

# A practical guide to episode groupers for cost-of-illness analysis in health services research

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## Abstract

Despite the prominence of episode groupers for analysis and reimbursement in US payer settings, peer-reviewed articles using episode groupers for cost-of-illness analysis that informs public health research and decision-making are uncommon. This article provides a brief practical guide to episode-based cost analysis and offers some examples of episode grouper products. It is intended for an audience of health services researchers and managers in public health settings who perform or commission cost-of-illness studies with the US healthcare claims fee-for-service data but lack familiarity with episode groupers.

## Keywords

Episode of care, health services research, costs and cost analysis, health expenditures, value-based purchasing

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Healthcare episode groupers are complex software analytic tools for systematically bundling healthcare services that patients received—as reported in US medical claims data sets—into clinically meaningful “episodes” to compare quality and cost across patients with the same health condition or disease. Privately-developed groupers have long been used for provider comparisons at US health insurance companies.<sup>1,2</sup> Now, various such groupers are the analytic basis for Medicaid provider bundled payments in multiple US states.<sup>3–5</sup> Centers for Medicare & Medicaid Services (CMS) developed its own grouper for hospital-based and follow-up care that determines some provider bundled payments.<sup>6</sup> Health care providers expect that the prevalence of episode-based bundled payments will increase.<sup>7</sup>

Despite the prominence of episode groupers for analysis and reimbursement in US payer settings, peer-reviewed articles using episode groupers for cost-of-illness analysis that informs public health research and decision-making are uncommon. This article provides a brief practical guide to episode-based cost analysis and offers some examples of episode grouper products. It is intended for an audience of health services researchers and managers in public health settings who perform or commission cost-of-illness studies with US healthcare claims fee-for-service data but lack familiarity with the episode groupers. Episode-based analysis and groupers are important topics for this audience for three reasons. First, the same properties that make episodes a

desirable tool to determine appropriate healthcare provider payments make episode-based analysis desirable for some cost-of-illness research questions—episodes are clinically homogeneous disease categories with similarly expected resource consumption.<sup>8</sup> This means episodes can be used to measure variation in per-patient, condition-specific medical services and costs across diverse populations—for example, by provider, geography, or health plan type.<sup>9</sup> Second, health services researchers outside of payer and provider settings might have a unique and valuable role to play in the ongoing assessment of episode grouper products through application in research studies. The majority of episode groupers to date were created by private companies, for whom there is perhaps little incentive to publicly summarize and critique the product landscape. Third, it will become necessary to understand these topics to properly measure and research US

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**Table 1.** Comparison of three cost-of-illness analysis methods.

Method	Encounter-based	Person-based	Episode-based
Description	Sum of all service payments associated with a particular diagnosis or procedure code during a given timeline in one or more clinical settings	Statistically apportioned service payments for a specified timeline in multiple clinical settings based on patient characteristics	Algorithmically apportioned service payments for selected disease-related services within a specified timeline in one or more clinical settings
Example	Diabetes-related inpatient spending is estimated as the sum of payments for hospital-based services with a diabetes primary diagnosis code	Diabetes-related spending is estimated through a regression model of per-patient total spending with a covariate indicating which patients have a diabetes diagnosis	Diabetes-related spending is estimated as the sum of payments for selected services that may or may not have an accompanying diagnosis code, but which clinical experience identifies as attributable
Identification of disease-attributable costs relies on	Accurate diagnosis or procedure coding per service	Difference in spending between people with and without a particular disease or procedure	Clinical experience to identify attributable services and spending

Source: Adapted from other sources.<sup>8,10,11</sup>

healthcare prices as payments increasingly trend toward bundled payments. A somewhat similar transition occurred in the early 1980s when CMS used Diagnosis Related Groups (DRGs) to establish prospective payments for inpatient services for clinically similar classes of patients based on principal diagnoses and procedures. Consequently, researchers studying US hospital payments necessarily used DRGs.

