EMmax rules. Increasing the minimum any-type episode requirement produces a minimal decrease in the number of Symmetry-produced attributable episodes available for RURs. Moving from a 1-episode rule to a 10-episode rule decreases the share of attributed episodes by just 1 percent under the PBmax rule and has a negligible effect under the EMmax rule. When the minimum is increased to 30 episodes, shares of attributed episodes available for RURs drop by 2 percent for both attribution rules. When the minimum any-type episode rule is set to 30, 97 percent of attributed episode costs are captured for both PBmax- and EMmax- attributed episodes.

Table 4.1: Characteristics of Episodes by Minimum Number of Episodes per Provider, Symmetry PBmax

Attribution Rules		Attributed Episodes				OR Providers w/ Attributed Episodes		Attributed Episode Characteristics		Attributed Providers' Share of Episode Costs
Minimum # Episodes	Same Type?	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
1	No	817,496	100%	$651,351,951	100%	4,640	100%	$100	11	24%
10	No	812,503	99%	$646,318,595	99%	3,220	69%	$100	11	24%
20	No	806,338	99%	$640,263,952	98%	2,772	60%	$100	11	24%
30	No	798,635	98%	$632,507,097	97%	2,458	53%	$100	11	24%
1	Yes	817,496	100%	$651,351,951	100%	4,640	100%	$100	11	24%
10	Yes	508,993	62%	$352,361,389	54%	2,087	45%	$95	11	29%
20	Yes	404,859	50%	$261,157,530	40%	1,387	30%	$93	10	32%
30	Yes	347,370	42%	$206,360,164	32%	1,046	23%	$93	9	34%

Table 4.2: Characteristics of Episodes by Minimum Number of Episodes per Provider, Symmetry EMmax

Attribution Rules		Attributed Episodes				OR Providers w/ Attributed Episodes		Attributed Episode Characteristics		Attributed Providers' Share of Episode Costs
Minimum # Episodes	Same Type?	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
1	No	592,513	100%	$588,313,981	100%	3,197	100%	$124	24	19%
10	No	589,764	100%	$584,068,880	99%	2,434	76%	$124	24	19%
20	No	586,021	99%	$578,574,993	98%	2,169	68%	$124	24	19%
30	No	581,173	98%	$569,595,814	97%	1,970	62%	$124	24	19%
1	Yes	592,513	100%	$588,313,981	100%	3,197	100%	$124	24	19%
10	Yes	323,337	55%	$273,754,232	47%	1,567	49%	$124	34	26%
20	Yes	237,060	40%	$193,075,341	33%	1,020	32%	$125	40	28%
30	Yes	189,201	32%	$147,139,322	25%	739	23%	$125	44	30%

Episode characteristics are also not affected by increasing the minimum any-type episode requirement. When the minimum episode requirement is raised from 1 to 30 any-type episodes, the median length of PBmax-attributed episodes does not change, and neither does the median cost. The median cost and length of EMmax-attributed episodes also remain the same at $124 and 24 days, regardless of which any-type episode requirement is used.

The share of providers eligible for RURs, though, drops appreciably when the minimum any-type episode requirements increase. Raising the minimum any-type episode requirement for PBmax-attributed episodes to 10 decreases the number of eligible providers from 4,640 to 3,220, or just 69 percent of all providers attributed at least one episode. Only about half of all providers who are attributed at least one episode are attributed 30 or more episodes. Three quarters of providers attributed any episodes under the EMmax rule treat 10 or more episodes, and 62 percent treat 30 or more episodes.

4.1.2 *Share of Costs/Providers Covered Requiring Common Symmetry Episodes*

The last four rows of Tables 4.1 and 4.2 reveal that when a same-type episode restriction is used, shares of Symmetry episodes available for RURs drop substantially, as do shares of episode costs. Of all PBmax-attributed episodes, 62 percent of episodes are attributed to providers who are attributed at least 10 of the same-type episodes; only 55 percent of EMmax-attributed episodes are attributed to providers who are attributed at least 10 episodes of the same-type. Under a 10 same-type episode rule, about half of all attributed episode costs cannot be used for RURs. Advancing to a 30 same-type episode rule leaves only 42 percent of PBmax-attributed episodes and 32 percent of attributed episode costs. When using EMmax-attributed episodes, setting the minimum same-type episode restriction to 30 drops the share of episodes to just 32 percent, representing only 25 percent of costs for EMmax-attributed episodes. Turning to provider shares, less than half of the providers who are attributed at least one episode under the PBmax rule are attributed 10 or more same-type episodes, and just 49 percent of providers attributed at least one episode under the EMmax rule are attributed 10 or more episodes. Furthermore, setting the cell size to a minimum of 30 same-type episodes excludes over three-quarters of providers. When providers are required to treat at least 30 episodes of the same type, only 1,046 remain eligible under PBmax, and 739 under EMmax.

Table 4.3 shows the effect of same-type episode cell size rules on the share of episodes and costs attributed to providers under the PBmax rule for the top 10 ETGs (as ranked by total costs). Episode shares range from 40 to 99 percent across the top 10 ETGs under a 10 same-type episode rule. In other words, 99 percent of all attributed SL 1 cataract episodes are attributed to providers who are attributed costs for at least 10 SL 1 cataract episodes, but only 40 percent of all SL 2 thigh, hip & pelvis fracture or dislocation episodes are attributed to providers who are attributed costs for 10 or more of these types of episodes. Increasing the cell size requirement does not drop the share of attributed episodes for SL 1 cataract episodes appreciably (dropping only 3 percentage points when the minimum is set to 30 same-type episodes), but advancing to a 30 same-type episode rule cuts the shares of attributed episodes by 30 percent or more for four of

Table 4.3: Attributed Episodes and Costs by Episode Cell-Size Rule for Top-10-Cost ETGs, PBmax

ETG: Description		Same-Type Episode Cell Size Rule					
		10		20		30	
		% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All ETGs		62%	54%	50%	40%	42%	32%
386500L2:	Ischemic heart disease, SL 2	73%	86%	62%	75%	55%	66%
386500L1:	Ischemic heart disease, SL 1	82%	91%	70%	80%	64%	76%
351700L1:	Cataract, SL 1	99%	99%	97%	99%	96%	99%
386500L3:	Ischemic heart disease, SL 3	62%	79%	52%	65%	44%	50%
316000L2:	Cerebral vascular accident, SL 2	61%	64%	41%	43%	29%	31%
386500L4:	Ischemic heart disease, SL 4	61%	69%	43%	46%	20%	18%
712208L2:	Joint degeneration, localized - back, SL 2	61%	81%	43%	67%	31%	44%
713103L2:	Closed fracture or dislocation - thigh, hip & pelvis, SL 2	40%	47%	23%	27%	17%	20%
712202L2:	Joint degeneration, localized - knee & lower leg, SL 2	70%	85%	55%	71%	40%	58%
388100L2:	Hypertension, SL 2	90%	88%	80%	78%	73%	69%

the top 10 ETGs. The episode share for SL 4 ischemic heart disease episodes drops by two thirds from a rate of 61 percent under a 10 same-type episode rule to just 20 percent under a 30 same-type episode rule.

Table 4.4 is similar to Table 4.3, but presents the effects of episode cell-size rules on EMmax-attributed episodes. It shows that EMmax-attributed episodes are more sensitive to increases in same-type minimum requirements compared to PBmax-attributed episodes. Attributed episode shares under a 10 same-type episode rule vary from 26 percent for SL 2 fractures and dislocations of the thigh, hip and pelvis to 92 percent for SL 1 cataract episodes.

Table 4.4: Attributed Episodes and Costs by Episode Cell-Size Rule for Top-10-Cost ETGs, EMmax

ETG: Description		Same-Type Episode Cell Size Rule					
		10		20		30	
		% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All ETGs		55%	47%	40%	33%	32%	25%
386500L2:	**Ischemic heart disease, SL 2**	73%	80%	58%	66%	49%	59%
386500L1:	**Ischemic heart disease, SL 1**	82%	87%	68%	76%	61%	71%
351700L1:	**Cataract, SL 1**	92%	89%	87%	85%	83%	83%
386500L3:	**Ischemic heart disease, SL 3**	54%	64%	41%	50%	34%	42%
316000L2:	**Cerebral vascular accident, SL 2**	58%	63%	40%	47%	21%	23%
386500L4:	**Ischemic heart disease, SL 4**	45%	48%	32%	36%	17%	19%
712208L2:	**Joint degeneration, localized - back, SL 2**	60%	67%	44%	50%	30%	35%
713103L2:	**Closed fracture or dislocation - thigh, hip & pelvis, SL 2**	26%	27%	8%	8%	3%	4%
712202L2:	**Joint degeneration, localized - knee & lower leg, SL 2**	68%	70%	51%	55%	34%	35%
388100L2:	**Hypertension, SL 2**	90%	87%	79%	76%	71%	68%

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And under a 30 same-type episode rule, just 3 percent of attributed episodes of fractures or dislocations or the thigh, hip and pelvis are managed by providers who manage at least 30 or more of these episode types.

Table 4.5: Shares of Top Specialties with Minimum Number of Same-Type Episodes, Symmetry PBmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode		
			Same-Type Episode Cell Size Rule		
			10	20	30
All Specialties	5,061	3,784	45%	30%	23%
Chiropractic	579	368	37%	20%	12%
Family practice	470	448	55%	33%	23%
Internal medicine	404	383	63%	50%	40%
Nurse practitioner	279	235	29%	11%	7%
Optometry	257	217	68%	52%	40%
Clinical psychologist	173	16	3%	1%	1%
Physician assistant	165	137	18%	6%	4%
Obstetrics/gynecology	164	148	54%	30%	20%
Psychiatry	163	64	12%	5%	1%
General surgery	160	142	55%	27%	18%
Physical therapist	160	16	22%	7%	2%
Orthopedic surgery	154	144	61%	39%	23%

We also find substantial variation in attribution rates across top specialties by claims in episodes when rules for same-type episode treatment are applied. Table 4.5 presents the number of providers with at least one PB claim or E&M claim in an episode, and shows the impact of same-type episode cell-size rules on the share of providers with at least one PBmax-attributed episode. We see that there are 63 percent of attributed internal medicine specialists who treat at

least 10 episodes of the same type, and 40 percent who treat 30 or more. About 55 percent of family practice and general surgery specialists treat 10 or more same-type episodes, but only 23 percent of family practice and 18 percent of general surgery specialists treat 30 or more same-type episodes.

Finally, as expected, fewer providers are attributed with multiple episodes when the EMmax attribution rule is used, as Table 4.6 shows. Only 37 percent of attributed internal medicine specialists treat 30 or more episodes. What these tables show is that providers in

Table 4.6: Shares of Top Specialties with Minimum Number of Same-Type Episodes, Symmetry EMmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode		
			Same-Type Episode Cell Size Rule		
			10	20	30
All Specialties	5,061	3,784	49%	32%	23%
Chiropractic[11]	579	368	N/A	N/A	N/A
Family practice	470	448	53%	33%	21%
Internal medicine	404	383	63%	48%	37%
Nurse practitioner	279	235	33%	12%	8%
Optometry	257	217	38%	22%	14%
Clinical psychologist	173	16	0%	0%	0%
Physician assistant	165	137	18%	7%	4%
Obstetrics/gynecology	164	148	52%	26%	18%
Psychiatry	163	64	9%	4%	2%
General surgery	160	142	49%	22%	13%
Physical therapist	160	16	10%	0%	0%
Orthopedic surgery	154	144	58%	35%	19%

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[11] Some chiropractors have E&M claims in episodes, but none of these claims have positive payments. Because chiropractors do not have episodes attributed to them under the EMmax rule, their denominator for these percentages is zero and the fraction is undefined.

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certain specialties will be more likely to be profiled, especially if more restrictive episode rules are applied. Ideally, episode restrictions could be set high enough to produce reliable estimates of resource use, but even with low episode requirements, less than half of all providers treat sufficient numbers of same-type episodes to predict resource use.

4.1.3 Share of Costs/Providers Covered by Any Episode Rule for Medstat

The first four rows of Tables 4.7 and 4.8 present the effect of raising the minimum number of Medstat-produced episodes that must be attributed to a provider under PBmax or EMmax, respectively, in order to be eligible for RURs. The first rows in these tables correspond to figures presented in Table 3.16 for episodes attributed to Oregon providers with an identifiable specialty. Increasing the minimum any-type episode requirement produces a minimal decrease in the number of Medstat-produced episodes available for RURs. Moving from a 1 any-type episode rule to a 10 any-type episode rule only decreases the share of attributed episodes by 1 percent under both the PBmax and EMmax rules. When the minimum is increased to 30, shares of attributed episodes available for RURs only drop by 2 percent under both attribution rules. And given that few attributed episodes are dropped when any-type episode requirements increase, it is not surprising that episode characteristics are not affected by increasing the minimum any-type episode requirement.

However, when the minimum any-type episode requirements increase, the share of providers eligible for RURs drops appreciably. Table 4.7 shows that raising the minimum any-type episode requirement for PBmax-attributed episodes to 10 decreases the number of eligible providers from 4,501 to 3,156, or just 70 percent of all providers attributed with at least one episode. Shares of eligible providers drop to 60 and 54 percent for providers who direct care for 20 or more and 30 or more episodes respectively. Table 4.8 shows that of the providers attributed with episodes under the EMmax rule, 77 percent treat 10 or more any-type episodes, and 63 percent treat 30 or more any-type episodes. Whereas, shares of EMmax-attributed providers are higher than shares of PMmax-attributed providers under similar episode cell size rules, there are still substantially fewer providers in each EMmax cell. Finally, setting the any-type episode restriction to 10 increases the typical PB-max attributed episode length from 8 to 12 days, and episodes that remain under the 30 any-type episode restriction are typically 15 days long. Even so, typical cost of these episodes changes little as the any-type restriction increase.

Table 4.7: Characteristics of Episodes by Minimum Number of Episodes per Provider, Medstat PBmax

Attribution Rules		Attributed Episodes				OR Providers w/ Attributed Episodes		Attributed Episode Characteristics		Attributed Providers' Share of Episode Costs
Minimum # Episodes	Same Type?	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
1	No	794,254	100%	$620,978,004	100%	4,501	100%	$93	8	23%
10	No	789,434	99%	$616,280,903	99%	3,156	70%	$93	8	23%
20	No	782,966	99%	$608,755,495	98%	2,694	60%	$93	8	24%
30	No	775,976	98%	$601,473,826	97%	2,409	54%	$93	8	24%
1	Yes	794,254	100%	$620,978,004	100%	4,501	100%	$93	8	23%
10	Yes	583,297	73%	$404,098,022	65%	2,408	53%	$92	12	27%
20	Yes	486,873	61%	$322,690,861	52%	1,765	39%	$92	14	29%
30	Yes	425,628	54%	$271,853,552	44%	1,387	31%	$91	15	30%

Table 4.8: Characteristics of Episodes by Minimum Number of Episodes per Provider, Medstat EMmax

Attribution Rules		Attributed Episodes				OR Providers w/ Attributed Episodes		Attributed Episode Characteristics		Attributed Providers' Share of Episode Costs
Minimum # Episodes	Same Type?	#	% All	Total Cost	% All Costs	#	%	Median Cost	Median Length (Days)	
1	No	597,850	100%	$563,814,606	100%	3,126	100%	$108	14	18%
10	No	595,286	100%	$559,898,307	99%	2,410	77%	$108	14	18%
20	No	591,561	99%	$555,036,049	98%	2,149	69%	$108	14	18%
30	No	586,985	98%	$548,022,016	97%	1,961	63%	$108	14	18%
1	Yes	597,850	100%	$563,814,606	100%	3,126	100%	$108	14	18%
10	Yes	401,328	67%	$326,193,085	58%	1,759	56%	$111	21	23%
20	Yes	315,675	53%	$247,521,208	44%	1,283	41%	$113	26	25%
30	Yes	261,477	44%	$201,017,851	36%	982	31%	$114	29	26%

The figures in the top four rows of Tables 4.7 and 4.8 do not require episodes to be of the same type, so it is possible that while a provider is attributed with 30 or more episodes, there might not be enough common episodes to produce reliable estimates of resource use. The following section explores how restricting common episode requirements affect shares of episodes and providers eligible for profiling.

4.1.4 Share of Costs/Providers Covered Requiring Common Medstat Episodes

The last four rows of Tables 4.7 and 4.8 demonstrate that imposing a same-type episode rule substantially reduces the share of episodes available for use in generating RURs. Of all PBmax-attributed Medstat episodes, 73 percent are assigned to providers who are attributed with 10 or more of the same type of episode. When a minimum 30 same-type episode rule is applied, episode share drops to 54 percent, and cost share to 44 percent. The same-type episode restriction produces an even greater drop in episode shares for EMmax-attributed episodes, with a 10 episode minimum rule leaving 67 percent of EMmax-attributed episodes and 58 percent of attributed episode costs, and a 30 same-type episode rule leaves 44 percent of episodes and 36 percent of episode costs.

The number of eligible providers also drops substantially when more restrictive episode rules are applied. Only 56 and 53 percent of providers are attributed with at least 10 same-type episodes under the PBmax and EMmax rules, respectively. And when a 30 same-type episode rule is applied, nearly 70 percent of both PBmax and EMmax assigned providers become ineligible to receive RURs. So, using the PBmax attribution rule and applying a 30 same-type episode minimum leaves only 1,387 providers eligible for RURs, and only 982 providers when the EMmax attribution rule is used.

Focusing on the top 10 MEGs by total costs, Table 4.9 shows the influence of same-type episode rules on shares of PBmax-attributed episodes and shares of costs by episode type. Under the 10 same-type episode rule, between 51 and 99 percent of all attributed episodes go to providers attributed with at least 10 episodes for each MEG, which capture between 52 and 99 percent of attributed MEG costs. Increasing the individual cell size rule barely changes the percent of attributed cataract episodes, but it has a substantial effect for other MEGs. For instance, the share of attributed myocardial infarction episodes drops from 72 to 55 percent when

the episode cell size advances from 10 to 30. With head or neck fractures of the femur, this change leads to a drop in shares from 62 percent to 22 percent.

