

TENNCARE Bundled Payment Initiative: Description of Bundle Risk Adjustment for Wave 3 Episodes

**Respiratory Infection; Pneumonia; Inpatient Urinary Tract Infection; Outpatient Urinary Tract Infection;
Esophagogastroduodenoscopy (EGD); Gastrointestinal hemorrhage (GIH)**

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The State of Tennessee has implemented a bundle-based approach to reimburse providers for the care delivered to patients enrolled in the State's Medicaid program. Bundled payments cover all of the services provided to a patient for treatment of a specific condition during a defined episode of care, including services related to diagnosing, managing and treating that condition. The actual provision of services to a specific patient for a specific condition is herein called an "episode" while the grouping for payment of episode-related services normally used to treat the condition is called a "bundle." This distinction is useful because the State may choose as a matter of policy to exclude from the bundle some of the services in an episode. For each of these patients and episodes, a provider will be determined to have overall responsibility (the episode "quarterback"). The total cost of care for each quarterback in delivering all bundled services will be measured and compared with targets and thresholds to determine overall performance.

The comparison of bundle costs for a provider is based on the average *risk-adjusted* cost of the provider's episodes with the targets and thresholds established by the State for payment purposes. The health care services required to deliver a bundle of care can vary greatly across patient episodes. Risk adjustment quantifies the part of this variation in cost that can be explained by clinical factors such as disease progression, comorbidities, and other patient attributes that correlate with clinical need, including age and gender. A higher risk score for an episode means a higher expected cost relative to other episodes of the same type due to the clinical or demographic factors. Risk adjusting bundle costs enables more equitable comparisons across providers and with targets and thresholds.

The first phase of this new payment initiative included three bundle types: Asthma, Acute Exacerbation; Perinatal; and Total Joint Replacement. An earlier document, that includes several detailed examples of episode risk adjustment, describes the risk adjustment approach used for these three bundles. This earlier document may provide useful background to those new to bundled payment.

The present document provides details on the approach used by UnitedHealthcare to compute episode risk and to risk-adjust episode costs for six care bundles: Respiratory Infection (RI); Pneumonia (PNA); Inpatient Urinary Tract Infection (UTI-I); Outpatient Urinary Tract Infection (UTI-O); Esophagogastroduodenoscopy (EGD); and Gastrointestinal Hemorrhage (GIH). It describes the general approach used to measure risk across all six bundle types, followed by a description of the specific risk markers used for each type of bundle.

I. Overview: Measuring Episode Risk

Episode risk models are designed to predict the total *expected cost* for an episode of care – those costs that are expected given the clinical characteristics of the patient and the episode. These costs include the payments for all services received by a patient during the course of an episode. Given a measure of the expected cost, or relative risk, for an episode, actual episode costs can be risk-adjusted. Risk-adjusted costs can then be compared across all quarterbacks and combined with targets to determine performance under the program. Example 1 illustrates this concept:

As shown in Example 1, all episodes for the quarterback are assessed to determine their relative risk and the quarterback's average risk-adjusted cost is computed.

A unique *risk model* was developed for each bundle type based on clinical and demographic variables that would influence the potential cost of those specific episodes.

Episode risk models use two key features: episode *risk markers* and episode *risk weights*. *Risk markers* describe those unique clinical characteristics of an episode that were found statistically to affect episode costs. *Risk weights* describe a risk marker's incremental relative contribution to expected episode costs, or risk.

As noted above, a separate risk model was developed for each bundle type. As a result, the risk markers and risk weights included in the models differ by bundle type. This is to be expected, given that different clinical factors will have a different impact on bundle costs, depending upon the type of episode.

Five major steps are used to assign a risk score to a bundle:

1. Identify clinical risk markers using clinical input;
2. Assign demographic risk markers;
3. Apply risk weights to each risk marker;
4. Compute an episode risk score;
5. Adjust final risk weights for *risk score neutrality*

Each of these steps is described below.