### Context for episode-based cost-of-illness analysis

Health services researchers commonly face the question, “What is the cost of health condition X?” This question is critical for a variety of constituencies—payers, public health agencies, health advocacy, academic researchers, and patients. The way researchers implement cost-of-illness analysis in response to this question depends on the available data and methods to frame cost results for a given constituency. Typically, researchers using US medical claims data employ one of two approaches to estimate the cost of a health condition (see Table 1 for the summary).<sup>8,10,11</sup>

1. Encounter-based analysis: Sum of all service payments associated with a particular diagnosis or procedure code in a given setting and timeline (e.g. assessing diabetes-related spending by analyzing claims for specific encounters with a diabetes diagnosis code).
2. Person-based analysis: Statistically apportioned service payments for a specified timeline based on patient characteristics (e.g. use of a regression model including a diabetes diagnosis covariate to identify diabetes spending within the total per-patient spending among patients with and without a diabetes diagnosis).

Episode-based analysis shares features of both the encounter-based and person-based methods but is far less

common among published cost-of-illness research studies. Broadly, healthcare episodes refer to related healthcare services provided to treat a clinical condition or procedure within a specified time period.<sup>12</sup> For example, an episode might comprise an acute event (e.g. live birth) and selected preceding and follow-up care (e.g. specified prenatal visits, lab tests, emergency department visits, medications, and imaging 280 days before a birth, and delivery and postpartum care up to 60 days after hospital discharge).<sup>5</sup> Similar to the person-based approach, an episode algorithm considers all the treatments and conditions a patient experiences in a given period. However, with a traditional person-based approach (i.e. statistical apportionment of costs by condition based on the comparison of patients with and without those conditions) it is difficult to comprehensively allocate all of a patient’s services and costs to separate condition categories. In contrast, this can be done with both the episode-based and encounter-based approaches. In the context of the two traditional cost of illness methods, an episode-based approach may be considered an elaborate and formal type of encounter-based analysis, in which health conditions have fixed, complex administrative code-based definitions spanning multiple code and service types, specific timelines, and is typically achieved using episode grouper software.

### Episode groupers

An episode grouper is a set of software programming algorithms that systematically define the healthcare services that belong to multiple distinct healthcare episodes. At a very high level, one can think about these algorithms as assigning each of a patient’s medical claims to a particular episode. While all groupers follow this basic idea, the way a particular episode grouper assigns claims to the episodes is unique to that grouper.

Episode-based analysis does not require an episode grouper; researchers can instead pursue study-specific, ad

hoc episode definitions and risk-adjustment approaches, including the option to build episodes from an encounter-based analysis tool such as Clinical Classifications Software (CCS; this free software tool collapses all diagnosis and procedure codes into a smaller number of categories).<sup>13</sup> However, there are three potential advantages of using groupers if an episode-based analysis is desired to address a given research question. First, episode groupers provide an off-the-shelf analysis tool informed by clinical experience that might not be readily accessible to health services researchers. Episode groupers are typically developed by teams with expertise in clinical practice, coding norms, and claims data; in this way, they allow researchers to leverage the expertise of the episode grouper developers. Second, researchers may run into difficulty assigning goods or services to condition categories when there is no associated clinical diagnosis code—for example, prescription drug claims typically do not have associated diagnosis codes. Episode groupers, on the other hand, typically include criteria for assigning drug claims to the episodes. Third, groupers offer opportunities for replicability and comparability across studies that use the same groupers.

A drawback of using groupers is that such products have been criticized for a lack of transparency, a lack of vetting through published research, and logistical difficulty in applying groupers to existing medical claims data sets.<sup>8,14</sup> Owing to the heterogeneity in groupers' methods, direct comparisons have demonstrated substantive differences among ostensibly similar episodes in terms of health service inclusion criteria and estimated episode costs.<sup>15</sup> This is a challenge that all researchers will confront, and should formally acknowledge, if they opt to use an episode grouper for cost-of-illness analysis.