Table 4.9: Attributed Episodes and Costs by Episode Cell-Size Rule for Top-10-Cost MEGs, PBmax

MEG: Description		Same-Type Episode Cell Size Rule					
		10		20		30	
		% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All MEGs		73%	65%	61%	52%	54%	44%
374:	**Osteoarthritis**	82%	92%	68%	84%	58%	76%
10:	**Angina Pectoris, Chronic Maintenance**	87%	90%	78%	85%	71%	78%
11:	**Acute Myocardial Infarction**	72%	82%	61%	71%	55%	63%
92:	**Cataract**	99%	99%	97%	98%	96%	98%
397:	**Cerebrovascular Dis with Stroke**	56%	54%	32%	34%	21%	25%
426:	**Complications of Surgical and Medical Care**	51%	52%	27%	25%	19%	15%
510:	**Pneumonia: Bacterial**	64%	63%	43%	45%	28%	29%
348:	**Fracture: Femur, Head or Neck**	62%	69%	33%	38%	22%	25%
13:	**Essential Hypertension, Chronic Maintenance**	95%	87%	91%	81%	85%	75%
6:	**Arrhythmias**	85%	87%	74%	79%	68%	75%

Table 4.10 shows that the EMmax-attributed episodes also have substantial variation in shares of top 10 MEG episodes eligible for RURs, as well as differences in shares when compared to PBmax-attributed episodes (Table 4.9). Episode shares vary from 27 percent for episodes of femur fracture to 96 percent for essential hypertension chronic maintenance under the 10 same-type episode rule, and from 0 percent for head or neck femur fractures to 85 percent for essential hypertension chronic maintenance under the 30 same-type episode rule. The effect of raising the minimum episode requirement also varies by MEG. Advancing from 10 to 30

same-type episodes causes the share of attributed arrhythmia episodes to drop from 83 to 62 percent. The same change causes the number of attributed pneumonia episodes to drop by nearly 40 percentage points, decreasing the share of attributed episode cost from 65 to 28 percent. This shows that whereas a large majority of pneumonia cases are treated by providers attributed with 10 or more cases of these episodes, far fewer are treated by providers attributed with treating 30 or more cases.

Table 4.10: Attributed Episodes and Costs by Episode Cell-Size Rule for Top-10-Cost MEGs, EMmax

| MEG: Description | Same-Type Episode Cell Size Rule | | | | | |
| | 10 | | 20 | | 30 | |
	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All MEGs	67%	58%	53%	44%	44%	36%
374: Osteoarthritis	86%	87%	72%	76%	61%	65%
10: Angina Pectoris, Chronic Maintenance	88%	87%	77%	77%	70%	72%
11: Acute Myocardial Infarction	63%	65%	48%	52%	39%	44%
92: Cataract	91%	87%	87%	84%	83%	80%
397: Cerebrovascular Dis with Stroke	61%	62%	37%	42%	23%	30%
426: Complications of Surgical and Medical Care	47%	42%	21%	14%	18%	9%
510: Pneumonia: Bacterial	64%	65%	44%	48%	27%	28%
348: Fracture: Femur, Head or Neck	27%	30%	3%	3%	0%	0%
13: Essential Hypertension, Chronic Maintenance	96%	91%	91%	85%	85%	79%
6: Arrhythmias	83%	82%	70%	70%	62%	65%

Table 4.11 presents the number of providers by specialty with at least one PB claim or E&M claim in an episode, and shows the impact of same-type episode cell-size rules on the

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Table 4.11: Shares of Top Specialties with Minimum Number of Same-Type Episodes, Medstat PBmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode		
			Same-Type Episode Cell Size Rule		
			10	20	30
All Specialties	4,954	3,740	53%	39%	31%
Chiropractic	578	368	52%	32%	22%
Family practice	475	456	65%	50%	41%
Internal medicine	407	387	69%	60%	51%
Nurse practitioner	272	231	41%	25%	14%
Optometry	255	218	65%	48%	39%
Obstetrics/gynecology	161	147	56%	31%	23%
Psychiatry	156	63	17%	6%	3%
General surgery	155	139	64%	42%	25%
Physical therapist	155	11	40%	19%	10%
Physician assistant	155	135	33%	16%	10%
Orthopedic surgery	154	144	82%	58%	48%
Clinical psychologist	152	15	2%	1%	1%

share of providers with at least one PBmax-attributed episode. There is substantial variation in attribution rates across top specialties by claims in episodes when individual cell size rules for same-type MEG treatment are applied. We see that 82 percent of orthopedic surgeons attributed with at least one episode are attributed with at least 10 or more same-type episodes, and 69 percent of internal medicine specialists and 52 percent of attributed chiropractors are attributed with for 10 or more same-type episodes. However, only 45 percent of general practice specialists are attributed with at least 10 same-type episodes. When the 30 same-type episode rule is

applied, internal medicine specialists show the highest attribution rate, at 51 percent, but only 22 percent of chiropractic specialists are attributed with at least 30 episodes of the same type.

Table 4.12: Shares of Top Specialties with Minimum Number of Same-Type Episodes, Medstat EMmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode		
			Same-Type Episode Cell Size Rule		
			10	20	30
All Specialties	4,954	3,740	56%	41%	31%
Chiropractic[12]	578	368	N/A	N/A	N/A
Family practice	475	456	61%	45%	33%
Internal medicine	407	387	69%	59%	48%
Nurse practitioner	272	231	42%	24%	13%
Optometry	255	218	36%	20%	14%
Obstetrics/gynecology	161	147	53%	30%	19%
Psychiatry	156	63	6%	6%	4%
General surgery	155	139	62%	31%	18%
Physical therapist	155	11	17%	0%	0%
Physician assistant	155	135	30%	11%	7%
Orthopedic surgery	154	144	80%	56%	47%
Clinical psychologist	152	15	0%	0%	0%

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[12] Some chiropractors have E&M claims in episodes, but none of these claims have positive payments. Because chiropractors do not have episodes attributed to them under the EMmax rule, their denominator for these percentages is zero and the fraction is undefined.

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In examining EMmax-attributed episodes in Table 4.12, we see lower shares of attributed providers charged with directing care for multiple same-type episodes. And because chiropractors do not provide E&M services, not a single chiropractor is attributed an episode.

4.2   Effects of Altering Number of Assigned Episodes/Providers within Specialties

Same-type episode rules allow for RUR scores that better reflect the typical cost efficiency of a single provider, but scores are also intended to show relative cost efficiency so that providers can be compared to a benchmark level. The benchmark represents the average cost of treating an episode. As such, sufficient numbers of providers need to be evaluated in addition to having sufficient numbers of episodes treated. So, in addition to the same-type episode cell size rule, a comparison group cell size rule needs to be established. As well as having sufficient numbers of providers treating minimum numbers of same-type episodes, the comparison group may be further restricted to providers sharing the same specialty, as providers with different specialties may be more likely to treat more severe cases of certain episode types.

We consider a variety of peer-group specifications that we will designate using the basic forms, *ME-MP-SS,* where:

> *ME* = [minimum # episodes of same type]
> *MP* = [minimum # providers assigned the same episode type]
> *SS* = providers in *MP* must be in same specialty (*Yes*) or not (*No*)

Under this naming convention, a *10-10-No* rule requires that each provider must be attributed with at least 10 episodes of the same type and that there must be at least 10 providers of any specialty who are attributed with a minimum of 10 episodes of the same type. By contrast, a *30-10-Yes* rule requires that each provider must be attributed with at least 30 same-type episodes and that there must be at least 10 providers from the same specialty who attributed with a minimum 30 of the same-type episodes. Below we evaluate the impact of combing same-type episode rules with different peer-group rules on the composition and cost of episodes and the composition of providers eligible for RURs. Section 4.2.1 presents the influence of the different

cell size rules using Symmetry episodes, and Section 4.2.2 shows the effects of the different cell size rules using Medstat episodes.

4.2.1 Costs/Providers Covered under Symmetry with Common Episodes and Specialties

Table 4.13 lists the shares of PBmax-attributed episodes, costs, and providers covered under the different episode and comparison group cell size rules. For episodes that are attributed under each peer-group specification, the table also provides the median cost per episode, median duration in days per episode and the share of costs covered by attributed providers' PB claims. Looking at the second row, we see that adding a 10 provider requirement to the 10 same-type episode restriction without restricting by specialty (the *10-10-No* rule) decreases the percent of attributed episodes to 61 percent, compared to 62 percent under a 10-1 rule (see Table 4.1), and the share of providers with at least one attributed episode who are still eligible to receive an RUR score under this restriction remains the same, at 45 percent. However, when comparing the *10-10-No* rule to the 10-10 rule *with* the same specialty restriction (*10-10-Yes*), shares of attributed episodes and providers drop 7 and 5 percentage points respectively, leaving only 40 percent of providers eligible for RURs. Under a *20-20-No* rule, only 45 percent of episodes and 29 percent of providers are eligible for RURs, while under a *20-20-Yes* rule, the shares drop to 35 percent of episodes and 22 percent of providers.

Table 4.14 is similar in structure to Table 4.13 but it presents the cell size effects on episode and provider composition under the EMmax attribution rule. We see that EMmax-attributed episode shares are more sensitive to increases in comparison group cell size requirements. For instance, under the *20-20-Yes*, 26 percent of EMmax-attributed episodes and 22 percent of providers remain eligible for RURs, compared to 35 percent of PBmax-attributed episodes and 22 percent of providers. This results from the fact that providers universally file PB claims, but not all providers file E&M claims. Additionally, the filing of E&M claims will vary among episode type and specialty type. As noted earlier, chiropractors are not reimbursed for E&M claims, and only file PB claims for subluxation treatments.

Focusing on the top 10 ETGs by cost, Tables 4.15 and 4.16 show the effects of increasing the cell size requirements on the number of PBmax- and EMmax-attributed episodes, respectively, of each ETG eligible for generating RURs and the shares of costs covered by them.

Table 4.13: Characteristics of Episodes by Cell-Size Rules, Symmetry PBmax

Minimum # Episodes of Same Type	Minimum # Providers	Same Specialty?	% Attributed Episodes	% of Attributed Episode Costs	% Attributed Providers	Median Cost per Episode	Median Length per Episode (Days)	Attributed Providers' Share of Episode Costs
1	1	No	100%	100%	100%	$100	11	24%
10	10	No	61%	51%	45%	$94	11	30%
20	10	No	48%	36%	30%	$92	9	32%
30	10	No	40%	27%	22%	$89	8	36%
10	20	No	59%	46%	45%	$93	10	30%
20	20	No	45%	28%	29%	$89	8	37%
30	20	No	37%	22%	21%	$87	8	38%
10	30	No	58%	39%	44%	$92	9	33%
20	30	No	42%	26%	27%	$87	8	36%
30	30	No	34%	19%	19%	$84	7	38%
10	10	Yes	54%	39%	40%	$91	9	31%
20	10	Yes	41%	26%	25%	$87	7	37%
30	10	Yes	34%	20%	18%	$83	5	39%
10	20	Yes	48%	29%	36%	$86	8	36%
20	20	Yes	35%	18%	22%	$81	6	42%
30	20	Yes	29%	15%	16%	$78	4	43%
10	30	Yes	41%	22%	32%	$80	7	39%
20	30	Yes	31%	13%	20%	$77	4	47%
30	30	Yes	23%	8%	14%	$75	1	58%

Table 4.14: Characteristics of Episodes by Cell-Size Rules, Symmetry EMmax

Minimum # Episodes of Same Type	Minimum # Providers	Same Specialty?	% Attributed Episodes	% of Attributed Episode Costs	% Attributed Providers	Median Cost per Episode	Median Length per Episode (Days)	Attributed Providers' Share of Episode Costs
1	1	No	100%	100%	100%	$124	24	19%
10	10	No	53%	44%	49%	$123	34	25%
20	10	No	38%	28%	31%	$122	40	28%
30	10	No	29%	20%	22%	$121	46	30%
10	20	No	51%	38%	48%	$121	33	26%
20	20	No	34%	23%	30%	$119	42	30%
30	20	No	25%	17%	19%	$123	55	31%
10	30	No	48%	35%	48%	$120	34	26%
20	30	No	31%	20%	27%	$118	47	29%
30	30	No	21%	13%	16%	$125	72	31%
10	10	Yes	46%	35%	43%	$120	35	26%
20	10	Yes	31%	22%	25%	$119	43	29%
30	10	Yes	24%	15%	17%	$119	49	33%
10	20	Yes	39%	25%	38%	$114	36	29%
20	20	Yes	26%	16%	22%	$118	51	32%
30	20	Yes	19%	12%	15%	$124	71	33%
10	30	Yes	33%	20%	34%	$113	40	30%
20	30	Yes	21%	11%	19%	$120	69	38%
30	30	Yes	15%	5%	10%	$123	92	49%

Table 4.15: Attributed Episodes and Costs by Cell-Size Rules for Top-10-Cost ETGs, PBmax

ETG: Description		Comparison Group Cell Size Rule											
		10-10		10-20		20-10		20-20		30-10		30-20	
		% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All ETGs		54%	39%	48%	29%	41%	26%	35%	18%	34%	20%	29%	15%
386500L2:	Ischemic heart disease, SL 2	65%	56%	65%	56%	54%	52%	54%	52%	49%	49%	39%	45%
386500L1:	Ischemic heart disease, SL 1	76%	65%	73%	63%	65%	60%	60%	58%	61%	59%	57%	57%
351700L1:	Cataract, SL 1	95%	87%	95%	87%	94%	87%	94%	87%	92%	87%	92%	87%
386500L3:	Ischemic heart disease, SL 3	49%	52%	0%	0%	45%	47%	0%	0%	40%	43%	0%	0%
316000L2:	Cerebral vascular accident, SL 2	50%	44%	30%	23%	29%	26%	0%	0%	10%	9%	0%	0%
386500L4:	Ischemic heart disease, SL 4	50%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
712208L2:	Joint degeneration, localized - back, SL 2	45%	71%	16%	37%	25%	55%	0%	0%	0%	0%	0%	0%
713103L2:	Closed fracture or dislocation - thigh, hip & pelvis, SL 2	40%	47%	40%	47%	0%	0%	0%	0%	0%	0%	0%	0%
712202L2:	Joint degeneration, localized - knee & lower leg, SL 2	63%	79%	53%	78%	51%	69%	46%	68%	38%	57%	38%	57%
388100L2:	Hypertension, SL 2	86%	85%	84%	82%	75%	74%	71%	69%	65%	64%	65%	64%

Moving from a *10-1-No* rule (see Table 4.3) rule to a *10-10-Yes* rule excludes 8 percent of PBmax-attributed SL 2 ischemic heart disease episodes, leaving 65 percent of these PBmax-attributed episodes representing 56 percent of costs. Increasing the comparison group requirement from 10to 20 only appears to affect SL 2 ischemic heart disease episode shares when the 30 episode cell size rule is applied, with episode shares dropping 10 percentage points and episode costs by 4 percent. Other episode types, though, are more sensitive to increasing the comparison group requirement. Moving from a *10-10-Yes* to a *10-20-Yes* rule drops the shares of SL 2 cerebral vascular accident episodes from 50 to 30 percent and the shares of associated costs from 44 to 23 percent. Whereas shares SL 2 and SL 1 ischemic heart disease episodes do not drop much when comparison group requirements are increased, increasing this requirement from 10 comparable providers to 20 eliminates all SL 3 and SL 4 ischemic heart disease episodes. So while there are sufficient numbers providers attributed with low-severity ischemic heart disease episodes to allow for peer group requirements over 10, there is a limited pool of peers attributed with more severe cases of this disease.

We find similar patterns for ETGs under the EMmax attribution rule; however one ETG in Table 4.16 shows how this rule not only restricts the number of attributed episodes, but also distributes episodes to other providers compared to the PBmax rule. Of EMmax-attributed SL 2 cerebral vascular accident episodes, 17 percent are attributed to providers who are attributed with 20 or more of these cases, and there are at least 20 providers who meet the episode cell size requirement. Yet, no PBmax-attributed SL 2 cerebral vascular accident episodes meet the *20-20-Yes* requirement, as shown in Table 4.15. In examining this difference in outcomes, we found that the EMmax rule attributes 25 internal medicine specialists with at least 30 episodes; however, the PBmax rule only attributes 19 internal medicine specialists with at least 30 of these episodes each. Some SL 2 cerebral vascular accident episodes that are assigned to internal medicine specialist under the EMmax rule are attributed to other specialists, such as surgeons, under the PBmax rule. This occurs because the surgeons associated with these episodes are not the ones filing E&M claims, yet the surgical PB claims are much more expensive than the E&M claims filed by the internal medicine specialists. As a result of different attribution patterns across the two rules, 6 fewer internal medicine specialists meet the 30 episode requirement under the PBmax rule compared to the EMmax rule, which drops the comparison group of those treating 30 SL 2 cerebral vascular episodes below the 20-member minimum.

Table 4.16: Attributed Episodes and Costs by Cell-Size Rules for Top-10-Cost ETGs, EMmax

ETG: Description		Comparison Group Cell Size Rule											
		10-10		10-20		20-10		20-20		30-10		30-20	
		% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All ETGs		46%	35%	39%	25%	31%	22%	26%	16%	24%	15%	19%	12%
386500L2:	Ischemic heart disease, SL 2	70%	76%	68%	74%	52%	62%	52%	62%	46%	58%	34%	49%
386500L1:	Ischemic heart disease, SL 1	78%	83%	75%	79%	65%	73%	60%	70%	56%	68%	56%	68%
351700L1:	Cataract, SL 1	90%	86%	90%	86%	86%	84%	86%	84%	83%	82%	74%	80%
386500L3:	Ischemic heart disease, SL 3	42%	52%	0%	0%	35%	45%	0%	0%	0%	0%	0%	0%
316000L2:	Cerebral vascular accident, SL 2	50%	45%	38%	34%	17%	17%	17%	17%	11%	10%	0%	0%
386500L4:	Ischemic heart disease, SL 4	42%	47%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
712208L2:	Joint degeneration, localized - back, SL 2	45%	53%	20%	28%	31%	40%	0%	0%	0%	0%	0%	0%
713103L2:	Closed fracture or dislocation - thigh, hip & pelvis, SL 2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
712202L2:	Joint degeneration, localized - knee & lower leg, SL 2	64%	66%	52%	58%	50%	53%	43%	48%	33%	35%	33%	35%
388100L2:	Hypertension, SL 2	88%	84%	85%	81%	76%	73%	75%	72%	67%	65%	63%	59%

When all ETGs are considered, we find that when increasing comparison group cell size requirements from 10 to 20 peers, shares of PBmax and EMmax attributed episodes drop between 5 and 7 percentage points, depending on episode cell size rule; shares of attributed episode costs drop between 3 and 10 percentage points.

Turning to provider shares, Tables 4.17 and 4.18 report the effects of different episode/provider cell size rules on providers' eligibility for RURs across the top specialties with E&M claims under the PMmax and EMmax rule, respectively.   These tables also show by specialty the number of providers with at least one PB claim or E&M claim in an episode.