Example 1: EGD Episode Risk Adjustment

- A gastroenterologist serves as the quarterback for fifteen (15) EGD episodes during calendar year 2015;
- The total cost for each of those episodes is calculated using costs for all services included in the episode (for example anesthesia, imaging and testing, evaluation and management, medications, etc.);
- The characteristics of the 15 patients and their episodes are used to assign a risk score to each individual episode. This risk score represents the relative expected costs of each episode based on clinical and patient factors such as age, gender, diagnoses, and disease comorbidities.
- Episode risk is expressed as a relative score. A risk score of 1.000 represents the average risk of episodes for a given set of covered lives. An individual EGD episode that, based on its clinical and patient factors, is expected to be 10 percent higher cost than average would be assigned a risk score of 1.100
- The actual total cost for each of the gastroenterologist's episodes is risk-adjusted to compute risk adjusted total cost. Actual cost is divided by episode risk score, so that higher risk episodes will have costs adjusted down while lower risk episodes will have costs adjusted up, allowing episodes with different risk to be fairly compared. For example, an episode with a total cost of \$33,000 and a risk score of 1.100 would have a risk-adjusted total cost of \$30,000.
- The quarterback's overall performance is based on average risk adjusted cost for the 15 episodes. This amount can be compared with that of other providers and with targets to determine performance under the program.

II. Assigning Clinical Risk Markers to an Episode

The following steps are used to assign clinical risk markers to an episode:

- II.1. Identify qualified services that can contribute diagnoses to risk marker identification
- II.2. Identify the set of initial risk markers using clinical criteria
- II.3. Assign clinically appropriate service timing to risk markers
- II.4. Reduce to a minimum necessary set of risk markers per bundle using statistical criteria

II.1 Identify Qualified Services

Only diagnoses from *qualified* service records are considered when identifying risk markers. Qualified services include services such as office visits, consultations, ER visits, surgeries and inpatient stays. Non-qualified services include services such as lab or radiology or services delivered by a DME or ambulance provider. In this way, the methodology does not consider diagnoses from ancillary services or “rule-out” tests. Only services with diagnoses confirmed and assigned by a clinician or facility are used. Qualified services are determined by examining the procedure and revenue codes on an individual service record.

II.2 Identify Initial Risk Markers

Clinical risk markers are based on the diagnoses observed on qualified services. The diagnoses associated with qualified services are grouped into Episode Treatment Groups® (ETGs®). ETGs are then selected for evaluation as a risk marker based on their clinical relevance to the episode and their prevalence in the episodes.¹

II.3 Assign Service Timing

Service timing is also important when setting initial clinical risk markers. Three windows of service timing, based on clinical appropriateness, were specified for all risk markers: (1) risk marker occurred in the 365 days prior to the episode start through 30 days prior to the episode start (*Comorbidity risk marker, prior window*); (2) risk marker occurred in the 30 days prior to the episode start through end of the episode (*Episode risk marker window*); (3) risk marker occurred in the 365 days prior to the episode start through the episode end (*Comorbidity risk marker, full window*).

- *Episode risk marker window* – used to identify risk markers that occurred in the context of the episode itself. The episode risk marker window begins 30 days prior to episode start and extends through the end of the episode.
- *Comorbidity risk marker, full window* – used to identify risk markers for other conditions not directly related to the episode that increase the complexity and risk associated with its delivery. This window includes a longer period of time – 365 days prior to the episode start through the episode end.
- *Comorbidity risk marker, prior window* – used to identify risk markers for other conditions not directly related to the episode that increase the complexity and risk associated with its delivery. This window covers the 365 days prior to the episode start through 30 days prior to the episode start. This approach allows for recognition of patient comorbidities that might be considered complications of the episode itself, if first observed during the episode risk marker

¹ The methodology described here uses the clinical constructs of Episode Treatment Groups® (ETGs®) to categorize diagnosis codes into clinically meaningful groups. The clinical constructs within the ETG methodology are defined in terms of both ICD-9-CM and ICD-10-CM/PCS, which means that the risk models described here do not depend upon the underlying coding system used to populate claims.

window. For example, for Pneumonia (PNA) episodes, the “Pulmonology diseases signs & symptoms” comorbidity risk marker is triggered only by diagnoses observed for the patient during the 365 days prior to the episode start through 30 days prior to the episode start.

Following this step, all initial clinical risk markers have been assigned to the episode.

II.4 Reduce to the Minimum Necessary Set of Risk Markers per Bundle

After the initial clinical review, the selected set of clinical risk markers were statistically analyzed to determine their impact on costs for the episode being evaluated. Risk factors for inclusion in the final model were determined based on their clinical relevance to the episode and their impact on costs.