## Selecting an episode grouper

In Table 2, we have assembled some basic characteristics of selected episode groupers so that the researchers may begin to assess the differences among them: 3M Patient-focused Episode (3M PFE) Software,<sup>16</sup> Cave Grouper,<sup>17</sup> CMS-Bundled Payments for Care Initiative (BPCI),<sup>18</sup> McKinsey & Company,<sup>5</sup> OptumInsight Symmetry Treatment Episode Groups (ETG)<sup>19</sup> and Procedure Episode Groups (PEG),<sup>20</sup> Prometheus,<sup>21</sup> and Medical Episode Grouper (MEG).<sup>22</sup>

To conduct a cost-of-illness analysis using an episode grouper, a likely first consideration is which grouper has a relevant episode definition. As of January 2019, CMS-BPCI had the fewest defined episodes ( $n=48$ ), while 3M PFE, OptumInsight Symmetry ETG, Cave Grouper, and MEG (all  $n>500$ ) had the most (Table 2). Among the groupers profiled here, only some appear to have publicly-available, comprehensive episode lists (CMS-BPCI, McKinsey & Company, Prometheus; OptumInsight Symmetry PEG, and ETG lists appear to be available after online registration).

A second consideration might be the grouper's conceptual focus and approach to episode definition. For example, OptumInsight PEG bundles surgical procedures and related services that span multiple clinical visits and identifies a physician responsible for each episode's services and costs. In CMS-BPCI episodes, the inpatient facility is the responsible provider, and episodes include only inpatient and related post-acute care. The McKinsey & Company grouper—assessed for this article through public documentation of Tennessee's bundled payments initiative<sup>5</sup>—assigns episode responsibility to physicians or facilities by episode; for example, the hospital facility is the responsible provider for an inpatient asthma episode and the orthopedic surgeon is the responsible provider for a total joint replacement episode. One focus of the Prometheus grouper is potentially avoidable complications—defined as “events that negatively impact patients and are controllable by providers.”<sup>21</sup>

A more detailed investigation of condition-specific episode definitions within groupers is required to understand the scope of included and excluded procedures; for example, whether an episode definition in a given grouper includes acute events or procedures related to an underlying condition, but excludes ongoing management costs of that condition. The scope of each episode definition affects which patients meet the criteria to be included in an episode-based analysis, and therefore has important implications for risk adjustment among included patients to identify an appropriate average cost per episode. A more “narrow” episode definition (i.e. a greater number and more specific criteria for patient inclusion) implies more homogeneity among the patients. On the other hand, more broadly defined episodes imply more heterogeneity among the patients meeting episode criteria, which increases the need for appropriate risk adjustment. For instance, there may be an older patient with late-stage heart disease and a younger patient with early-stage heart disease that both meet the criteria for a given episode. Previous research has provided important direct comparative information demonstrating how individual beneficiaries' claims are assigned to selected episodes; for example, by number of included claims and total episode cost per beneficiary.<sup>14</sup>

A third consideration in selecting an episode grouper might be whether public documentation of episode definitions and supporting analysis elements (e.g. risk adjustment) are essential for the research study. For example, public documentation of CMS-BPCI, McKinsey & Company, and Prometheus episodes includes complete lists of claims code types and values that comprise each episode. CMS-BPCI does not appear to have a specific associated risk adjustment approach, while other groupers have limited public reporting on associated risk-adjustment approaches (Table 2). A fourth and related potential consideration for selecting an episode grouper is logistical—whether the grouper has publicly-available text-based (e.g. list of administrative codes) or machine-readable (e.g. SAS) episode definitions. A fifth