Table 4.17: Shares of Top Specialties Covered by Cell-Size Rules, Symmetry PBmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode					
			Comparison Group Cell Size Rule					
			10-10	10-20	20-10	20-20	30-10	30-20
All Specialties	5,061	3,784	40%	36%	25%	22%	18%	16%
Chiropractic	579	368	37%	37%	20%	20%	12%	12%
Family practice	470	448	55%	54%	33%	33%	23%	22%
Internal medicine	404	383	62%	61%	48%	46%	37%	36%
Nurse practitioner	279	235	20%	19%	6%	0%	0%	0%
Optometry	257	217	67%	67%	52%	50%	39%	39%
Clinical psychologist	173	16	0%	0%	0%	0%	0%	0%
Physician assistant	165	137	0%	0%	0%	0%	0%	0%
Obstetrics/gynecology	164	148	51%	50%	27%	20%	18%	0%
Psychiatry	163	64	10%	0%	0%	0%	0%	0%
General surgery	160	142	52%	48%	21%	0%	7%	0%
Physical therapist	160	16	17%	17%	0%	0%	0%	0%
Orthopedic surgery	154	144	60%	54%	36%	32%	21%	20%

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Of all optometrists attributed with at least one PBmax episode, 67 percent remain eligible to receive an RUR score under the 10-10 comparison group cell size rule. Looking across the columns we see that moving from a 10 to 20 comparison group minimum barely affects the share of optometrists, regardless of episode cell size rule. The same pattern applies to family practice, internal medicine and chiropractic specialist shares, with at most a four percentage point drop in shares in response to increasing the peer group size requirement from 10 to 20 specialists of the same type. However, moving from a *20-10-Yes* to a *20-20-Yes* rule drops general surgery specialists' shares from 21 percent to 0.

Table 4.18: Shares of Top Specialties Covered by Cell-Size Rules, Symmetry EMmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode					
			Comparison Group Cell Size Rule					
			10-10	10-20	20-10	20-20	30-10	30-20
All Specialties	5,061	3,784	43%	38%	25%	22%	17%	15%
Chiropractic	579	368	N/A	N/A	N/A	N/A	N/A	N/A
Family practice	470	448	53%	52%	32%	31%	20%	20%
Internal medicine	404	383	61%	60%	46%	46%	35%	34%
Nurse practitioner	279	235	22%	21%	6%	0%	0%	0%
Optometry	257	217	37%	36%	19%	19%	12%	0%
Clinical psychologist	173	16	0%	0%	0%	0%	0%	0%
Physician assistant	165	137	0%	0%	0%	0%	0%	0%
Obstetrics/gynecology	164	148	50%	50%	25%	18%	17%	0%
Psychiatry	163	64	0%	0%	0%	0%	0%	0%
General surgery	160	142	43%	29%	13%	0%	0%	0%
Physical therapist	160	16	0%	0%	0%	0%	0%	0%
Orthopedic surgery	154	144	56%	51%	33%	27%	15%	15%

Finally, using EMmax-attributed episodes further decreases the share of providers eligible for RURs, and in some cases the drop in shares is substantial. For instance, optometrist shares, which are among the highest under the PBmax rule, are among the lowest under the EMmax rule, with only 12 percent of optometrists with at least one attributed episode eligible for RURs under a *30-10-Yes* rule. However, we do find that shares for family practice and internal medicine specialists change little when moving from a 10 to 20 minimum comparison group rule, and show patterns similar to PBmax attribution.

4.2.2 Costs/Providers Covered under Medstat with Common Episodes and Specialties

Tables 4.19 and 4.20 show the influence of adding comparison group cell size rules on the composition of episodes and providers for Medstat episodes. These tables list the shares of PBmax- and EMmax-attributed episodes, costs, and providers covered under the different episode and comparison group cell size rules. For episodes that are attributed under each peer-group specification, the tables also provide the median cost per episode, median duration in days per episode and the share of costs covered by attributed providers' PB claims. Looking at Table 4.19, we see that moving from *10-1-No* rule (see Table 4.7) to a *10-10-No* rule drops the share of PBmax-attributed episodes to 73 percent, and shares of costs to 64 percent. Further restricting the sample to require the members in the comparison group to share the same specialty (*10-10-Yes)* drops episode shares by another 7 percent, and costs by 12 percent to just above half of PBmax-attributed episode costs. Only 58 percent of episodes and 39 percent of providers are eligible for RURs under a *20-20-No* rule, and the shares drop to 47 percent of episodes and 32 percent of providers under a *20-20-Yes* rule. The application of the most restrictive rule listed, *30-30-Yes*, leaves only 33 percent of episodes, representing just 16 percent of PBmax-attributed costs, for use in creating RURs. This means that an overwhelming majority of episode costs could not be used to evaluate resource use if this rule is applied. Turning to provider shares, we see that such shares drop, as minimum provider requirements increase. When the same-specialty restriction is applied, provider shares drop between 4 to 10 percent compared to similar minimum episode and provider requirements without the same-specialty restriction. Even at the least restrictive same-type episode and group rule, *10-10-Yes*, less than half of all providers attributed episodes under the PBmax rule would receive RURs.

Table 4.19: Characteristics of Episodes by Cell-Size Rules, Medstat PBmax

Minimum # Episodes of Same Type	Minimum # Providers	Same Specialty?	% Attributed Episodes	% of Attributed Episode Costs	% Attributed Providers	Median Cost per Episode	Median Length per Episode (Days)	Attributed Providers' Share of Episode Costs
1	1	No	100%	100%	100%	$93	8	23%
10	10	No	73%	64%	53%	$92	12	27%
20	10	No	60%	50%	39%	$92	15	28%
30	10	No	52%	40%	31%	$90	15	30%
10	20	No	72%	62%	53%	$92	12	27%
20	20	No	58%	46%	39%	$92	15	29%
30	20	No	49%	33%	30%	$89	15	33%
10	30	No	71%	61%	53%	$92	12	27%
20	30	No	56%	38%	38%	$89	15	32%
30	30	No	47%	30%	29%	$89	17	33%
10	10	Yes	66%	52%	48%	$89	12	28%
20	10	Yes	54%	40%	35%	$88	14	30%
30	10	Yes	46%	30%	27%	$86	15	33%
10	20	Yes	60%	41%	44%	$86	11	30%
20	20	Yes	47%	28%	32%	$83	14	34%
30	20	Yes	39%	23%	23%	$82	15	35%
10	30	Yes	55%	35%	43%	$81	11	31%
20	30	Yes	42%	24%	28%	$81	16	34%
30	30	Yes	33%	16%	21%	$78	16	40%

Table 4.20: Characteristics of Episodes by Cell-Size Rules, Medstat EMmax

Minimum # Episodes of Same Type	Minimum # Providers	Same Specialty?	% Attributed Episodes	% of Attributed Episode Costs	% Attributed Providers	Median Cost per Episode	Median Length per Episode (Days)	Attributed Providers' Share of Episode Costs
1	1	No	100%	100%	100%	$108	14	18%
10	10	No	66%	57%	56%	$111	21	23%
20	10	No	51%	41%	41%	$113	27	24%
30	10	No	42%	33%	31%	$114	30	26%
10	20	No	65%	54%	56%	$111	22	22%
20	20	No	49%	36%	40%	$114	29	26%
30	20	No	38%	27%	30%	$114	35	27%
10	30	No	63%	52%	56%	$111	22	23%
20	30	No	47%	33%	40%	$112	29	25%
30	30	No	35%	25%	27%	$114	37	27%
10	10	Yes	60%	48%	51%	$109	22	23%
20	10	Yes	45%	34%	36%	$109	28	25%
30	10	Yes	36%	27%	26%	$109	31	26%
10	20	Yes	53%	38%	46%	$104	21	24%
20	20	Yes	38%	25%	31%	$106	30	27%
30	20	Yes	29%	21%	21%	$114	44	28%
10	30	Yes	48%	31%	43%	$101	22	25%
20	30	Yes	33%	22%	28%	$111	42	27%
30	30	Yes	25%	17%	21%	$115	58	29%

Looking at cell size effects on episode and provider composition under the EMmax attribution rule presented in Table 4.20, we see a similar pattern compared to the PBmax results, but on average EMmax-attributed episodes are more sensitive to increasing comparison group requirements. For instance, under the *20-20-Yes* rule, 38 percent of episodes and 31 percent of EMmax attributed providers are eligible for RURs, compared to 47 percent of episodes and 32 percent of providers when the PBmax rule is used. The biggest drop in provider shares resulting from applying a same-specialty requirement occurs between the *10-30-No* and *10-30-Yes* rules, where provider shares drop from 53 percent for 43 percent. And recall, the pool of providers with at least one EMmax attributed rule is smaller than the PBmax-attributed provider pool.

Tables 4.21 and 4.22 show that the effect of comparison group requirements also varies across the different MEGs under the PBmax and EMmax rules, respectively. These tables present the effect of increasing the size of the peer group requirement on the number of episodes of each MEG eligible for generating RURs, and the shares of costs covered by these episodes. For many MEGs, increasing comparison group requirements produces little change in shares of MEGs. For example, moving from a *10-1-No* rule (see Table 4.9) to a *10-10-Yes* rule drops shares of PBmax-attributed cataract episodes by just 5 percent, dropping shares from 99 to 94 percent. And moving from a 10 to 20 comparison group requirement under either a 20 or 30 episode cell size rule does not reduce shares of cataract episodes. Other chronic episodes, such as angina pectoris or essential hypertension, also show little change in shares resulting from increasing comparison group requirements. However, four of the top 10 MEGs by cost are sensitive to increasing peer group requirements. Both cerebrovascular disease with stroke and femur fracture episode shares are eliminated for RUR evaluation when a *20-20-Yes* rule is applied, even though moving from a *10-10-Yes* to a *10-20-Yes* rule barely reduces shares for these MEGs. And depending on episode cell size rules, between 55 and 48 percent of PBmax-attributed acute myocardial infarction episodes are treated by at least 10 same-type providers, but there are not 20 same-type providers who treat at least 10 of these episodes, let alone 30.

We find similar patterns in response to changes in comparison group requirements when episodes are attributed using the EMmax rule, shown in Table 4.22. Shares of osteoarthritis, angina pectoris, cataract, pneumonia, hypertension and arrhythmias episode change little in response to increasing group size requirements from 10 to 20, while shares of other MEGs, such

Table 4.21: Attributed Episodes and Costs by Cell-Size Rules for Top-10-Cost MEGs, PBmax

| MEG: Description | Comparison Group Cell Size Rule | | | | | | | | | | | |
| | 10-10 | | 10-20 | | 20-10 | | 20-20 | | 30-10 | | 30-20 | |
	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All MEGs	66%	52%	60%	41%	54%	40%	47%	28%	46%	30%	39%	23%
374: Osteoarthritis	77%	88%	67%	84%	62%	79%	55%	71%	49%	66%	46%	63%
10: Angina Pectoris, Chronic Maintenance	82%	61%	79%	60%	72%	57%	72%	57%	66%	56%	61%	55%
11: Acute Myocardial Infarction	55%	53%	0%	0%	52%	51%	0%	0%	48%	47%	0%	0%
92: Cataract	94%	87%	94%	87%	93%	86%	93%	86%	92%	86%	92%	86%
397: Cerebrovascular Dis with Stroke	45%	32%	45%	32%	21%	14%	0%	0%	12%	9%	0%	0%
426: Complications of Surgical and Medical Care	38%	37%	21%	22%	16%	17%	0%	0%	0%	0%	0%	0%
510: Pneumonia: Bacterial	61%	61%	57%	52%	34%	34%	34%	34%	18%	21%	18%	21%
348: Fracture: Femur, Head or Neck	60%	67%	60%	67%	33%	38%	0%	0%	0%	0%	0%	0%
13: Essential Hypertension, Chronic Maintenance	91%	82%	89%	78%	87%	77%	86%	75%	81%	70%	75%	61%
6: Arrhythmias	78%	83%	78%	83%	67%	75%	67%	75%	61%	72%	56%	69%

Table 4.22: Attributed Episodes and Costs by Cell-Size Rules for Top-10-Cost MEGs, EMmax

MEG: Description	Comparison Group Cell Size Rule											
	10-10		10-20		20-10		20-20		30-10		30-20	
	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs	% Episodes	% Costs
All MEGs	60%	48%	53%	38%	45%	34%	38%	25%	36%	27%	29%	21%
374: Osteoarthritis	82%	84%	72%	76%	65%	69%	59%	63%	54%	58%	51%	56%
10: Angina Pectoris, Chronic Maintenance	85%	81%	81%	78%	73%	73%	73%	73%	67%	70%	67%	70%
11: Acute Myocardial Infarction	60%	62%	46%	50%	42%	46%	0%	0%	37%	42%	0%	0%
92: Cataract	90%	84%	90%	84%	86%	82%	86%	82%	83%	79%	75%	78%
397: Cerebrovascular Dis with Stroke	52%	40%	52%	40%	31%	25%	0%	0%	13%	11%	0%	0%
426: Complications of Surgical and Medical Care	33%	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
510: Pneumonia: Bacterial	58%	55%	58%	55%	35%	37%	35%	37%	18%	21%	18%	21%
348: Fracture: Femur, Head or Neck	16%	21%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
13: Essential Hypertension, Chronic Maintenance	94%	89%	92%	82%	90%	82%	88%	79%	83%	74%	77%	67%
6: Arrhythmias	79%	79%	79%	79%	65%	66%	65%	66%	59%	61%	59%	61%

as femur fractures, are eliminated when the requirements increase. However, there are some notable differences in patterns across Tables 4.21 and 4.22 that highlight differences in attribution patterns between the PBmax and EMmax rules. For instance, the shares of EMmax-attributed osteoarthritis episodes are consistently higher compared to PBmax-attributed episodes. Additionally, while there is less than 20 PBmax attributed providers who treat at least 10 episodes of acute myocardial infarction episodes, almost half of these MEGs are treated by 20 or more providers of the same-type who are attributed at least 10 episodes under the EMmax rule. As noted in the previous section, changing from the PBmax rule to the EMmax rule can shift attribution from specialists who file expensive PB claims to specialists more likely to file E&M claims. As a result, we find cases where one rule more consistently attributes episodes to specialists of a certain type, leading to differences in outcomes under different cell size rules across the different attribution rules.

Finally, the share of providers by specialty eligible for RURs also varies in response to different episode/provider cell size rules; however the effect is minimal when moving from a peer group minimum of 10 to 20. Table 4.23 presents the number of providers by specialty with at least one PB claim or E&M claim in an episode, and shows the impact of comparison group cell size rules on the shares of providers with at least one PBmax-attributed Medstat episode. These results reveal that optometrist shares are not sensitive to increasing comparison group cell size, with the shares of providers remaining the same as comparison group requirement increases from 10 to 20 across all episode cell size rules. Orthopedic surgery shares are also only marginally affected by increasing peer group requirements from 10 to 20 same-type specialists, with at most a 2 percent drop in shares in response to increasing requirements by 10 same-type specialists.

Using EMmax-attributed episodes further decreases the share of providers eligible for RURs, and in some cases substantially, as shown in Table 4.24. For instance, while optometrists exhibit one of the highest attribution rates under the various cell size rules under PBmax, they exhibit one of the lower attribution rates under EMmax. Even so, changing from a 10 to 20 comparison group size requirement produces little change in provider shares under the 10 and 20 episode cell size rules. And whereas moving from a *30-10-Yes* rule to *30-20-Yes* rule eliminates some specialty types, this only occurs with specialties showing low shares under the 30 episode cell size rule.

Table 4.23: Shares of Top Specialties Covered by Cell-Size Rules, Medstat PBmax

Specialty	# Providers w/≥1 PB Claim in an Episode	# Providers w/≥1 E&M Claim in an Episode	Share of Providers w/≥ 1 Attributed Episode					
			Comparison Group Cell Size Rule					
			10-10	10-20	20-10	20-20	30-10	30-20
All Specialties	4,954	3,740	48%	44%	35%	32%	27%	23%
Chiropractic	578	368	52%	52%	32%	32%	21%	21%
Family practice	475	456	65%	65%	50%	50%	41%	41%
Internal medicine	407	387	69%	68%	59%	58%	50%	49%
Nurse practitioner	272	231	32%	30%	17%	17%	10%	0%
Optometry	255	218	65%	65%	48%	48%	39%	38%
Obstetrics/gynecology	161	147	56%	56%	30%	29%	23%	15%
Psychiatry	156	63	11%	0%	0%	0%	0%	0%
General surgery	155	139	61%	58%	38%	28%	18%	0%
Physical therapist	155	11	40%	38%	17%	15%	7%	0%
Physician assistant	155	135	16%	0%	0%	0%	0%	0%
Orthopedic surgery	154	144	82%	80%	58%	57%	47%	45%
Clinical psychologist	152	15	0%	0%	0%	0%	0%	0%

Table 4.24: Shares of Top Specialties Covered by Cell-Size Rules, Medstat EMmax

| Specialty | # Providers w/≥1 PB Claim in an Episode | # Providers w/≥1 E&M Claim in an Episode | Share of Providers w/≥ 1 Attributed Episode | | | | | |
| | | | Comparison Group Cell Size Rule | | | | | |
			10-10	10-20	20-10	20-20	30-10	30-20
All Specialties	4,954	3,740	51%	46%	36%	31%	26%	21%
Chiropractic	578	368	N/A	N/A	N/A	N/A	N/A	N/A
Family practice	475	456	61%	61%	44%	44%	33%	33%
Internal medicine	407	387	69%	68%	58%	58%	47%	47%
Nurse practitioner	272	231	33%	30%	15%	15%	8%	0%
Optometry	255	218	36%	36%	20%	18%	12%	0%
Obstetrics/gynecology	161	147	51%	51%	29%	29%	18%	0%
Psychiatry	156	63	0%	0%	0%	0%	0%	0%
General surgery	155	139	59%	52%	25%	15%	8%	0%
Physical therapist	155	11	0%	0%	0%	0%	0%	0%
Physician assistant	155	135	16%	0%	0%	0%	0%	0%
Orthopedic surgery	154	144	79%	79%	56%	55%	46%	45%
Clinical psychologist	152	15	0%	0%	0%	0%	0%	0%

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4.3 Summary of Findings

This section evaluates the consequences of altering the specifications of peer groups on the shares of episode costs and eligible providers covered by the different attribution rules. In particular, we consider a variety of peer-group specifications represented by the simple designation, *ME-MP-SS,* where:

> *ME* = [minimum # episodes of same type]
> *MP* = [minimum # providers assigned the same episode type]
> *SS* = providers in *MP* must be in same specialty (*Yes*) or not (*No*)

Thus, the designation *20-10-No* means that for a provider to be made a member of a peer group, this individual must have been attributed at least 20 episodes of the same type, and there must be at least 10 total providers assigned at least 20 episodes of the same type as well. The designation *20-10-Yes* further restricts the minimum 10 provider reference pool to providers of the same specialty. Consequently, if an evaluator specifies that providers must have at least 30 attributed episodes treating the same illness to receive an efficiency score in a RUR, and providers cannot be scored unless there are at least 20 providers in the same specialty scored for 30 episodes of exactly the same type, then the implied peer group specification is *30-20-Yes*.