III. Assigning Demographic Risk Markers to a Bundle

Demographic characteristics of patients can also affect risk, either because age and gender can affect coverage decisions or because they serve as proxies for unmeasured clinical attributes. For this reason, the statistical evaluation of potential risk markers also evaluates the extent to which the models should distinguish among patients based on age and gender. Four of the six bundle types include two or more demographic risk markers in the final risk model – based on an individual’s age and gender at the time of the trigger event. Age and gender did not have a statistically meaningful effect on the costs of Respiratory Infection (RI) or Gastrointestinal Hemorrhage (GIH) bundles, which means that all individuals are assigned the same base risk weight that corresponds to an uncomplicated episode.

IV. Apply Risk Weights to each Marker

Each risk marker is assigned a *risk weight*. This risk weight describes a marker’s incremental contribution to bundle risk for that bundle type. Model risk weights were estimated using historical data describing a large number of bundles. The risk weights for each risk model, by episode type are described below, in tables 1-6. For each episode all of the demographic and clinical risk markers are captured along with the corresponding *risk weights*. All identified *risk weight* values are then added together to achieve the preliminary risk score for that individual episode.

V. Preliminary Risk Score. A risk scoring formula was applied following the identification of risk markers and the assignment of risk weights. These formulas are used to compute a risk score for each episode.

VI. Adjust Preliminary Risk for Risk Score Neutrality. The preliminary risk score for an episode was then multiplied by an episode specific risk neutrality factor. This factor was based on the adjustment needed to insure that the average risk score for each episode was equal to 1.00 for UnitedHealthcare. Risk neutrality factors are calculated at the beginning of each performance period. These values are held constant through the performance period to ensure that providers are measured against constant risk-adjusted thresholds. The final risk score after this adjustment was then used to risk adjust the cost of the individual episode.

Tables 1 – 6 below show the risk weights for Respiratory Infection (RI), Pneumonia (PNA), Inpatient Urinary Tract Infection (UTI-I), Outpatient Urinary Tract Infection (UTI-O) Esophagogastroduodenoscopy (EGD) and Gastrointestinal hemorrhage (GIH). The risk weights shown in these Tables were used to risk-adjust the cost of the individual episodes. The risk score for each episode is the sum of the risk weights for all risk markers observed.

**Table 1
RI Bundle Risk Markers and Weights**

Risk Marker	Risk Weight
All Male and Female, all ages	0.85638
Diabetes (Comorbidity risk marker, full window)	0.12349
Chronic sinusitis (Comorbidity risk marker, full window)	0.11146
Other infectious diseases of intestines & abdomen (Comorbidity risk marker, full window)	0.05493
Infectious diseases signs & symptoms (Comorbidity risk marker, prior window)	0.05383
Acute sinusitis (Comorbidity risk marker, prior window)	0.02440
Other disorders of ear/nose/throat (Comorbidity risk marker, prior window)	0.04691
Otolaryngology diseases signs & symptoms (Comorbidity risk marker, prior window)	0.03369
Viral Pneumonia (Comorbidity risk marker, prior window)	0.06243
Asthma (Comorbidity risk marker, prior window)	0.07481
Cardiovascular diseases signs & symptoms (Episode risk marker window)	0.23839
Otitis media (Episode risk marker window)	0.28529
Acute Sinusitis (Episode risk marker window)	0.10906
Other infections of ear/nose/throat (Episode risk marker window)	0.27565
Other disorders of ear/nose/throat (Episode risk marker window)	0.09602
Acute bronchitis (Episode risk marker window)	0.30841
Asthma (Episode risk marker window)	0.50569
Chronic obstructive pulmonary disease (Episode risk marker window)	0.29272
Inflammation of esophagus (Episode risk marker window)	0.09272
Gastritis &/or duodenitis (Episode risk marker window)	0.14248
Gastroenterology diseases signs & symptoms (Episode risk marker window)	0.17566