**Table 2.** Summary of analytic components in selected episode groupers.

Product	Episode example	Sample conceptual focus <sup>a</sup>	Number of episodes	Clinical setting	Public episode definition	Linked risk-adjustment approach
3M Patient-focused Episode Software	Not reported.	<ul style="list-style-type: none"> <li>Event-based episodes per patient</li> <li>Cohort-based episodes among patients with a shared condition or characteristic</li> </ul>	>500	All	No	3M Clinical Risk Groups
Cave Grouper	Urinary tract infection	<ul style="list-style-type: none"> <li>Physician relative efficiency and effectiveness scores</li> <li>High-cost patient prediction</li> </ul>	>500	All	No	CCGroup MediScreen
CMS-BPCI	Urinary tract infection	Inpatient and post-acute care	~50	Inpatient, skilled nursing facility, inpatient rehabilitation facility, long-term care hospital or home health agency	Yes	No
McKinsey & Company	Perinatal	Principal Accountable Provider	>100	All	Yes	Yes <sup>b</sup>
Optum Symmetry Episode Treatment Groups	Pregnancy, with delivery	<ul style="list-style-type: none"> <li>Patient total cost of care by condition categories</li> <li>Provider profiling</li> </ul>	>500	All	Yes	Optum Symmetry Episode Risk Groups
OptumInsight Symmetry Procedure Episode Groups	Radical hysterectomy	<ul style="list-style-type: none"> <li>Medical and surgical procedure cost</li> <li>Provider profiling</li> </ul>	~200	All	No	Optum Symmetry Episode Risk Groups
Prometheus Analytics	Pregnancy	Potentially avoidable complications	~100	All	Yes	Prometheus Analytics risk adjustment
Medical Episode Grouper	Cardiac arrhythmias	<ul style="list-style-type: none"> <li>Population profiling</li> <li>Provider profiling</li> </ul>	>500	All	No	Disease Staging and Diagnostic Cost Groups

Information as of January 2019 in public documentation reviewed for this article, which comprised peer-reviewed articles and Internet searches for vendor product names; sources as cited in the References list. Readers are encouraged to check those and related sources for more details and updated information on the groupers briefly summarized here.

<sup>a</sup>CMS-BPCI Centers for Medicaid and Medicare Services' Bundled Payments for Care Improvement.

<sup>b</sup>As highlighted in public documentation primarily from vendors; this is not an exhaustive list of conceptual orientations among profiled groupers.

<sup>c</sup>Not detailed in public documentation reviewed for this article in cited sources.



potential consideration is a cost; many of the profiled groupers and supporting elements such as risk-adjustment tools are proprietary (pricing was not reported in the public documentation review for this article).

A more detailed comparison among the groupers profiled here would be a substantial undertaking, potentially to include each grouper's code input data (e.g. CPT and ICD), classification methods for co-occurring and contiguous episodes, classification methods for medical complexity and illness severity, use and details of "clean periods" that define an episode's conclusion, and so on.<sup>8</sup> Risk adjustment is a major topic in episode-based cost analysis; a previous study of several commercial claims-based, risk-adjustment tools noted substantial variation among them.<sup>23</sup> This article's reference list can be a starting point for sources of additional information for each profiled grouper so that researchers can access and compare these details with respect to specific research topics.

## Conclusion

This brief review aimed to summarize the potential merits of episode-based cost-of-illness analysis and provide a brief practical guide to some high-level characteristics of selected episode groupers for an audience of health services researchers and managers conducting or commissioning cost-of-illness analyses. This review was not systematic and was based on public information, with a modest aim to address a perceived lack of summary information on episode groupers with respect to common cost-of-illness research methods. This review has not attempted to address outstanding questions about the appropriate analytical and policy applications for episode-based healthcare analysis.<sup>6,24–26</sup> This review summarized but did not attempt to completely explain the differences in some episode groupers that may be applicable to different research settings. Health services researchers and decision makers can use this brief comparative summary to inform themselves on the potential usefulness of episode-based analysis and episode groupers for cost-of-illness analysis with US healthcare claims data.

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