Clearly, if one chooses a peer group with a higher value of *ME* or *MP,* or if one selects *Yes*, one decreases the number of providers qualified to receive a RUR score, along with the share of episodes and costs covered by scored services. The question is how large is the decrease in the coverage of scored providers and costs.

Tables 4.25 and 4.26 below answer this question using the findings developed in this section. Whereas tables presented elsewhere in this section show the fractions of episodes, costs and providers covered by different specifications of peer groups using all *attributed* episodes as the reference population, Tables 4.25 and 4.26 present these fractions considering all episodes as the reference population. (This is the same reference group of episodes analyzed in Section 3.) Thus, Tables 4.25 and 4.26 account for the impact of episode attribution in addition to the effects of alternative peer-group specifications.

Table 4.25: Fractions of All Episodes and Providers Covered by Cell-Size Rules, Symmetry

Attribution Rule		% All Episodes	% All Episode Costs	% Providers w/PB Claims in Episodes
PBmax	1-1-No	80%	89%	92%
	10-1-No	50%	48%	41%
	10-10-No	48%	45%	41%
	10-10-Yes	43%	35%	36%
	30-1-No	34%	28%	21%
	30-10-No	32%	24%	20%
	30-10-Yes	27%	18%	16%
EMmax	1-1-No	58%	81%	63%
	10-1-No	31%	38%	31%
	10-10-No	31%	35%	31%
	10-10-Yes	27%	28%	27%
	30-1-No	18%	20%	15%
	30-10-No	16%	16%	14%
	30-10-Yes	14%	12%	11%

Table 4.26: Fractions of All Episodes and Providers Covered by Cell-Size Rules, Medstat

Attribution Rule		% All Episodes	% All Episode Costs	% Providers w/PB Claims in Episodes
PBmax	1-1-No	81%	90%	91%
	10-1-No	60%	58%	49%
	10-10-No	59%	57%	48%
	10-10-Yes	54%	46%	44%
	30-1-No	44%	39%	28%
	30-10-No	42%	35%	28%
	30-10-Yes	37%	27%	24%
EMmax	1-1-No	61%	81%	63%
	10-1-No	41%	47%	36%
	10-10-No	41%	46%	35%
	10-10-Yes	37%	39%	32%
	30-1-No	27%	29%	20%
	30-10-No	26%	27%	19%
	30-10-Yes	22%	22%	17%

Inspection of the results in Tables 4.25 and 4.26 reveals that tightening the specification of peer-group requirements sharply reduces the number of providers eligible for assignment of

RUR scores and the share of Medicare costs covered by scored providers, regardless of how one raises requirements. More specifically, these tables show:

- With respect to the sample of episodes constructed by the Symmetry grouper, we learned in Section 3, and showed in the tables above, that attribution using the PBmax rule assigned 80% of all episodes and 89% of the total episode costs to OR providers. Furthermore, 92% of eligible OR providers receive at least one episode attribution (Table 4.25). These percentages mean that:

  o Requiring providers to be assigned at least 10 episodes of the same type (i.e., adopting the *10-1-No* specification for the peer group) means that only 41 percent of the eligible pool meet this criterion. These providers account for 48 percent of total episode costs.

  o Requiring providers to have at least 30 such episodes (i.e., specifying instead *30-1-No* peer groups) means that 21 percent of eligible providers receive RUR scores, and providers having at least 30 such episodes account for 28 percent of total episode costs.

  o Raising the peer group standard to *10-10-Yes* means that 36 percent of eligible providers receive a RUR score, and scored services cover 35 percent of Medicare costs.

  o Using a peer group specification of *30-10-Yes* means that 16 percent of eligible providers receive a RUR score, and scored services cover only 18 percent of Medicare costs.

- With respect to the sample of episodes created by the Symmetry grouper, we learned in Section 3 that attribution using the EMmax rule assigned 58 percent of all episodes and 81 percent of the total episode costs to OR providers. Further, 63 percent of eligible OR providers receive at least one episode attribution (Table 4.25). These percentages mean that:

  o Adopting a *10-1-No* rule for the peer group means that 31 percent of the eligible providers receive a RUR score, and scored services cover 38 percent of Medicare costs.

  o Adopting a *30-1-No* rule reduces the share of evaluated providers to 15 percent and the share of covered costs to 20 percent.

  o Raising the peer group standard to *10-10-Yes* means that 27 percent of eligible providers receive a RUR score, and scored services cover 28 percent of Medicare costs.

  o Restricting the peer group specification to *30-10-Yes* means that 11 percent of eligible providers receive a RUR score, and scored services cover only 12 percent of Medicare costs.

- With respect to the sample of episodes produced by the Medstat grouper, we learned in Section 3 that attribution using the PBmax rule assigns 81 percent of all episodes and 90 percent of the total episode costs to OR providers. Further, 91 percent of eligible OR

providers receive at least one episode attribution (Table 4.26). These percentages mean that:

- o Adopting a *10-1-No* rule means that 49 percent of the eligible providers receive a RUR score, and scored services cover 58 percent of Medicare costs.

- o Adopting a *30-1-No* rule reduces the share of evaluated providers to 28 percent and the share of covered costs to 39 percent.

- o Raising the peer group standard to *10-10-Yes* means that 44 percent of eligible providers receive a RUR score, and scored services cover 46 percent of Medicare costs.

- o Restricting the peer group specification to *30-10-Yes* means that 24 percent of eligible providers receive a RUR score, and scored services cover only 27 percent of Medicare costs.

- With respect to the sample of episodes constructed by the Medstat grouper, we learned in Section 3 that attribution using the EMmax rule assigns 61 percent of all episodes and 81 percent of the total episode costs to OR providers. Furthermore, 63 percent of eligible OR providers receive at least one episode attribution (Table 4.26). These percentages mean that:

- o Adopting a *10-1-No* rule for the peer group means that 36 percent of the eligible providers receive a RUR score, and scored services cover 47 percent of Medicare costs.

- o Adopting a *30-1-No* rule reduces the share of evaluated providers to 20 percent and the share of covered costs to 29 percent.

- o Raising the peer group standard to *10-10-Yes* means that 32 percent of eligible providers receive a RUR score, and scored services cover 39 percent of Medicare costs.

- o Restricting the peer group specification to *30-10-Yes* means that 17 percent of eligible providers receive a RUR score, and scored services cover only 22 percent of Medicare costs.

5 CONSIGNING RUR SCORES TO PROVIDERS

RUR scores measure resource use relative to benchmark levels. Scores can either represent relative use for treating a specific episode type, or can aggregate efficiency measures across different types of episodes to produce a composite score. Regardless of whether measures reveal relative costs specific to a category of episodes or characterize overall evaluations, RUR scores should identify cost-efficient patient care. Consequently, factors influencing costs that are ancillary to provider actions should be controlled prior to score calculation.

To answer the sixth question in the Introduction – *What adjustments should be incorporated in scoring to account for the health of patients and other ancillary factors influencing cost?* – Section 5.1 develops a regression approach to control for demographic mix and provider specialty. Building on the estimates of this model, Section 5.2 addresses the seventh question in the Introduction – *What is a RUR score for a physician?* – by developing a flexible approach for computing episode-specific RUR scores for individual providers. Section 5.3 proposes an answer to the eighth question in the Introduction – *How should scores for different types of episodes be aggregated into a single composite score for physicians?* – by presenting an aggregated RUR score for individual providers using outputs from both Symmetry and Medstat groupers. Finally, Section 5.4 illustrates the properties of the RUR scores created by our approach by showing the distribution of overall scores for internal medicine specialists receiving RURs under a variety of attribution rules.

5.1 Introducing a Regression Methodology to Measure a Provider's Relative Cost

Using episodes as the unit of observation, logged episode costs are regressed on a set of variables measuring patient risk and specialty type.[13] This generates a set of coefficients which are used to calculate an adjusted cost for each episode, which represent the expected cost of treating a specific episode of a patient in the baseline category of risk. The adjusted costs, in turn, are used to calculate an average adjusted episode cost for an individual within a specialty and episode type, and a benchmark average is calculated which is the average adjusted episode cost for all episodes of a given type treated by providers of the same specialty. A provider's individual episode type scores are then used to generate an overall score. Section 5.1.1 discusses

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[13] Regressing costs on patient risk and specialty variables leads to cost predictions below zero. Logging the dependent variable corrects for this, and predicted logged costs are transformed to return them to a dollar scale.

regression specifications and adjusted cost calculations for Symmetry and Medstat episodes. Section 5.1.2 shows how episode-specific RUR scores are calculated using regression results. Section 5.1.3 presents how episode-specific RUR scores are used to calculate composite RUR scores.

5.1.1 Inferring Typical Costs for Specialties within Episode Types

Several factors determine episode cost other than the efficiency of care provided by a physician. Because RUR scores are intended to supply providers, patients and payers with information on a provider's efficiency in treating patients, determinants of episode costs beyond efficiency of care must be purged prior to RUR score calculation. First among these is episode severity. Even within episode types, there can be a great deal of variation in the resources needed to treat patients with varying kinds of complications. Related to episode severity, beneficiary risk characteristics will also affect episode costs. And finally, specialties will have different costs that factor into the cost of treating an episode.[14]

We use regression methods to purge episode cost differences caused by factors other than the provider's efficiency. This is done by regressing logged cost for a specific episode type on a set of dummy variables measuring risk factors and specialty type, as shown in the regression formulas below:

(5.1) For Symmetry: $\ln(EpCost_{ik}) = \mu\delta_{ik} + \beta X_{ik} + \varepsilon_{ik}$

(5.2) For Medstat: $\ln(EpCost_{ik}) = \mu\delta_{ik} + \beta X_{ik} + \theta Z_{ik} + \varepsilon_{ik}$

where: $\ln(EpCost_{ik}) = $ log of the cost of the ith episode for the kth provider;

$\delta_k = $ a vector of specialty dummy variables associated with the ith episode for the kth provider;

$X_{ik} = $ a vector of age/gender dummy variables for the $(i,k)^{th}$ episode;

$Z_{ik} = $ a vector of severity level dummy variables for the $(i,k)^{th}$ Medstat episode;

$\varepsilon_{ik} = $ error term for the $(i,k)^{th}$ episode;

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[14] Of course, other things influence episode cost, such as geographic cost variation. We control for geographic price variation by limiting scores to providers in a single state who treat beneficiaries from the same state. Additional variation can occur at the sub-state level, and this variation can be controlled for by limiting analysis to sub-state geographic units, or controlling for geographic regions using regression methods. If other cost determinants are identified, they can be purged from episode costs using either of the methods we use for controlling for risk/severity, specialty, or geographic variation.

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μ = regression coefficients measuring cost differentials for different specialties;

β = regression coefficients measuring the influence of the controls X;

θ = regression coefficients measuring the influence of controls Z.

Observations in this regression consist of all episodes of the type under consideration attributed to a designated set of providers; each regression is run for a common type of episodes. Severity dummy variables are not included as controls for Symmetry episodes, as we use the combination of a base ETG and a severity level as an episode type; as such, the episode cells for Symmetry regressions incorporate severity level. For elements of X, we include the set of age-gender variables making up the demographic risk factors incorporated in CMS's HCC risk adjustment models. Jointly, we refer to the effects of X and Z as risk factors in the following discussion. Appendix A presents a detailed description of our regression specification and approach, and motivates our use of the estimates from these regressions to measure adjusted episode costs for individual providers and for their corresponding specialty.

The coefficients produced by these regressions represent the average added cost to an episode from a baseline age/gender combination and the average adjusted cost associated with the episode severity above or below a baseline severity level (for Medstat episodes only). The specialty dummy variables represent the average cost of each specialty after controlling for the influences of X and Z. We do not use these coefficients in our calculations of adjusted episode costs for an individual provider as we calculate adjusted costs within a specialty.

5.1.2 Evaluating the Relative Cost of a Provider within Specialties and Episode Types

The adjusted cost for each episode is calculated by subtracting the coefficients for age and gender risk characteristics and for severity level (in the case of Medstat episodes) from the logged cost of the episode, as shown by the equations below:

(5.3)   For Symmetry : $LogAdjustedEpCost_{ik} = \ln(EpCost_{ik}) - \beta_{age/gender\_ik}$

(5.4)   For Medstat: $LogAdjustedEpCost_{ik} = \ln(EpCost_{ik}) - \beta_{age/gender\_ik} - \theta_{risk\_ik}$

where: $\beta_{age/gender\_ik}$ = Coefficient for age/gender category of beneficiary for the $(i,k)^{th}$ episode (0 if age/gender category is baseline);

$$\theta_{risk\_ik} = \text{Coefficient for Medstat risk category for } (i,k)^{th} \text{ episode (0 if risk category is baseline).}$$

Because all the elements of *X* and *Z* represent of dummy variables, subtracting the coefficients from ln(*EpCosts*) in (5.3) and (5.4) removes the estimated effects of these variables on episode costs. As noted above, we do not use the coefficient for the specialty, as we only calculate benchmark adjusted cost within a specialty. We then retransform measures into levels and dollars via the relationship:

(5.5) $AdjustedEpisodeCost_{ik} = \exp\{LogAdjustedEpisodeCost_{ik}\}$.

By subtracting out the coefficients for episode $(i,k)^{th}$'s relevant risk factors, we create an adjusted cost figure purged of each episode's average cost differences from a baseline risk group. (The baseline risk group is represented by the omitted age/gender category and omitted severity score for Medstat). Averaging the variable *AdjustedEpisodeCost* within a specialty group estimates the expected cost of the observations over which the average is computed, assuming the errors ε in (5.1) and (5.2) are distributed independently of both *X* and *Z* holding the specialty of the observations constant—an assumption maintained in the following calculation of scores. (See Appendix A for further motivation of this approach.)

5.2 Assigning Providers RUR Scores

Given the above measures of adjusted costs for each episode, we can compute RUR scores within episode types, and an overall score by weighting RUR values across episode types. This section answers the question, *What is a RUR score for a physician?* Sections 5.2.1 shows the calculations for episode-specific RUR scores, and Section 5.2.2 shows the calculations for an overall provider score.

5.2.1 Computing a Provider RUR Score for Each Episode Type

The average adjusted episode cost for each provider *k* (the Tax ID/specialty combination) is calculated for all n_k of episode $(i,k)^{th}$ using the following equation:

(5.6) $P_m = (1/n_k) \sum_{i=1}^{n_k} AdjustedEpisodeCost_{ik}$

We also calculate the benchmark adjusted episode cost for all episodes $(i,k)^{th}$ treated by providers in specialty *B* using the following equation:

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$$(5.7) \quad R_m = (1/N_B) \sum_{k \in B} \sum_{i=1}^{n_k} AdjustedEpisodeCost_{ik}$$

where $N_B = \sum_{k \in B} n_k$ = the number of episodes treated by all providers k who are in

specialty B (i.e., for all $k \in B$). P_m estimates the average episode cost of provider k adjusting for the impacts of X and Z on costs, and R_m estimates the average episode cost of all providers in the same specialty as provider k.

The RUR score is then calculated by dividing the average adjusted cost of an episode for a provider (equation (5.6)) by the average adjusted cost of an episode treated by all providers within a specialty (equation (5.7)), which yields:

$$(5.8) \quad S_{km} = P_m \Big/ R_m = \text{RUR score for } k^{th} \text{ provider in specialty/episode type } m,$$

This score represents the average resource level an individual provider uses to treat a specific episode type relative to a benchmark cost of treating an episode by providers from the same specialty. So, for example, an RUR score for a provider of 1.12 would show that the provider uses on average 12 percent more resources to treat an episode compared to the benchmark resource level; an RUR score of 0.62 would show that a provider uses 38 percent fewer resources compared to the benchmark resource level.

5.2.2 Aggregating Relative Cost Measures to Construct an Overall Provider Score

Episode-specific scores show only relative resource use for treating a specific episode type, and may not provide a good indication of a provider's overall efficiency. However, individual scores can be used to generate a composite score which would reflect a provider's overall efficiency. One method to calculate an overall score is to simply calculate the mean of the RUR scores for an individual provider; however this approach gives equal weight to each score regardless of how many episodes are treated within episode types or the resource level required to treat episode types.

To take into account resource levels required to treat specific episode types, we calculate a weighted average of scores, as shown by the formula below:

(5.9) $OverallScore = \sum_{m \in M} W_m \times S_{km}$

where: M = set of episode types for which a provider is scored;

$W_m = \dfrac{T_m}{T}$;

T_m = average total adjusted cost for all episodes of type m per provider in reference group specialty;

$T = \sum_{m \in M} T_m$;

S_{km} = RUR score for k^{th} provider in episode/specialty type m.

This weighting scheme gives more weight to scores for episode types that use more resources per provider overall.

Although the overall score is in the same scale as the episode-specific score, the two cannot be interpreted in the same manner. Where the episode-specific score indicates the degree to which a provider's resource use for treating an episode lies above or below a benchmark for treating a case of this episode type, there is no such composite benchmark measure. Instead, it shows a weighted average of resource use relative to a set of episode-specific benchmarks. Because the weighting is a function of the average cost of each episode type and number of same-type episodes a reference group treats, the overall score represents the relative use if the provider were to treat the average number of episodes for each episode type used to calculate the composite score. So, a composite score of 1.2 would show that were the provider to treat the average number of episodes as those in the reference groups, the resources used by this provider would be 20 percent above the average of providers across the different reference groups.

5.3 Template for an RUR

This section answers the question, *How should scores for different types of episodes be aggregated into a single score for physicians?* An RUR for an individual provider supplies information about both reference groups and individual providers. The reference group comprises providers of the same specialty who also treat sufficient numbers of a specific episode type. Information for the group includes the average number of episodes treated, the average cost of these episodes, average adjusted cost, and total average adjusted cost per provider. The

average adjusted cost for the reference group represents the benchmark resource level for treating the episode for this specialty. The adjusted average total cost per provider represents the total level of resources expected to be used to treat the average case load for a provider. The RUR also shows the distribution of episode costs and the share of costs originating from providers charged with directing care for an episode.

Information for the individual provider includes the number of episodes treated, average episode cost, and the average adjusted episode cost. It also includes the RUR score, which is the average adjusted cost for the provider divided by the average adjusted cost for the reference group. The report also lists a provider rank, which is the percentile in resource use for that provider among all providers in the reference group. Finally, the report also presents the percent of episodes within certain percentiles for costs, as well as the individual provider's cost share for episodes she treated.