**Table 2
PNA Bundle Risk Markers and Weights**

Risk Marker	Risk Weight
Female 22 to 54	0.98617
Female 55 to 64	1.25409
Male 22 to 54	0.99347
Male 55 to 64	1.46507
All Male and Female, 01 to 21	0.64238
Hypertension (Comorbidity risk marker, full window)	0.29803
Chronic obstructive pulmonary disease (Comorbidity risk marker, prior window)	0.54798
Pulmonology diseases signs & symptoms (Comorbidity risk marker, prior window)	0.19752
Septicemia (Episode risk marker window)	2.07314
Dehydration (Episode risk marker window)	1.20337
Congestive heart failure (Episode risk marker window)	0.71326
Cardiovascular diseases signs & symptoms (Episode risk marker window)	0.41660
Asthma (Episode risk marker window)	0.49805
Acute renal failure (Episode risk marker window)	1.66482

Table 3
UTI-I Bundle Risk Markers and Weights

Risk Marker	Risk Weight
Females, all ages	0.65938
Males, all ages	0.76315
Infectious diseases signs & symptoms (Comorbidity risk marker, prior window)	0.23782
Dehydration (Comorbidity risk marker, prior window)	0.20608
Acute renal failure (Comorbidity risk marker, prior window)	0.10785
Infection of upper genitourinary system (Comorbidity risk marker, prior window)	0.10243
Septicemia (Episode risk marker window)	0.67222
Other infectious diseases (Episode risk marker window)	0.20540
Bacterial lung infections (Episode risk marker window)	0.29136
Pulmonology diseases signs & symptoms (Episode risk marker window)	0.17104
Acute renal failure (Episode risk marker window)	0.18818
Inflammation of genitourinary system, except kidney stones (Episode risk marker window)	0.30655
Urinary incontinence (Episode risk marker window)	0.28181

**Table 4
UTI-O Bundle Risk Markers and Weights**

Risk Marker	Risk Weight
Female 1 to 5	1.03292
Female 6 to 54	0.74238
Female 55 to 64	0.84831
Male 1 to 34	0.78912
Male 35 to 54	1.09678
Male 55 to 64	0.95285
Inflammation of genitourinary system, except kidney stones (Comorbidity risk marker, prior window)	0.23034
Dehydration (Episode risk marker window)	0.26467
Gastroenterology diseases signs & symptoms (Episode risk marker window)	0.50777
Acute renal failure (Episode risk marker window)	0.24698
Infection of upper genitourinary system (Episode risk marker window)	0.46056
Kidney Stones (Episode risk marker window)	0.83658
Infection of ovary and/or fallopian tubes (Episode risk marker window)	0.22222
Gynecological signs & symptoms (Episode risk marker window)	0.26997

**Table 5
EGD Bundle Risk Markers and Weights**

Risk Marker	Risk Weight
Female 1 to 21	1.14715
Female 22 to 64	0.89266
All Male	0.99257
Chronic renal failure (Comorbidity risk marker, full window)	0.03134
Dehydration (Episode risk marker window)	0.19850
Other metabolic disorders (Episode risk marker window)	0.10363
Tonsillitis, adenoiditis or pharyngitis (Episode risk marker window)	0.09392
Pulmonology diseases signs & symptoms (Episode risk marker window)	0.10068
Gastritis &/or duodenitis (Episode risk marker window)	0.03974
Irritable bowel syndrome (Episode risk marker window)	0.03855
Hepatology diseases signs & symptoms (Episode risk marker window)	0.04666
Infection of lower genitourinary system, not sexually transmitted (Episode risk marker window)	0.07044
Pancreatitis (Episode risk marker window)	0.13551

Table 6
GIH Bundle Risk Markers and Weights

Risk Marker	Risk Weight
All Male and Female, all ages	0.19298
Other hematologic diseases (Comorbidity risk marker, prior window)	0.31872
Nutritional deficiency (Episode risk marker window)	1.83638
Dehydration (Episode risk marker window)	0.41028
Other metabolic disorders (Episode risk marker window)	0.84860
Endocrine disease signs & symptoms (Episode risk marker window)	1.29228
Alcohol dependence (Episode risk marker window)	0.56580
Cardiovascular diseases signs & symptoms (Episode risk marker window)	0.56453
Ulcer (Episode risk marker window)	0.55945
Non-malignant neoplasm of intestines & abdomen (Episode risk marker window)	1.22471
Other diseases of hepatobiliary system (Episode risk marker window)	0.63481
Acute renal failure (Episode risk marker window)	1.15134