Sections 5.3.1 and 5.3.2 present an RUR for an individual provider using Symmetry episodes. Sections 5.3.3 and 5.3.4 show an RUR for the same individual using Medstat episodes. The episodes were attributed using the PBmax rule, and the *10-10-Yes* cell size rule was used for selecting eligible attributed providers.

5.3.1 Individual Reports for a Provider's Specialties and Assigned Symmetry Episodes

Tables 5.1 to 5.3 show RURs for an internal medicine specialist for treating three different categories of Symmetry episodes. Table 5.1 shows an RUR for an internal medicine specialist for treating SL 2 cerebral vascular accident episodes. Looking at the top half of the table, we see that on average, providers in the reference group treat 28 SL 2 cerebral vascular accident episodes. The average cost of treating this episode type among the reference group is $2,869, with an average adjusted cost of $2,315. As the table shows, there is substantial variation in adjusted costs for this reference group, with a more than 20-fold difference in cost between the 25th and 75th percentiles. The final two cells show the share for PB claim costs assigned to an episode and total episode cost that originate directly from the attributed provider. For this episode type, less than half of all PB claim costs are charged by the attributed provider. This means that, on average, more PB costs stem from providers other than the ones deemed responsible for directing care for these episodes. When all costs are considered, we see that the

average share of total episode costs directly originating from the attributed provider is only 6 percent.

The bottom half of the table lists the information for our example provider. This provider treated less than half the average number of cerebral vascular accident episodes than his peer group. The average actual cost of treating these episodes was $9,051, and after adjusting for case mix, the average cost of treating these episodes is $8,366, with a standard deviation of $15,108. Compared to the benchmark adjusted cost, $2,315, this provider uses 3.61 times more resources to treat SL 2 cerebral vascular accident episodes, making him the provider with the highest resource use in his peer group. The cells after the provider's ranking list the share of the provider's episodes that fall within certain percentiles of costs for this episode type. We see that this provider has no episodes that are less than $113 (the cost of 25th percentile cerebral vascular accident episode), and 42 percent of his attributed episodes show adjusted costs between $113 and $2,610 (the cost at the 75th percentile). This means that most of this provider's attributed episodes are in the top 25 percent in costs, and, as the table shows, one-fourth are in the top decile. Finally, of the 12 cerebral vascular accident episodes attributed to this provider, he is responsible for 38 percent of PB costs, and just 3 percent total episode costs, both of which are lower than the shares of his peers.

Table 5.2 presents an RUR for the same provider but for treating SL 3 bacterial lung infection episodes. At 12 episodes, our example provider treats just 3 fewer SL 3 bacterial lung infections compared to his average peer. The provider's average adjusted resource use, at $5,692, is 76 percent higher than the benchmark resource level, $3,230, again placing this provider as the most resource intensive provider among the reference group. Even though this provider is ranked as having the highest resource use for these episode types and SL2 cerebral vascular accident episodes, there is far less variation in average provider resource use, as shown by the high score of 3.61 for SL2 cerebral vascular accident episodes compared to the high score of 1.76 score for SL 3 bacterial lung infections. In other words, the average resource use by the most resource intensive provider is 3.61 times as high as the benchmark for SL2 cerebral vascular accident episodes, but is 1.76 times as high as the benchmark cost of treating SL3 bacterial lung infections.

But whereas this example provider shows high levels of relative resource use in treating SL 3 bacterial lung infection episodes, he demonstrates better than average resource use for

Table 5.1: Resource Utilization Report (RUR) for Individual Provider, Symmetry (Part 1)

Episode Type: ETG 316000L2 – Cerebral Vascular Accident, SL2
Attribution Rule: 10-10-Yes, PBmax, Internal Medicine Specialty

| Reference Group | Average # Episodes | Cost per Episode | | | Average Total Adj. Cost for Episodes per Provider (T_m) | | Ranges of Adjusted Costs per Episode | | | | Share of Provider's PB Cost | |
		Average Actual Cost	Average Adjusted Cost (R_m)	Std Dev Adj. Cost			25th Percentile Value	50th Percentile Value	75th Percentile Value	90th Percentile Value	Average % of All PB Cost	Average % of Episode Cost
	28	$2,869	$2,315	$4,997	$63,847	--	$113	$368	$2,610	$6,512	48%	6%

Provider	# of Episodes	Average Actual Cost	Average Adjusted Cost (P_m)	Std Dev Adj. Cost	Score (P_m /R_m)	Provider Rank in Reference Group	% of Provider's Episodes in 0th - 25th Pctile Range	% of Provider's Episodes in 25th - 75th Pctile Range	% of Provider's Episodes in 75th - 90th Pctile Range	% of Provider's Episodes in 90th - 100th Pctile Range	% of All PB Cost	% of Total Episode Cost
	12	$9,051	$8,366	$15,108	3.61	100%	0%	42%	33%	25%	38%	3%

Table 5.2: Resource Utilization Report (RUR) for Individual Provider, Symmetry (Part 2)

Episode Type: ETG 437400L3 - Bacterial Lung Infections, SL3

Attribution Rule: 10-10-Yes, PBmax, Internal Medicine Specialty

| Reference Group | Average # Episodes | Cost per Episode | | | Average Total Adj. Cost for Episodes per Provider (T_m) | | Ranges of Adjusted Costs per Episode | | | | Share of Provider's PB Cost | |
		Average Actual Cost	Average Adjusted Cost (R_m)	Std Dev Adj. Cost			25th Percentile Value	50th Percentile Value	75th Percentile Value	90th Percentile Value	Average % of All PB Cost	Average % of Episode Cost
	15	$2,735	$3,230	$4,120	$48,861	--	$190	$1,315	$5,081	$8,849	58%	8%

Provider	# of Episodes	Average Actual Cost	Average Adjusted Cost (P_m)	Std Dev Adj. Cost	Score (P_m / R_m)	Provider Rank in Reference Group	% of Provider's Episodes in 0th - 25th Pctile Range	% of Provider's Episodes in 25th - 75th Pctile Range	% of Provider's Episodes in 75th - 90th Pctile Range	% of Provider's Episodes in 90th - 100th Pctile Range	% of All PB Cost	% of Total Episode Cost
	12	$4,774	$5,692	$5,080	1.76	100%	0%	67%	8%	25%	51%	5%

Table 5.3: Resource Utilization Report (RUR) for Individual Provider, Symmetry (Part 3)

Episode Type: ETG 437400L4 - Bacterial Lung Infections, SL4
Attribution Rule: 10-10-Yes, PBmax, Internal Medicine Specialty

| Reference Group | Average # Episodes | Cost per Episode | | | Average Total Adj. Cost for Episodes per Provider (T_m) | | Ranges of Adjusted Costs per Episode | | | | Share of Provider's PB Cost | |
		Average Actual Cost	Average Adjusted Cost (R_m)	Std Dev Adj. Cost			25th Percentile Value	50th Percentile Value	75th Percentile Value	90th Percentile Value	Average % of All PB Cost	Average % of Episode Cost
	16	$4,182	$2,673	$3,402	$42,340	--	$190	$1,977	$3,755	$6,209	57%	8%

Provider	# of Episodes	Average Actual Cost	Average Adjusted Cost (P_m)	Std Dev Adj. Cost	Score (P_m /R_m)	Provider Rank in Reference Group	% of Provider's Episodes in 0th - 25th Pctile Range	% of Provider's Episodes in 25th - 75th Pctile Range	% of Provider's Episodes in 75th - 90th Pctile Range	% of Provider's Episodes in 90th - 100th Pctile Range	% of All PB Cost	% of Total Episode Cost
	10	$3,855	$2,275	$2,283	0.85	37%	20%	50%	30%	0%	66%	10%

treating more severe cases. Table 5.3 presents an RUR for this provider in treating SL 4 bacterial lung infections, and shows that the provider's average adjusted resource use, at $2,275, is 15 percent below the benchmark resource level, at $2,673. This places this provider at the 37th percentile in resource use among this provider's peers.   And whereas 25 percent of this provider's SL 3 bacterial lung infection episodes fell in the top decile in costs, none of this provider's SL 4 bacterial lung infection episodes were among the top 10 percent in costs.

5.3.2 Overall Score for Symmetry Episodes

Table 5.4 shows the overall score for our example provider, calculated from the provider's three episode-specific scores. The overall score represents the weighted average of the provider's three episode type scores (equation (5.9)). Each score is weighted by the average total adjusted cost for all episodes of that type treated by providers in the same specialty (T_m in Tables 5.1 through 5.3), divided by the sum of average total adjusted costs for all episode types treated both by the provider under consideration and by other providers in the same specialty. This weighting scheme, then, is a function of both average costs and average case load, emphasizing episode types that represent relatively high costs for Medicare.

Table 5.4: Overall Score for Individual Example Provider, Symmetry

Provider Characteristics			
ID #	8EAEB06F4F9C1129CF02F971C7876B61		
Specialty	Internal Medicine		
Attribution Approach	Symmetry: PBmax		
Cell Size	10-10		
Individual Episode Categories	Individual Score	Weight	Weighted Score
ETG 316000L2: Cerebral vascular accident, SL 2	3.61	0.41	1.49
ETG 437400L3: Bacterial lung infections, SL 3	1.76	0.32	0.56
ETG 437400L4: Bacterial lung infections, SL 4	0.85	0.27	0.23
Overall	--	1.00	2.28

In this case, the largest weight (0.41) is assigned to SL 2 cerebral vascular accident episodes, which have an average total adjusted cost per provider of $63,847 (Table 5.1). The next largest weight (0.32) is assigned to SL 3 bacterial lung infections for which the average provider in the reference group is attributed with $48,861. Finally, the score for treating SL 4

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bacterial lung infections receives the lowest rate (0.27), as providers in the reference group show the lowest average total adjusted cost among the three episode types, at $42,340 (Table 5.3). For this provider, the individual score with the greatest weight is also the provider's highest score at 3.67 for SL 2 cerebral vascular accident episodes, and the score that is weighted the least is the lowest score at 0.95 for SL4 bacterial lung infection episodes. Summing the weighted scores (0.42*3.61 + 0.32*1.76 + 0.27*0.85) produces an overall score of 2.28. So while the provider is relatively efficient in treating high severity level bacterial lung infection episodes, the overall score is influenced more by the provider's high resource use for SL 2 cerebral vascular accident episodes and SL 3 bacterial lung infections due to the greater weights associated with these episode types.

5.3.3 Individual Reports for a Provider's Specialties and Assigned Medstat Episodes

Tables 5.5 and 5.6 show RURs for the same internal medicine specialist, but for treating just two Medstat MEGs: cerebrovascular disease with stroke and pneumonia. The average cost for treating cerebrovascular disease with stroke episodes among the provider's reference group is $3,533, with an average adjusted cost of $2,916. As the top part of Table 5.5 shows, there is substantial variation in adjusted costs for this reference group — an almost 30-fold difference in cost between the 25th and 75th percentile adjusted costs. Also, about half of all PB claims costs originate from the providers directing care for the episode, but only 4 percent of total episode costs originate from the attributed providers in this reference group.

The bottom half of Table 5.5 shows that our example provider treated 12 episodes of cerebrovascular disease with stroke, compared with an average of 22 episodes for the reference group, and the provider's average adjusted cost for treating these episodes is $5,925, with a standard deviation of $5,500. The adjusted cost for this provider is twice as high as the adjusted cost for the reference group, as shown by the score of 2.03, placing the provider in the 90th percentile of resource use. Half of cerebrovascular disease with stroke episodes treated by this provider are between the 75th and 90th percentile of costs, and another 17 percent are in the top decile. While this provider ranks among the highest in resource use, a smaller share of PB costs originate from this provider compared to the reference group: 38 percent of all PB costs originate from the provider's PB claims, compared to 48 percent for the reference group.

Table 5.5: Resource Utilization Report (RUR) for Individual Provider, Medstat (Part 1)

Episode Type: MEG 397 - Cerebrovascular Dis with Stroke

Attribution Rule: 10-10-Yes, PBmax, Internal Medicine Specialty

| Reference Group | Average # Episodes | Cost per Episode | | | Average Total Adj. Cost for Episodes per Provider (T_m) | | Ranges of Adjusted Costs per Episode | | | | Share of Provider's PB Cost | |
		Average Actual Cost	Average Adjusted Cost (R_m)	Std Dev Adj. Cost			25th Percentile Value	50th Percentile Value	75th Percentile Value	90th Percentile Value	Average % of All PB Cost	Average % of Episode Cost
	22	$3,543	$2,916	$5,833	$63,868	--	$40	$116	$3,477	$9,155	49%	4%

Provider	# of Episodes	Average Actual Cost	Average Adjusted Cost (P_m)	Std Dev Adj. Cost	Score (P_m /R_m)	Provider Rank in Reference Group	% of Provider's Episodes in 0th - 25th Pctile Range	% of Provider's Episodes in 25th - 75th Pctile Range	% of Provider's Episodes in 75th - 90th Pctile Range	% of Provider's Episodes in 90th - 100th Pctile Range	% of All PB Cost	% of Total Episode Cost
	12	$7,226	$5,925	$5,500	2.03	90%	0%	0%	50%	17%	38%	4%

Table 5.6: Resource Utilization Report (RUR) for Individual Provider, Medstat (Part 2)

Episode Type: MEG 510 - Pneumonia: Bacterial
Attribution Rule: 10-10-Yes, PBmax, Internal Medicine Specialty

Reference Group	Average # Episodes	Cost per Episode			Average Total Adj. Cost for Episodes per Provider (T_m)		Ranges of Adjusted Costs per Episode				Share of Provider's PB Cost	
		Average Actual Cost	Average Adjusted Cost (R_m)	Std Dev Adj. Cost			25th Percentile Value	50th Percentile Value	75th Percentile Value	90th Percentile Value	Average % of All PB Cost	Average % of Episode Cost
	27	$3,518	$1,529	$2,827	$41,171	--	$61	$216	$2,174	$4,554	56%	7%

Provider	# of Episodes	Average Actual Cost	Average Adjusted Cost (P_m)	Std Dev Adj. Cost	Score (P_m/R_m)	Provider Rank in Reference Group	% of Provider's Episodes in 0th - 25th Pctile Range	% of Provider's Episodes in 25th - 75th Pctile Range	% of Provider's Episodes in 75th - 90th Pctile Range	% of Provider's Episodes in 90th - 100th Pctile Range	% of All PB Cost	% of Total Episode Cost
	22	$6,632	$2,454	$1,959	1.61	87%	0%	45%	45%	9%	54%	6%

Table 5.6 presents the second RUR for this provider, for treating pneumonia episodes. For this type of episode, the average adjusted cost for the reference group is $1,529 and the average adjusted cost for the provider is $2,454 producing a RUR score of 1.61. This provider's resource use places her at the 87th percentile in costs for treating pneumonia among internal medicine specialists.

5.3.4 Overall Score for Medstat Episodes

Table 5.7 presents the overall Medstat score for our example provider. This score is calculated from two types of episodes, cerebrovascular disease with stroke and pneumonia. The individual scores show that the provider's resource use is above the benchmark for each episode type. However, the cerebrovascular disease with stroke score is weighted more than the pneumonia score in the calculation of the overall score, because the average total adjusted cost for episodes of cerebrovascular disease with stroke per provider, at $63,868, producing a weight of 0.61, is higher than the average total adjusted costs for pneumonia episodes, at $41,171, producing a weight of 0.39. Because the weighting places more emphasis on the more resource intensive cerebrovascular disease with stroke episodes and this is the provider's highest individual score of the two, the overall score is higher than if it were simply an average of the two scores.

Table 5.7: Overall Score for Individual Example Provider, Medstat

Provider Characteristics			
ID #	8EAEB06F4F9C1129CF02F971C7876B61		
Specialty	Internal Medicine		
Attribution Approach	Medstat: PBmax		
Cell Size	10-10		
Individual Episode Categories	Individual Score	Weight	Weighted Score
MEG 397: Cerebrovascular Dis with Stroke	2.03	0.61	1.24
MEG 510: Pneumonia: Bacterial	1.61	0.39	0.63
Overall	--	1.00	1.86

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5.4 How Much Do RUR Scores Vary Across Providers?

Another principal product of this section consists of a tool for assessing the variability of "cost efficiencies" across health-care professionals, with each provider evaluated with contemporaries in their specialty. The measure of cost efficiency is the provider's RUR score. This score is structured similarly to the risk scores used by CMS to adjust premiums for beneficiaries enrolling in managed care plans. In particular, an ETG/MEG specific RUR score of 1.0 shows that, on average, a provider uses resources on par with the benchmark cost for treating the specific episode type. An overall RUR score of 1.0 indicates that at case loads equal to the average provider in each ETG/MEG specific reference group, the provider would have costs equal to the sum of costs for the average providers with benchmark costs for each episode type. While the overall score shifts the comparison from the episode level to a caseload level, the overall scores do not require that comparisons only be made within an episode/specialty reference group.

This concluding discussion illustrates a simple variant of a tool for comparing the RUR scores of providers. In particular, the analysis presents the distribution of overall scores for those Oregon providers in internal medicine, the medical specialty that includes the largest number of evaluated physicians. We restrict comparisons to be within a single specialty to make evaluations as meaningful as possible. Section 5.4.1 below presents score distributions utilizing the Symmetry grouper in conjunction with PBmax attribution rule, and Section 5.4.2 presents findings based on the Medstat grouper.

5.4.1 Distribution of Symmetry Scores within Specialty

The average, standard deviation and percentiles of overall RUR scores produced for internal medicine specialist treating Symmetry episodes is presented in Table 5.8. Using the PBmax attribution rule and *10-10-Yes* cell size rule, 238 internal medicine specialists receive scores, with a mean of 1.04, and a standard deviation of 0.49. These scores show a wide range of resource use across the 238 providers; with resource use for the provider at the first percentile showing a score of 0.32, and the provider at the 99th percentile showing an overall score of 2.98. So, within this specialty, we see the resource use ranges anywhere from a third of average use to 3 times the average. With an overall score of 2.28, our example provider above would rank somewhere between the 95th and 99th percentile in overall resource use, which is just below the provider's ranking for two of the individual episode types; however, recall that at least for one

episode type, SL 4 bacterial lung infections, the provider ranks at the 34th percentile in treating that particular episode type.

Table 5.8: Summary Statistics for Symmetry Scores for Internal Medicine Providers

# Providers	Summary Statistics		Percentiles of Provider Scores								
	Mean	Std Dev	1st	5th	10th	25th	50th	75th	90th	95th	99th
238	1.04	0.49	0.32	0.49	0.64	0.75	0.94	1.16	1.57	1.85	2.98

5.4.2 Distribution of Medstat Scores within Specialty

Table 5.9 shows the average, standard deviation, and distribution of scores for Medstat episodes attributed under the PBmax rule, using a *10-10-Yes* cell size rule. There are 20 more providers scored using Medstat episodes, and we also see some difference in averages and dispersion. The mean RUR score for internal medicine providers treating Medstat is 1.12, with a standard deviation of 0.88. The range between the 1st percentile and 99th percent is quite large, with the provider at the 1st percentile showing an overall score of 0.30 and the provider at the 99th percentile showing an overall score of 5.20. Our example provider's overall Medstat score of 1.86 would place the provider just above the 90th percentile. For the two episode specific scores, the provider ranked at 90th and 87th percentile.

Table 5.9: Summary Statistics for Medstat Scores for Internal Medicine Providers

# Providers	Summary Statistics		Percentiles of Provider Scores								
	Mean	Std Dev	1st	5th	10th	25th	50th	75th	90th	95th	99th
258	1.12	0.88	0.30	0.46	0.57	0.70	0.89	1.19	1.70	2.91	5.20

6   COMPARISON OF SCORES UNDER DIFFERENT RUR REGIMES

This concluding section takes up our final question – *Are individual physicians scored similarly across different RUR regimes?*   Whereas the above findings of Sections 3 and 4 suggest that the two groupers produce similar attribution patterns, and Section 5 happens to present similar rankings of RURs under the two groupers for the single example provider considered in this analysis, the scores and rankings of providers can in fact diverge sharply under alternative assignment regimes and across the groupers. Within each grouper, Section 6.1 illustrates the differences in RUR ratings that can arise due to variation in attribution and cell-size rules, considering both the PBmax and EMmax specifications. Section 6.2 presents differences that can occur in providers' relative scores across groupers, holding the other aspects of the assignment rules constant.

6.1   Alternative RUR Regimes within Groupers

Altering attribution and cell size rules not only affects the shares of episodes and providers eligible for RUR scores; these rules can affect the scores themselves. Using different attribution rules could lead to different providers being attributed with a different mix of episode types. Changing episode cell size rules can also affect a provider's mix of episode types used for calculating overall scores, as a provider may treat a sufficient number of a specific episode type that qualifies under a low cell size rule but is not sufficient to meet the requirement of a high cell size rule. Additionally, the attribution and cell size rules, by affecting the samples used for the regressions, can affect scores by changing estimates of specialty and risk effects. In Sections 6.1.1 and 6.1.2, we compare scores within groupers across the PBmax and EMmax rules. In Sections 6.1.3 and 6.1.4 we compare scores within groupers across the *10-10-Yes* and *30-10-Yes* cell size rules. Finally, Sections 6.1.5 and 6.1.6 explore the use of a different weighting scheme for calculating overall scores. For all of these within-grouper comparisons, we focus on scores for internal medicine providers.

6.1.1   Comparison of Attribution Rules for Symmetry

Tables 6.1 and 6.2 present statistics on the differences in overall scores produced under both the PBmax and EMmax attribution rule for providers receiving scores under the *10-10-Yes* cell size rule. Table 6.1 presents percentiles of differences between scores for the 225 providers who are attributed sufficient numbers of episodes under both attribution rules; 13 providers

receive a score under one attribution rule but not one under the other. The table shows substantial variation in scores between the two attribution rules. The provider at the first percentile receives an EMmax score that is nearly a point higher than the PBmax score, and the provider at the 99th percentile has a PBmax score that is nearly three-quarters of a point greater than the EMmax score. Table 6.2 presents the distribution of absolute-value differences between the two scores. The mean difference in scores is 0.17 points, with differences ranging from 0 to 2.03 points. For 25 percent of providers, scores change by only 0.05 points or less when moving from one attribution rule to another; however, for the top fifth of providers, we see changes of a quarter point or more as a result of changing the attribution rule.

Table 6.1: Distribution of Differences in (PBmax Score) - (EMmax Score), Symmetry

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
13	225	-0.97	-0.45	-0.19	-0.05	0.05	0.14	0.26	0.34	0.72

Table 6.2: Summary Statistics for Absolute-Value Differences in PBmax and EMmax Scores, Symmetry

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
13	225	0.17	0.23	0.00	2.03	0.05	0.11	0.25	0.39	0.54

Table 6.3 presents a cross tabulation of the scores produced under the two attribution rules. Each column represents a specific range of scores from EMmax-attributed episodes, and each row represents a specific range of scores from PBmax-attributed episodes. Providers falling on the shaded diagonals show some general agreement between scores produced under the two attribution rules. The middle diagonal covers the distribution of providers with scores that differ by no greater than 0.3 points; the lower and upper diagonals cover providers with scores that differ by no greater than 0.6 points. For example, in the lower diagonal is a cell showing that 4 percent of providers receive a score for EMmax-attributed episodes ranging from 0.3 to 0.6

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Table 6.3: Cross Tabulation of PBmax Score by EMmax Score, Symmetry

Range of Scores		EMmax Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
PBmax Score	**0 - 0.3**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	
	0.3 - 0.6	0.9%	4.4%	2.2%	0.9%	0.0%	0.0%	0.0%	0.0%	8.4%	19	
	0.6 - 0.9	0.0%	4.0%	25.8%	3.1%	3.1%	0.4%	0.0%	0.0%	36.4%	82	
	0.9 - 1.1	0.0%	0.9%	9.3%	12.4%	1.8%	0.0%	0.0%	0.4%	24.9%	56	
	1.1 - 1.4	0.0%	0.4%	3.1%	6.7%	5.3%	0.9%	0.9%	0.0%	17.3%	39	
	1.4 - 1.7	0.0%	0.0%	0.0%	0.0%	3.1%	2.2%	0.0%	0.4%	5.8%	13	
	1.7 - 2.0	0.0%	0.0%	0.0%	0.4%	0.0%	1.8%	0.9%	0.4%	3.6%	8	
	2.0+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	2.7%	3.6%	8	
Totals	**%**	0.9%	9.8%	40.4%	23.6%	13.3%	5.3%	2.7%	4.0%	100.0%	--	
	#	2	22	91	53	30	12	6	9	--	225	8.4%
	Diag.										26.7%	53.8%

points and a score for PMmax-attributed episodes anywhere between 0.6 and 0.9 points. The table shows that little more than half of the providers have scores falling on the middle diagonal, with nearly 90 percent within the three shaded diagonals.

If we consider overall scores falling between 0.9 and 1.1 points as indicating "average" resource use, Table 6.3 also shows disagreement between the two scores on whether a provider's resource use is below average, average, or above average. For example, observations in the fourth row represent providers who receive scores indicating average resource use under the PBmax rule. Of the 24.9 percent of providers who are ranked as average under the PBmax rule, only about half are ranked as average under the EMmax attribution rule; 40 percent become designated as below average and the remaining 10 percent change from average to above average as a result of switching from the PBmax to EMmax rule. Additionally, observations in the upper-right and lower-left quadrants show providers who change from being ranked as above average to ranking below average when moving from one attribution rule to the other. Summing the observations in each quadrant, we find that when switching from the PBmax to EMmax rule, 3.5 percent of providers change from being designated as below average to above average (observations in the lower-left quadrant) and another 3.5 percent change from being below average to above average (observations in the upper-right quadrant).

6.1.2 Comparison of Attribution Rules for Medstat

Table 6.4 shows that by using Medstat episodes and the *10-10-Yes* cell size rule, there are 249 internal medicine specialists given scores under both the PBmax and EMmax rules, and 13 who receive a score under one rule, but not under the other rule. The distribution of differences presented in Table 6.4 shows that a provider's EMmax score can be higher by 1.46 points or more or lower by 3.08 or more compared to the provider's PBmax score. Table 6.5 shows that the average absolute-value difference across PBmax and EMmax scores is 0.31 points, and the absolute-value differences range from 0 to 4.17 points. For 25 percent of the providers, the difference in scores is only 0.06 points or less, but for one-fifth of providers, scores differ by 0.38 points or more.

Table 6.4: Distribution of Differences in (PBmax Score) - (EMmax Score), Medstat

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
13	249	-1.46	-0.47	-0.26	-0.08	0.05	0.21	0.49	0.79	3.08

Table 6.5: Summary Statistics for Absolute Value Differences in PBmax and EMmax Scores, Medstat

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
13	249	0.31	0.51	0.00	4.17	0.06	0.16	0.38	0.65	1.28

Cross tabulations between the PBmax and EMmax scores for Medstat episodes are shown in Table 6.6. Almost 84 percent have scores produced under the two attribution rules that place them within one of the shaded diagonals, indicating differences in scores ranging from 0 to 0.6 points. However, of the 18.5 percent of providers ranked as "average" efficiency based on the PBmax attribution rule, 45 percent become rated as below average under the EMmax rule, and slightly more than 20 percent become ranked as above average. Additionally, over 6 percent change from being ranked above average to below average when switching from the PBmax to EMmax rule (observations in lower-left quadrant) and another 3 percent change from below average to above average (observations in upper-right quadrant).

Table 6.6: Cross Tabulation of PBmax Score by EMmax Score, Medstat

Range of Scores		EMmax Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
PBmax Score	0 - 0.3	0.4%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	3	
	0.3 - 0.6	0.4%	7.6%	3.2%	0.4%	0.4%	0.0%	0.4%	0.0%	12.4%	31	
	0.6 - 0.9	0.0%	7.6%	22.1%	5.2%	0.8%	0.0%	0.4%	0.8%	36.9%	92	
	0.9 - 1.1	0.0%	2.0%	6.4%	6.0%	3.6%	0.4%	0.0%	0.0%	18.5%	46	
	1.1 - 1.4	0.0%	0.4%	2.4%	4.4%	5.6%	0.0%	0.8%	0.0%	13.7%	34	
	1.4 - 1.7	0.0%	0.8%	1.6%	1.2%	1.2%	1.2%	1.2%	0.4%	7.6%	19	
	1.7 - 2.0	0.0%	0.8%	0.0%	0.4%	0.0%	1.2%	0.0%	0.4%	2.8%	7	
	2.0+	0.0%	0.0%	0.4%	0.0%	0.8%	0.8%	0.4%	4.4%	6.8%	17	
Totals	%	0.8%	20.1%	36.1%	17.7%	12.4%	3.6%	3.2%	6.0%	100.0%	--	
	#	2	50	90	44	31	9	8	15	--	249	14.5%
	Diag.										21.7%	47.4%

6.1.3 Comparison of Cell-Size Specifications for Symmetry

Table 6.7 presents the distribution of the difference in scores produced under the *10-10-Yes* and *30-10-Yes* cell size rule using PBmax-attributed Symmetry episodes. There are 142 internal medicine specialists who receive scores under both cell size rules. Another 96 providers receive scores under the *10-10-Yes* rule but do not obtain scores under the more restrictive *30-10-Yes* cell size rule. An examination of the absolute-value differences in scores in Table 6.8 shows that the average difference in scores for these providers is 0.2 points, with providers experiencing anywhere from a 0 to 1.14 point change in their scores when an alternate episode cell-size rule is used. For a quarter of providers, the expected change is small, with a difference of no more than 0.06 points. However, for 20 percent of these providers, changing the episode cell-size rule leads to changes in their scores of nearly a third of a point or more.

Table 6.7: Distribution of Differences in (*10-10-Yes* Score) - (*30-10-Yes* Score), Symmetry

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
96	142	-0.89	-0.52	-0.40	-0.19	-0.06	0.05	0.21	0.27	0.59

Table 6.8: Summary Statistics for Absolute-Value Differences in *10-10-Yes* and *30-10-Yes* Scores, Symmetry

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
96	142	0.20	0.20	0.00	1.14	0.06	0.12	0.31	0.42	0.59

Table 6.9 presents the cross tabulation of scores between the two cell size rules. We see that less than half of the providers receive scores that are between 0 and 0.3 points of each other, and at least 83 percent receive scores that are between 0 and 0.6 points of each other. For the roughly 25 percent of providers ranked as "average" efficiency based on a small cell-size (*10-10-Yes*) criterion, increasing the episode cell-size requirement leads to more than 27 percent of this

Table 6.9: Cross Tabulation of *10-10-Yes* Score by *30-10-Yes* Score, Symmetry

Range of Scores		30-10-Yes Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
10-10-Yes Score	0 - 0.3	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1	
	0.3 - 0.6	0.0%	2.1%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	8	
	0.6 - 0.9	0.0%	2.8%	22.5%	9.2%	7.7%	1.4%	0.0%	0.7%	44.4%	63	
	0.9 - 1.1	0.0%	0.7%	6.3%	9.2%	7.7%	1.4%	0.0%	0.0%	25.4%	36	
	1.1 - 1.4	0.0%	1.4%	2.1%	2.8%	4.2%	2.8%	1.4%	0.0%	14.8%	21	
	1.4 - 1.7	0.0%	0.0%	0.0%	0.0%	2.8%	2.1%	0.7%	0.0%	5.6%	8	
	1.7 - 2.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.4%	0.7%	2.8%	4	
	2.0+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.7%	1	
Totals	%	0.7%	7.0%	34.5%	21.1%	22.5%	8.5%	3.5%	2.1%	100.0%	--	
	#	1	10	49	30	32	12	5	3	--	142	24.6%
	Diag.										15.5%	43.0%

group becoming rated as below average and slightly more than 35 percent rated as above average. Over 3 percent of the providers change from being ranked above average to below average when the episode cell-size requirement increases to 30. Rankings for another 10 percent of providers change from below average to above average as a result of raising the minimum episode requirement from 10 to 30 episodes.

To understand how the scores across the two episode cell-size rules can provide contradictory information on resource use for a provider, we present the calculations for a provider who scores 2.03 under the *30-10-Yes* rule and 0.89 under the *10-10-Yes* rule in Tables 6.10 and 6.11. The score of 2.03 is calculated from two episode types where the provider received scores of 2.5 and 1.52, and weights for these scores of 0.52 and 0.48 respectively ($0.51*2.5 + 0.48*1.52 = 2.03$). Under the *10-10-Yes* rule, two new episode types were introduced into this provider's composite score calculation with scores of 0.46 and 0.93. And given that new providers are introduced into the reference groups for the existing two episodes types when the same-type episode restriction is relaxed, the scores for these two episode types change slightly, with one dropping from 2.5 to 2.2 and the other dropping from 1.52 to 1.51. The provider's score of 0.89 under the *10-10-Yes* rule is calculated from these four scores and four weights using the following formula: $0.67*0.46 + 0.03*0.93 + 0.15*2.2 + 0.15*1.51$. While introducing two episode types where the provider shows below average resource use does exert downward influence on the overall score, the greatest influence comes from the weight for the episode type with the lowest score (at 0.67), SL1 diabetes; this weight is four times greater than the weights given to the scores showing high resource use (at 0.15). Thus, the variability in scores under the two cell-size rules results from having a different mix of scores and weights from different episode types, and differences in reference groups.

Table 6.10: Overall Score for a Provider Showing Conflicting Symmetry Scores Using *30-10-Yes* Cell Size Rule

Provider Characteristics				
ID #	7D9B2EA56709834F3974B7819368F72B			
Specialty	Internal Medicine			
Attribution Approach	Symmetry: PBmax			
Cell Size	30-10			
Individual Episode Categories	Number of Episodes	Individual Score	Weight	Weighted Score
ETG 162200L1: Hypo-functioning thyroid gland, SL 1	76	2.50	0.52	1.29
ETG 164700L1: Hyperlipidemia, other, SL 1	36	1.52	0.48	0.74
Overall	112	--	1.00	2.03

Table 6.11: Overall Score for a Provider Showing Conflicting Symmetry Scores Using *10-10-Yes* Cell Size Rule

Provider Characteristics				
ID #	7D9B2EA56709834F3974B7819368F72B			
Specialty	Internal Medicine			
Attribution Approach	Symmetry: PBmax			
Cell Size	10-10			
Individual Episode Categories	**Number of Episodes**	**Individual Score**	**Weight**	**Weighted Score**
ETG 162200L1: Hypo-functioning thyroid gland, SL 1	76	2.20	0.15	0.33
ETG 163000L1: Diabetes, SL 1	10	0.46	0.67	0.31
ETG 164700L1: Hyperlipidemia, other, SL 1	36	1.51	0.15	0.23
ETG 403300L1: Acute sinusitis, SL 1	11	0.93	0.03	0.02
Overall	133	--	1.00	0.89

6.1.4 Comparison of Cell-Size Specifications for Medstat

The distribution of the difference in scores between the *10-10-Yes* and *30-10-Yes* cell-size rules for providers attributed with Medstat episodes is presented in Table 6.12. There are 189 providers who are scored under both cell size rules. Another 69 providers receive scores under the less restrictive rule but do not receive scores under the more restrictive rule. Scores under the *30-10-Yes* rule can range from being nearly 2 points greater to being more than 1 point lower than the *10-10-Yes* scores. Table 6.13 shows that the mean difference between scores for providers is 0.21 points, with differences ranging from 0 to nearly 2 points. We see that a quarter of these commonly scored providers show differences ranging from 0 to only 0.06; however, the scores for another 20 percent of these providers vary by 0.28 points or more when changing from one episode cell-size requirement to the other.

Table 6.12: Distribution of Differences (*10-10-Yes* Score) - (*30-10-Yes* Score), Medstat

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
69	189	-1.92	-0.65	-0.36	-0.14	-0.02	0.10	0.21	0.46	1.17

Table 6.13: Summary Statistics for Absolute-Value Differences in *10-10-Yes* and *30-10-Yes* Scores, Medstat

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
69	189	0.21	0.29	0.00	1.95	0.06	0.12	0.28	0.54	0.72

Table 6.14 shows the cross tabulation comparing scores given to providers treating Medstat episodes under the *10-10-Yes* and *30-10-Yes* cell-size rules. At least 83 percent receive scores that are between 0 and 0.6 points of each other, as identified by providers falling along the lower, middle or upper diagonals. Of the 21 percent of providers ranked as "average" efficiency based on a small cell-size criterion, 17 percent of this group become rated as below average when the cell-size requirement increases to 30 and another 40 percent change from receiving an

average ranking to an above average ranking. The table also shows that nearly 3 percent of the providers change from being rated above average to below average when the episode cell-size requirement increases to 30, and rankings for another 5 percent of providers change from below to above average.

To highlight how a provider's score can change from above to below average, we present Tables 6.15 and 6.16 showing the overall score calculations for the provider with a score of 2.77 under the *30-10-Yes* rule and 0.82 under the *10-10-Yes* rule. When the *30-10-Yes* rule is applied, this provider's overall score is calculated from a single RUR score for essential hypertension, of which this provider is attributed 31 episodes. The score of 2.77 places the provider as the most resource intensive provider among the reference group for treating this episode type. However, when the episode cell size requirement is reduced to 10, three new episode types are introduced into the calculation of the provider's overall score. For one of these episode types, type 2 diabetes mellitus, the provider shows resource use that is 15 percent more costly than the benchmark cost for treating this condition. For the other two episode types, cerebrovascular disease with stroke and chronic obstructive pulmonary disease, the provider shows below average resource use, with the provider showing resource use for strokes at one-twentieth of the benchmark cost. And because the weight the stroke episodes is the highest among the four episode types, this episode-specific score showing low resource use dominates the overall score. As shown with Symmetry-produced scores in the previous section, changing the episode cell size requirement changes the mix of episodes used for calculating overall scores. Often this does not substantially alter an overall score for providers, but in cases such as the one illustrated in the tables below, changes can be dramatic.

Table 6.14: Cross Tabulation of *10-10-Yes* Score by *30-10-Yes* Score, Medstat

Range of Scores		30-10-Yes Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
10-10-Yes Score	**0 - 0.3**	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1	
	0.3 - 0.6	1.1%	5.3%	3.7%	0.5%	0.5%	0.0%	0.0%	0.0%	11.1%	21	
	0.6 - 0.9	0.0%	3.2%	24.9%	7.9%	3.2%	1.1%	0.0%	0.5%	40.7%	77	
	0.9 - 1.1	0.0%	0.5%	3.2%	9.0%	7.4%	1.1%	0.0%	0.0%	21.2%	40	
	1.1 - 1.4	0.0%	0.0%	2.1%	3.2%	6.3%	1.1%	1.6%	0.5%	14.8%	28	
	1.4 - 1.7	0.0%	0.0%	0.5%	1.6%	2.1%	1.6%	0.0%	1.6%	7.4%	14	
	1.7 - 2.0	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.6%	0.0%	2.1%	4	
	2.0+	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.1%	0.5%	2.1%	4	
Totals	**%**	1.6%	9.0%	34.4%	22.8%	19.6%	5.3%	4.2%	3.2%	100.0%	--	
	#	3	17	65	43	37	10	8	6	--	189	**20.1%**
	Diag.										**13.8%**	**49.7%**

Table 6.15: Overall Score for a Provider Showing Conflicting Medstat Scores Using *30-10-Yes* Cell Size Rule

Provider Characteristics				
ID #	73B66F358EFDB695078016A3853F4D62			
Specialty	Internal Medicine			
Attribution Approach	Medstat: PBmax			
Cell Size	30-10			
Individual Episode Categories	**Number of Episodes**	**Individual Score**	**Weight**	**Weighted Score**
MEG 13: Essential Hypertension, Chronic Maintenance	31	2.77	1.00	2.77
Overall	31	--	1.00	2.77

Table 6.16: Overall Score for a Provider Showing Conflicting Medstat Scores Using *10-10-Yes* Cell Size Rule

Provider Characteristics				
ID #	73B66F358EFDB695078016A3853F4D62			
Specialty	Internal Medicine			
Attribution Approach	Medstat: PBmax			
Cell Size	10-10			
Individual Episode Categories	Number of Episodes	Individual Score	Weight	Weighted Score
MEG 13: Essential Hypertension, Chronic Maintenance	31	2.76	0.20	0.54
MEG 50: Diabetes Mellitus Type 2 and Hyperglycemic States Maintenance	13	1.15	0.18	0.20
MEG 397: Cerebrovascular Dis with Stroke	12	0.05	0.51	0.03
MEG 500: Chronic Obstructive Pulmonary Disease	11	0.38	0.12	0.04
Overall	67	--	1.00	0.82

6.1.5 Comparison of Different Score Aggregation Schemes for Symmetry

The weights used above in the construction of overall scores rely on the total adjusted average cost per provider for each episode type (equation (5.9)). This places emphasis on ETGs that contribute more to overall Medicare costs. However, other weights can be selected to emphasize other factors, which can be more or less sensitive to changes in provider behavior. To illustrate, consider an alternative weighting system that depends on how much resources a provider expends compared to a provider with the same case mix (both the same mix of episode types and the same caseload for each episode type) and whose adjusted costs equal the average for each episode type. In particular, consider weighting a provider's score for each ETG according to the average adjusted cost per episode for the peer group times the number of episodes the provider treats. One can calculate weights for this scheme using the following formula:

$$(6.1) \quad W_{mk} = \frac{T_{mk}}{T_k}$$

where: W_{mk} = the weight given each ETG-specific RUR score for provider k

T_{mk} = Provider k's number of episodes of ETG m times the average adjusted cost of ETG m episodes for the reference group.

$T_k = \sum_{m \in M} T_{mk}$, where M is the set of ETGs m attributed to provider k.

While this weight and the one proposed in Section 5 both rely on the average adjusted episode cost for the peer group, this weight depends on the provider's episode-specific caseload whereas the weight calculated using formula (5.9) depends on the caseloads of the reference group. If a provider rates as high cost for a particular episode type and performs relatively few episodes relative to the average for this type, then weighting scheme (6.1) penalizes this provider less that scheme (5.9) for this behavior. On the other hand, if the provider performs greater than the average number of episodes, then scheme (6.1) penalizes this provider more.

Tables 6.17 though 6.19 compare the scores calculated from these different weighting schemes using PBmax-attributed episodes and the *10-10-Yes* cell-size rule. With a mean difference of only 0.05 points, there appears to be little difference between scores for a provider under the two weighting schemes. Yet while the differences are small for an overwhelming

majority of providers—up to only 0.08 points for 80 percent of providers—scores can change by as much as three-quarters of a point.

Table 6.17: Distribution of Differences Between Overall Scores Based on Different Weights, Symmetry

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
0	238	-0.23	-0.11	-0.09	-0.03	0.00	0.02	0.08	0.14	0.26

Table 6.18: Summary Statistics for Absolute-Value Differences in Overall Scores Based on Different Weights, Symmetry

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
0	238	0.05	0.08	0.00	0.76	0.01	0.03	0.08	0.13	0.22

The cross tabulation of these scores in Table 6.19 shows that nearly all providers fall on one of the three middle diagonals. We do see, though, three providers with scores indicating above average resource use under one weighting scheme and below average resource use under the other weighting scheme. These differences occur when a provider's caseload differs from the peer group's average case load for an episode type.

However, even though an overwhelming majority of providers show similar scores across the two weighting schemes, the scores do differ in how they respond to changes in provider behavior. For the most part, if providers wish to improve their overall scores when weights are calculated using the reference group caseload (equation (5.9)), providers must improve relative resource efficiency in one or more of the episode types from which a provider's score is calculated. The only other option for improving scores would be to drop caseloads for episode types where the provider receives poor scores to a point where the ETG does not meet episode cell-size requirements. However, when weights are calculated using the provider's caseload, a provider can additionally improve his or her overall score, either by increasing the caseload for

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Table 6.19: Cross Tabulation of Overall Scores Using Different Weights, Symmetry

Range of Scores		Provider Caseload Weighted Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Reference Group Caseload Weighted Score	0 - 0.3	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	1	
	0.3 - 0.6	0.4%	5.9%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	8.0%	19	
	0.6 - 0.9	0.0%	0.4%	30.3%	3.8%	0.0%	0.4%	0.0%	0.0%	34.9%	83	
	0.9 - 1.1	0.0%	0.0%	2.9%	20.2%	1.7%	0.0%	0.0%	0.0%	24.8%	59	
	1.1 - 1.4	0.0%	0.0%	0.8%	2.5%	13.4%	0.4%	0.0%	0.0%	17.2%	41	
	1.4 - 1.7	0.0%	0.0%	0.0%	0.0%	0.8%	5.9%	0.0%	0.0%	6.7%	16	
	1.7 - 2.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	3.4%	0.0%	4.2%	10	
	2.0+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.8%	3.8%	9	
Totals	%	0.8%	6.3%	35.7%	26.5%	16.0%	7.6%	3.4%	3.8%	100.0%	--	
	#	2	15	85	63	38	18	8	9	--	238	7.6%
	Diag.										8.0%	83.2%

episode types where the provider shows below average resource use, or decreasing the caseload for episode types where the provider shows above average resource use. But while this might lead to efficiency gains by distributing care of certain conditions to more efficient providers, it might also cut access to care in areas where beneficiaries have little choice in choosing providers, if providers in these areas stop treating certain episode types for which they receive low scores.

6.1.6 Comparison of Different Score Aggregation Schemes for Medstat

In this section, we compare the different weighting schemes discussed in the previous section using Medstat episodes assigned by the PBmax attribution rule using the *10-10-Yes* rule for episode and peer group requirements. The distribution of differences in Table 6.20 shows that most providers receive similar scores under the two weighting schemes. However, Table 6.21 shows a mean difference of 0.09, indicating that there is variation between the two scores, and for at least one provider, the difference in scores under the two weighting schemes is 1.57 points.

Table 6.20: Distribution of Differences Between Overall Scores Based on Different Weights, Medstat

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
0	258	-0.62	-0.15	-0.09	-0.03	0.00	0.06	0.13	0.27	0.85

Table 6.21: Summary Statistics for Absolute-Value Differences in Overall Scores Based on Different Weights, Medstat

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
0	258	0.09	0.19	0.00	1.57	0.01	0.04	0.11	0.17	0.31

Table 6.22 shows a cross tabulation of the scores calculated using different weights; all but 7 of the 258 internal medicine specialists fall on the three middle diagonals, indicating good

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agreement between the two scores. But of the 7 that do not fall on the middle diagonals, 2 show scores between 1.4 and 1.7 under one weighting scheme and between 0.6 and 0.9 under the other weighting scheme. Thus, for these two providers, the weighting scheme determines whether they receive a score indicating above average resource use or below average resource use.

As different weighting schemes generally produce similar scores, the key question that must be answered when deciding upon which weighting scheme to use is how responsive scores should be to changes in provider behavior. As noted above, while using weights that are sensitive to a provider's caseload may induce efficiencies by distributing care of certain episode types to more efficient providers, they might also limit access to care for beneficiaries with certain conditions.

Table 6.22: Cross Tabulation of Overall Scores Using Different Weights, Medstat

Range of Scores		Provider Caseload Weighted Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Reference Group Caseload Weighted Score	0 - 0.3	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	3	
	0.3 - 0.6	0.8%	8.1%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	12.8%	33	
	0.6 - 0.9	0.0%	2.3%	31.8%	1.9%	0.0%	0.4%	0.0%	0.0%	36.4%	94	
	0.9 - 1.1	0.0%	0.0%	2.3%	14.0%	2.3%	0.0%	0.0%	0.4%	19.0%	49	
	1.1 - 1.4	0.0%	0.0%	0.4%	1.9%	10.5%	0.4%	0.0%	0.0%	13.2%	34	
	1.4 - 1.7	0.0%	0.0%	0.4%	0.8%	1.9%	4.3%	0.0%	0.0%	7.4%	19	
	1.7 - 2.0	0.0%	0.0%	0.0%	0.4%	0.4%	0.8%	1.2%	0.4%	3.1%	8	
	2.0+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	6.6%	7.0%	18	
Totals	%	1.9%	10.5%	38.8%	19.0%	15.1%	5.8%	1.6%	7.4%	100.0%	--	
	#	5	27	100	49	39	15	4	19	--	258	8.9%
	Diag.										10.5%	77.5%

6.2 Differences in RURs Across Groupers

The last question addressed in this report assesses how scores produced by the two groupers compare. We assess this by comparing scores between the two groupers under the two attribution rules, and by showing differences for all internal medicine providers and for the combined group of providers with specialties in internal medicine (IM), family practice (FP), or general practice (GP). Section 6.2.1 shows the difference in scores under the PBmax rule for internal medicine providers alone and for all three specialties combined, and Section 6.2.2 shows the difference in scores under the EMmax rule. All comparisons in Section 6.2 are made for scores based on episodes attributed under the *10-10-Yes* cell size rule.

6.2.1 Comparisons Across Groupers under the PBmax Attribution Rule

Tables 6.23 and 6.24 present the distribution and statistics for differences in overall scores for internal medicine providers for PBmax-attributed episodes across both groupers using the *10-10-Yes* cell-size rule. Of total of 261 providers who receive scores from at least one grouper, 235 are commonly scored by both groupers. The differences at various percentiles presented in Table 6.23 suggest that neither grouper produces systematically larger scores for a provider, but it is clear that a provider can expect to receive different scores between the two groupers. Table 6.24 shows that the average difference in scores is 0.33 points, with a standard deviation of 0.52. For a quarter of providers, the difference is less than 0.08 points, but for one-fifth the difference is greater than 0.4 points ranging up to 3.88.

Table 6.23: Distribution of Differences in (Symmetry Score) – (Medstat Score) for all Internal Medicine Providers, PBmax

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
26	235	-3.15	-0.73	-0.37	-0.16	0.04	0.20	0.45	0.74	1.48

Table 6.24: Summary Statistics for Absolute-Value Differences between Symmetry and Medstat Scores for all Internal Medicine Providers, PBmax

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
26	235	0.33	0.52	0.00	3.88	0.08	0.17	0.40	0.73	1.16

Tables 6.24 and 6.25 present the distribution and statistics when considering differences in scores for the 504 internal medicine (IM), family practice (FP) and general practice (GP) providers ranked by both groupers. We see marginally higher differences among scores, with a mean difference of 0.37 points, and differences ranging from 0 to 3.88. For a quarter of these providers, the difference is less than a tenth of a point; however for one-fifth of providers, changing groupers produces changes in scores ranging from nearly a half a point up to nearly 4 points.

Table 6.25: Distribution of Differences in (Symmetry Score) – (Medstat Score) for all IM, FP and GP Providers, PBmax

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
97	504	-3.05	-0.81	-0.47	-0.18	0.05	0.24	0.52	0.80	1.53

Table 6.26: Summary Statistics for Absolute-Value Differences between Symmetry and Medstat Scores for all IP, FP and GP Providers, PBmax

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
97	504	0.37	0.54	0.00	3.88	0.09	0.20	0.47	0.81	1.34

Table 6.27 presents a cross tabulation of internal medicine provider scores from the two groupers using the PBmax attribution and *10-10-Yes* cell size rules. If the groupers are producing similar scores, then the scores should all fall on the diagonal. Scores on the middle

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diagonal are those with differences ranging from 0 to 0.3 points, and scores in the lower or upper diagonal have differences ranging from 0.0 to 0.6. The table shows that just under 80 percent of providers fall within these three diagonals. However, it also shows that there are a number of providers who are ranked as using lower than average resources by one grouper and higher than average resources by the other grouper. In the far upper right-hand corner, we see that one provider is ranked as having among the lowest average resource use for Symmetry episodes, with a score between 0 and 0.3, yet is ranked as among the highest in resource use for Medstat, with a Medstat score of greater than 2. In fact, scores for nearly 7 percent of providers change from showing below average resource use to above average resource when switching from the Symmetry grouper to Medstat. Another 4 percent change from showing above average resource use to below average when switching from Symmetry to Medstat.

An examination of the scores produced for the 508 IM, FP, and GP providers in Table 6.28 shows that less than three quarters of providers fall on one of the three diagonals showing differences ranging from 0 to 0.6 points. Of providers ranked as "average" efficiency using Symmetry episodes, 43 percent of this group is rated as below average and nearly 29 percent is rated as above average when Medstat episodes are used. Additionally, scores for 6 percent of providers change from showing below average resource use to above average when moving from the Symmetry to Medstat grouper, and another 11 percent change from showing above average to below average resource use when switching from Symmetry to Medstat episodes.

Table 6.27: Cross Tabulation of Symmetry Score by Medstat Score for Internal Medicine Providers, PBmax

Range of Scores		Medstat Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Symmetry Score	0 - 0.3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	1	
	0.3 - 0.6	0.4%	3.8%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	8.1%	19	
	0.6 - 0.9	0.0%	6.4%	19.6%	5.5%	2.1%	0.9%	0.4%	0.4%	35.3%	83	
	0.9 - 1.1	0.0%	0.9%	8.9%	8.1%	4.7%	1.7%	0.4%	0.0%	24.7%	58	
	1.1 - 1.4	0.0%	0.9%	4.3%	4.7%	4.3%	2.1%	0.4%	0.9%	17.4%	41	
	1.4 - 1.7	0.0%	0.0%	0.4%	0.9%	2.1%	1.3%	0.9%	0.4%	6.0%	14	
	1.7 - 2.0	0.0%	0.4%	1.3%	0.0%	0.9%	0.0%	0.4%	1.3%	4.3%	10	
	2.0+	0.0%	0.0%	0.9%	0.0%	0.4%	0.9%	0.4%	1.3%	3.8%	9	
Totals	%	0.4%	12.3%	38.7%	19.6%	14.5%	6.8%	3.0%	4.7%	100.0%	--	
	#	1	29	91	46	34	16	7	11	--	235	17.9%
	Diag.										23.0%	38.7%

Table 6.28: Cross Tabulation of Symmetry Score by Medstat Score for IP, FM, and GP Providers, PBmax

Range of Scores		Medstat Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Symmetry Score	0 - 0.3	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.4%	2	
	0.3 - 0.6	0.2%	2.6%	4.0%	0.8%	0.2%	0.2%	0.2%	0.0%	8.1%	41	
	0.6 - 0.9	0.2%	5.4%	17.7%	6.3%	3.4%	1.0%	0.4%	0.4%	34.7%	175	
	0.9 - 1.1	0.2%	1.0%	8.7%	6.5%	4.2%	1.4%	0.4%	0.6%	23.0%	116	
	1.1 - 1.4	0.0%	1.0%	5.2%	5.0%	3.8%	2.4%	1.0%	1.0%	19.2%	97	
	1.4 - 1.7	0.0%	0.0%	1.8%	0.6%	2.4%	0.8%	0.4%	0.6%	6.5%	33	
	1.7 - 2.0	0.0%	0.4%	1.0%	0.0%	0.8%	0.2%	0.6%	0.8%	3.8%	19	
	2.0+	0.0%	0.2%	1.2%	0.2%	0.2%	0.8%	0.4%	1.2%	4.2%	21	
Totals	%	0.6%	10.7%	39.5%	19.4%	14.9%	6.7%	3.4%	4.8%	100.0%	--	
	#	3	54	199	98	75	34	17	24	--	504	18.3%
	Diag.										22.2%	33.1%

6.2.2 Comparison Across Groupers under the EMmax Attribution Rule

Tables 6.29 and 6.30 show the distribution summary statistics for differences in scores between groupers for just internal medicine providers, and Tables 6.31 and 6.32 present the same statistics for the combined group of IM, FP and GP providers under the EMmax rule. Table 6.30 shows that at 0.33 points, the mean difference for internal medicine providers is similar to the differences produced under the EMmax rule; however, we do find one provider whose scores across the two groupers differs by nearly 7 points when the EMmax attribution rule is used.

Table 6.29: Distribution of Differences in (Symmetry Score) – (Medstat Score) for all Internal Medicine Providers, EMmax

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
30	224	-2.97	-0.69	-0.44	-0.13	0.04	0.27	0.48	0.68	1.15

Table 6.30: Summary Statistics for Absolute-Value Differences between Symmetry and Medstat Scores for all Internal Medicine Providers, EMmax

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
30	224	0.33	0.58	0.00	6.91	0.07	0.19	0.46	0.68	0.80

The mean difference in scores for all IM, GP, and FP providers is slightly higher than the difference for only IM providers, at 0.36 points. Yet, the distribution of differences for all three specialties combined is nearly identical to the distribution for only internal medicine providers. At the 25th percentile, changing groupers produces up to a 0.1 point change, and at the 80th percentile, scores change by nearly a half point up to the maximum difference at nearly 7 points.

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Table 6.31: Distribution of Differences (Symmetry Score) – (Medstat Score) for all IM, FP and GP Providers, EMmax

# Providers		Percentiles of Difference in Provider Scores								
Not Scored by Both	Commonly Scored	1st	5th	10th	25th	50th	75th	90th	95th	99th
99	476	-2.07	-0.75	-0.49	-0.17	0.03	0.28	0.51	0.77	1.37

Table 6.32: Summary Statistics for Absolute-Value Differences between Symmetry and Medstat Scores for all IP, FP and GP Providers, EMmax

# Providers		Summary Statistics				Percentiles of Absolute Value of Difference in Provider Scores				
Not Scored by Both	Commonly Scored	Mean	Std Dev	Min	Max	25th	50th	80th	90th	95th
99	476	0.36	0.53	0.00	6.91	0.10	0.21	0.49	0.75	1.07

The cross tabulation of scores between the two groupers for internal medicine providers only and the combined group of IM, FP and GP providers under the EMmax attribution rule are shown in Tables 6.33 and 6.34. Both tables show that less than 40 percent of providers receive scores within 0.3 points of each other. When considering all three specialties, of the 24 percent of providers ranked as "average" efficiency using Symmetry episodes, changing to Medstat episodes leads to 43 percent of these providers receiving below average scores and another 30 percent receiving above average scores. Scores for 6.6 percent of providers change from showing below average resource use to above average resource use when switching from the Symmetry grouper to Medstat. Another 9.2 percent of providers change from showing above average resource use to below average when switching from Symmetry to Medstat.

Table 6.33: Cross Tabulation of Symmetry Score by Medstat Score for Internal Medicine Providers, EMmax

Range of Scores		Medstat Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Symmetry Score	0 - 0.3	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	2	
	0.3 - 0.6	0.4%	4.9%	2.7%	1.8%	0.0%	0.0%	0.0%	0.0%	9.8%	22	
	0.6 - 0.9	0.0%	9.4%	21.0%	5.8%	3.1%	0.0%	0.4%	0.4%	40.2%	90	
	0.9 - 1.1	0.0%	3.1%	7.6%	6.3%	4.5%	1.3%	0.9%	0.0%	23.7%	53	
	1.1 - 1.4	0.0%	0.9%	5.4%	2.2%	2.7%	0.9%	0.9%	0.4%	13.4%	30	
	1.4 - 1.7	0.0%	0.9%	1.3%	0.4%	1.8%	0.0%	0.0%	0.9%	5.4%	12	
	1.7 - 2.0	0.0%	0.4%	0.4%	0.4%	0.4%	0.4%	0.0%	0.4%	2.7%	6	
	2.0+	0.0%	0.0%	0.0%	0.9%	0.0%	0.9%	0.4%	1.8%	4.0%	9	
Totals	%	0.9%	20.1%	38.4%	17.9%	12.5%	3.6%	2.7%	4.0%	100.0%	--	
	#	2	45	86	40	28	8	6	9	--	224	14.7%
	Diag.										22.3%	37.1%

Table 6.34: Cross Tabulation of Symmetry Score by Medstat Score for IP, FM, and GP Providers, EMmax

Range of Scores		Medstat Score								Totals		
		0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.1	1.1 - 1.4	1.4 - 1.7	1.7 - 2.0	2.0+	%	#	Diag.
Symmetry Score	0 - 0.3	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	2	
	0.3 - 0.6	0.2%	4.4%	2.9%	1.1%	0.2%	0.2%	0.0%	0.0%	9.0%	43	
	0.6 - 0.9	0.2%	8.0%	17.6%	5.7%	5.0%	0.6%	0.4%	0.2%	37.8%	180	
	0.9 - 1.1	0.0%	2.5%	7.8%	6.7%	4.4%	1.1%	1.1%	0.6%	24.2%	115	
	1.1 - 1.4	0.0%	0.8%	4.6%	3.4%	3.8%	1.3%	0.6%	1.3%	15.8%	75	
	1.4 - 1.7	0.0%	0.4%	1.7%	0.4%	1.5%	0.2%	0.2%	0.8%	5.3%	25	
	1.7 - 2.0	0.0%	0.2%	1.1%	0.2%	0.6%	0.8%	0.0%	0.2%	3.2%	15	
	2.0+	0.0%	0.0%	0.4%	0.8%	0.8%	0.6%	0.4%	1.3%	4.4%	21	
Totals	%	0.6%	16.6%	36.1%	18.3%	16.4%	4.8%	2.7%	4.4%	100.0%	--	
	#	3	79	172	87	78	23	13	21	--	476	14.9%
	Diag.										22.1%	34.2%

6.3 Summary of Findings

This section examines consequences of altering attribution rules, cell size rules and weighting schemes on overall RUR scores within groupers, as well as comparing scores across groupers under common assignment regimes. For the within-grouper comparisons, we illustrate findings considering providers classified in the specialty of internal medicine. For the across-grouper comparisons, we consider internal medicine providers alone, as well as a pooled population of providers categorized in any of the three following specialties: internal medicine, family practice, and general practice. The principal findings include the following:

- Switching between the PBmax and EMmax attribution rules can lead to substantial differences in RUR scores for a significant number of providers:

    - For Symmetry episodes, only about 25 percent of providers experience a change in their RUR score below 0.05 points, or 5 percent of the base value of 1. One-fifth see greater than a 0.25 point change in their scores, with the largest change as high as 2.0 points.

    - Defining "average" efficiency by scores falling between 0.9 and 1.1 points, 25 percent of providers rank as average for PBmax-attributed Symmetry episodes, but switching to the EMmax rule leads to 40 percent of this group to change to below average and another 10 percent to change to above average.

    - Switching from the PBmax to the EMmax-attributed Symmetry episodes causes 3.5 percent of providers to move from below average to above average efficiency scores. Another 3.5 percent change from below average to above average.

    - For Medstat episodes, only about 25 percent of providers experience a change in their RUR score below 0.06 points; 20 percent see greater than a 0.38 point change in their scores, with the largest change being as high as 4.17 points.

    - Defining "average" efficiency by scores falling between 0.9 and 1.1 points, 18 percent of providers rank as average for PBmax-attributed Medstat episodes, but switching to the EMmax rule leads to 45 percent of this group to change to below average and to another 20 percent to change to above average.

    - Switching from the PBmax to EMmax-attributed Medstat episodes leads to over 6 percent of providers to change from above average to below average scores, and another 3 percent to change from below average to above average when moving from the PBmax to EMmax rule.

- Increasing the number of episodes for a health care professional to be evaluated can induce relatively large shifts in RUR scores for some providers. In particular, raising cell sizes from *10-10-Yes* to *30-10-Yes* using PBmax-attributed episodes yields the following results:

o   For Symmetry episodes, whereas 25 percent of providers experience a change in their RUR score below 0.06 points with an increase in episode cell sizes, 20 percent see greater than a 0.31 point change in their scores, with the largest change being as high as 1.14 points.

o   Using Symmetry episodes, for the 25 percent of providers ranked as "average" efficiency based on a small cell-size criterion, increasing the number of required episodes to 30 leads to 27 percent of this group becoming rated as below average and slightly more than 35 percent becoming rated as above average.

o   Over 3 percent of the providers with PBmax-attributed Symmetry episodes change from being ranked above average to below average scores when the episode cell-size requirement increases from 10 to 30. Another 10 percent of providers change from below to above average when a 30-episode minimum is imposed.

o   For Medstat episodes, 25 percent of providers experience a change in their RUR score below 0.06 points; 20 percent see greater than a 0.28 point change in their scores, with the largest change as high as 1.95 points.

o   Using Medstat episodes, for the 21 percent of providers ranked as "average" efficiency based on a small cell-size criterion, increasing from a 10 to 30-episode minimum causes 17 percent of this group to become rated as below average and slightly 40 percent to become ranked as above average.

o   Nearly 3 percent of the providers with PBmax-attributed Medstat episodes change from being ranked above average to below average scores when the episode cell-size requirement increases from 10 to 30. Concurrently, over 5 percent shift from below to above average.

o   A factor influencing changes in provider's RUR scores comes about from shifts in the mix of episode types used to evaluate the provider, along with the changes in weights used to aggregate across episode types.

- We find mostly minor differences in the overall scores assigned to providers considering two approaches for aggregating RURs across individual episode types. These weighting schemes, though, differentially encourage efficient providers to increase their caseloads to improve their scores.

- A provider's assessed overall efficiency can vary substantially depending on whether one relies on the MEG or ETG grouper to formulate episodes of care. In considering the combined pool of providers in any of the three specialties, we find:

o   Using PBmax-attributed episodes, 25 percent of providers experience a change in their RUR score below 0.09 points. One-fifth see greater than a 0.47 point change in their scores, with the largest change as high as 3.88 points.

o   Of the 23 percent of providers ranked as "average" efficiency using PBmax-attributed Symmetry episodes, 43 percent of this group become rated as below average and another 29 percent become rated as bove average when Medstat episodes are used.

o   Scores for 6 percent of providers change from indicating below average to above average resource use when switching from the Symmetry grouper to Medstat under PBmax. Another 11 percent of providers change from showing above average resource use to below average when switching from Symmetry to Medstat.

o   Using EMmax-attributed episodes, 25 percent of providers experience a change in their RUR score below 0.10 points. One-fifth see greater than a 0.49 point change in their scores, with the largest change as high as 6.91 points.

o   Of the 24 percent of providers ranked as "average" efficiency using EMmax-attributed Symmetry episodes, 43 percent of this group receive below average scores and another 30 percent receive above average scores when Medstat episodes are used.

o   Scores for 6.6 percent of providers change from indicating below average to above average resource use when switching from the Symmetry grouper to Medstat under EMmax. Another 9.2 percent of providers change from showing above average resource use to below average when switching from Symmetry to Medstat.

o   Overall, we see similar patterns when considering internal medicine providers alone, but the differences are marginally smaller compared to that of the combined pool.

REFERENCES

MaCurdy, Thomas, Jason Kerwin, Jonathan Gibbs, Eugene Lin, Carolyn Cotterman, Margaret O'Brien-Strain and Nick Theobald. 2008. "Evaluating the Functionality of the Symmetry ETG and Medstat MEG Software in Forming Episodes of Care Using Medicare Data." Burlingame, CA: Acumen, LLC.

APPENDIX A   SPECIFICATION OF REGRESSIONS USED TO COMPUTE ADJUSTED EPISODE COSTS

The physician scores discussed in Section 5 are calculated in three steps. First, the cost of each episode is adjusted using a regression approach to account for risk factors including beneficiary age and gender. Second, each provider's average cost per episode of a given type is compared to the average for all providers in the cell that have the provider's specialty. Finally, each provider's individual episode type scores are aggregated into an overall score. This appendix presents the method used to run the regressions to adjust episode costs in the first step of the scoring process. Section A.1 describes the methodology for running the regressions. Sections A.2 and A.3 explain the specifications for the regressions for Symmetry and Medstat

A.1   Regression Methodology

A formal representation of the regression specification used to impute "adjusted" episode costs takes the following form in vector notation:

(A.1) $$\omega_{ik} = \mu\delta_k + \beta X_{ik} + \theta Z_{ik} + \varepsilon_{ik}$$

where

$\omega_{ik} = \ln(Y_{ik})$

Y_{ik} = cost of the i-th episode for the kth provider

δ_k = vector of dummy variables identifying provider k's specialty associated with the $(i,k)^{th}$ episode

X_{ik} = vector of demographic controls associated with the $(i,k)^{th}$ episode

Z_{ik} = vector of severity and health risk factors associated with the $(i,k)^{th}$ episode

ε_{ik} = error term for the $(i,k)^{th}$ episode

μ = regression coefficients measuring cost differentials for the different provider specialties

β = regression coefficients measuring the influence of the controls X

θ = regression coefficients measuring the influence of the controls Z

This regression is run for a common type of episode, so only the providers vary in their specialties and the factors X and Z differ across the observations within this episode type. Observations for this regression consist of all episodes of the type under consideration attributed to a designated set of providers.

Expressed in levels, the average cost for provider k for this episode type adjusted for the effects of the controls X and Z can be written as:

$$(A.2) \quad P_m = \frac{1}{n_k} \sum_{k=1}^{n_k} \exp\{\omega_{ik} - \hat{\beta} X_{ik} - \hat{\theta} Z_{ik}\} = \frac{1}{n_k} \sum_{k=1}^{n_k} Y_{ik} \exp\{-\hat{\beta} X_{ik} - \hat{\theta} Z_{ik}\}$$

where n_k denotes the number of episodes for the kth provider. Similarly, the average cost for all providers in specialty B scored for this episode type adjusted for the effects of the controls X and Z can be written as:

$$(A.3) \quad R_m = \frac{1}{N_B} \sum_{k \in B} \sum_{i=1}^{n_k} \exp\{\omega_{ik} - \hat{\beta} X_{ik} - \hat{\theta} Z_{ik}\} = \frac{1}{N_B} \sum_{k \in B} \sum_{k=1}^{n_k} Y_{ik} \exp\{-\hat{\beta} X_{ik} - \hat{\theta} Z_{ik}\}$$

where this summation is done over all episodes treated by providers in the same specialty B (i.e., $k \in B$), with $N_B = \sum_{k \in B} n_k$ denotes the summation done over all episodes treated of this type by providers in the same specialty. Letting the notation $\delta_k = B$ identify those providers in specialty k, the value of P_m in (A.2) estimates E $[Y_{ik} \mid k, \delta_k = B, X = 0, Z = 0]$ and the value of R_m in (A.3) estimates E $[Y_{ik} \mid \delta_k = B, X = 0, Z = 0]$ assuming the errors ε in (A.1) are distributed independently of both X and Z conditional $\delta_k = B$; the conditional distribution of the ε_{ik}'s can be dependent on specialty and still have these estimation relations hold. Thus, P_m estimates the average episode cost of provider k adjusting for the impacts of X and Z on costs, and R_m estimates the average episode cost of all providers in the same specialty as provider k. Equation (A.2) motivates relation (5.6) in Section 5, and Equation (A.3) motivates relation (5.7).

A.2 Regression Specification for Symmetry

This section specifies the sample and explanatory variables used to adjust costs for Symmetry episodes.

A.2.1 Sample Used for Symmetry Regressions

The regressions are estimated separately for each ETG. For an episode to be included in this sample, it must:

- Qualify under the *10-10-Yes* rule using PBmax attribution for that ETG (irrespective of specialty).
- Be associated with a beneficiary with non-missing gender and date of birth variable.
- Have a cost greater than zero.

We run one regression per ETG using observations making up this *10-10-Yes* PBmax sample.

A.2.2 Covariates Included in Symmetry Regressions

The Symmetry grouper does not produce measures of severity for individual within the ETG categories used in this study, so we exclude Z from (A.1) when running the regression for

ETG episodes. Following the recommendation of Symmetry, ETGs are defined as the combination of Base ETG and severity level, so there is no difference in levels within an ETG.

For elements of X, we include the set of age-gender variables making up the demographic risk factors incorporate in CMS's HCC risk adjustment models. The HCC age-gender categories are: Male Age 0-34, Male Age 35-44, Male Age 45-54, Male Age 55-59, Male Age 60-64, Male Age 65-69, Male Age 70-74, Male Age 75-79, Male Age 80-84, Male Age 85-89, Male Age 90-94, Male Age 95+, Female Age 0-34, Female Age 35-44, Female Age 45-54, Female Age 55-59, Female Age 60-64, Female Age 65-69, Female Age 70-74, Female Age 75-79, Female Age 80-84, Female Age 85-89, and Female Age 90-94, Female Age 95+. We exclude the Female 65-69 age-gender dummy from the regression as a conventional normalization—if Female Age 65-69 is missing, then we drop the most common age-gender category that does appear.

A.3   Regression Specification for Medstat

This section specifies the sample and explanatory variables used to adjust costs for Medstat episodes.

A.3.1 Sample Used for Medstat Regressions

The regressions are estimated separately for each MEG. For an episode to be included in this sample, it must:

- Qualify under the *10-10-Yes*, PBmax attribution rule for that MEG (irrespective of specialty).
- Be associated with a beneficiary with non-missing gender and date of birth variable.
- Have a valid disease stage assignment (one of Medstat's defined values).
- Have a cost greater than zero.

We run one regression per MEG using observations making up this *10-10-Yes*, PBmax sample.

A.3.2 Covariates Included in Medstat Regressions

The Medstat grouper stratifies episodes by "disease stages", and we include the dummy variables indicating the main disease stage (identified by first digit of the disease stage) as elements of Z in (A.1) when running the regression for MEG episodes. As a conventional normalization, we exclude the lowest disease stage assignment found in within each sample of episodes in a given MEG.

For elements of X, we include the set of age-gender variables making up the demographic risk factors incorporate in CMS's HCC risk adjustment models. The HCC age-gender categories are: Male Age 0-34, Male Age 35-44, Male Age 45-54, Male Age 55-59, Male

Age 60-64, Male Age 65-69, Male Age 70-74, Male Age 75-79, Male Age 80-84, Male Age 85-89, Male Age 90-94, Male Age 95+, Female Age 0-34, Female Age 35-44, Female Age 45-54, Female Age 55-59, Female Age 60-64, Female Age 65-69, Female Age 70-74, Female Age 75-79, Female Age 80-84, Female Age 85-89, and Female Age 90-94, Female Age 95+. We exclude the Female 65-69 age-gender dummy from the regression as a conventional normalization—if Female Age 65-69 is missing, then we drop the most common age-gender category that does appear.