

TENNCARE Bundled Payment Initiative: Description of Bundle Risk Adjustment for Wave 8 Episodes

Acute Seizure, Syncope, Acute Gastroenteritis, Pediatric Pneumonia, Bronchiolitis, Colposcopy,
Hysterectomy, Gastrointestinal (GI) Obstruction, Appendectomy, Hernia Repair

Amerigroup, May 1, 2018

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 Amerigroup to compute episode risk and to risk-adjust episode costs for ten care bundles: Acute Seizure, Syncope, Acute Gastroenteritis, Pediatric Pneumonia, Bronchiolitis, Colposcopy, Hysterectomy, Gastrointestinal (GI) Obstruction, Appendectomy, and Hernia Repair. It describes the general approach used to measure risk across all ten 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 preliminary risk scores for *risk score neutrality*

Each of these steps is described below.

Example 1: Hernia Repair Episode Risk Adjustment

- A surgeon serves as the quarterback for ten (10) hernia repair episodes during calendar year 2019;
- The total cost for each of those episodes is calculated using costs for all services included in the episode (for example medications, imaging and testing, evaluation and management, etc.);
- The characteristics of the 10 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 spinal fusion 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 surgeon'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 10 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

Two sets of clinical risk markers are considered for use in risk-adjusting episodes based on the diagnoses observed on qualified services. First, 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 In addition, the State of Tennessee defines risk makers using both Clinical Classifications Software (CCS) groups and their own specific definitions. The second set of risk makers consists of those markers that are specified by the State that meet minimum requirements regarding frequency of occurrence. (The CCS groups are not used since they tend to duplicate information captured by ETGs.)

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 ETG-based 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.

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.

- *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 window.

In general, risk markers defined by the State include their own criteria with regard to service timing.

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 are analyzed statistically to determine their impact on costs for the episode being evaluated. Risk factors for inclusion in the final model are 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. Five of the ten 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 Pediatric Pneumonia, Bronchiolitis, Colposcopy, Gastrointestinal (GI) Obstruction, and Hernia Repair 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 1-10. 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. The preliminary risk score for each individual episode is calculated as the sum of individual risk weight values that apply to that episode. Preliminary risk scores for each episode are then adjusted to achieve risk score neutrality across all episodes.

VI. Adjust Preliminary Risk for Risk Score Neutrality. The preliminary risk score for an episode is 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 Amerigroup. 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 is then used to risk adjust the cost of the individual episode.

Example 2: Applying risk neutrality factors

- All risk factors associated with an episode are identified and the corresponding risk weight values (clinical and demographic) are added together to achieve the preliminary risk score for an individual episode.
- Preliminary risk scores are then multiplied by a risk neutrality factor to ensure that the average risk score for Amerigroup is 1.00.
- The application of the risk neutrality factor will make the final risk score different than the sum of risk weights listed in tables 1-9 below
- For example, if the risk neutrality factor for an Appendectomy episode was 0.987 then a 27 year old woman without other clinical risk factors would have a final risk score of .8176 ($0.987 * 0.8284 = 0.8176$).

Please go to the Amerigroup Portal at <https://www.hospitalbenchmarks.com/amg/Login.aspx> to find the most recent TENNCARE Bundled Payment Initiative Risk Neutrality Factors.

Tables 1 – 10 below show the risk weights for Acute Seizure, Syncope, Acute Gastroenteritis, Pediatric Pneumonia, Bronchiolitis, Colposcopy, Hysterectomy, Gastrointestinal (GI) Obstruction, Appendectomy, Hernia Repair. The risk weights shown in these Tables were used to risk-adjust the cost of the individual episodes. The preliminary risk score for each episode is the sum of the risk weights for all risk markers observed. The final risk score will be the preliminary risk score for an episode multiplied by an episode specific risk neutrality factor.

Table 1 Acute Seizure	
Risk Marker	Risk Weight
All Age 0 to 15	0.8461
All Age 16 to 35	0.6245
All Age 36 to 55	0.6843
All Age 56 to 64	0.7768
Organic drug or metabolic disorders (Episode risk marker window)	0.2813
Psychotic & schizophrenic disorders (Episode risk marker window)	0.0817
Other conduction disorders (Episode risk marker window)	0.1341
Bacterial lung infections (Episode risk marker window)	0.2268
Acute respiratory distress syndrome (Episode risk marker window)	0.4261
Acute Kidney Failure (During the 60 days prior to the episode or during the trigger window)	0.3980
Altered Mental Status (During the 60 days prior to the episode or during the trigger window)	0.2876
Conversion And Dissociative Disorders (During the 365 days prior to the episode or during the episode window)	0.2198
Encephalopathy (During the 365 days prior to the episode or during the episode window)	0.3089
Hyponatremia (During the 60 days prior to the episode or during the trigger window)	0.3740

**Table 1 (Con't)
Acute Seizure**

Risk Marker	Risk Weight
Intractable Epilepsy (During the 365 days prior to the episode or during the episode window)	0.2763
Other Congenital Anomalies (During the 365 days prior to the episode or during the episode window)	0.2865
Partial Seizures (During the 60 days prior to the episode or during the trigger window)	0.2081
Status Epilepticus (During the 60 days prior to the episode or during the trigger window)	0.5477
Substance Abuse: Cocaine or amphetamine dependence (Episode risk marker window), Acute alcohol intoxication (Episode risk marker window), or Alcohol dependence (Episode risk marker window)	0.1848
Other high cost low incident conditions: Alzheimer's disease (Comorbidity risk marker, full window), Hyponatremia (During the 60 days prior to the episode or during the trigger window), Acute Myocardial Infarction (During the 60 days prior to the episode or during the trigger window), Central Nervous System Infection (During the 60 days prior to the episode or during the trigger window), or Heart failure, diastolic (Comorbidity risk marker, full window)	0.4958
Brain Trauma/Injury: Intracranial Injury And Hemorrhage (During the 365 days prior to the episode or during the episode window) or Brain trauma (Episode risk marker window)	0.1419

Table 2 Syncope	
Risk Marker	Risk Weight
All Age 3 to 60	0.6569
All Age 2 or less or all Age 61 or greater	0.8610
Hypo-functioning adrenal gland (Comorbidity risk marker, full window)	0.4309
Cerebral vascular disease (Comorbidity risk marker, full window)	0.2490
Pulmonary heart disease (Comorbidity risk marker, full window)	0.3168
Other conduction disorders (Comorbidity risk marker, full window)	0.0812
Pulmonary embolism (Comorbidity risk marker, full window)	0.3714
Abnormal EKG (During the 60 days prior to the episode or during the episode window)	0.3434
Acute MI (During the 365 days prior to the episode or during the episode window)	0.4611
Altered Mental Status (During the 60 days prior to the episode or during the episode window)	0.2742
Chest Pain (During the 60 days prior to the episode or during the episode window)	0.2993
Fluid and Electrolyte Disorders (During the 60 days prior to the episode or during the episode window)	0.3138
Headache (During the 60 days prior to the episode or during the episode window)	0.1710
Hypertension (During the 365 days prior to the episode or during the episode window)	0.1715
Hypothyroidism: Hypothyroidism (Comorbidity risk marker, full window) or Hypothyroidism (During the 365 days prior to the episode or during the episode window)	0.0963
Shortness of Breath (During the 60 days prior to the episode or during the episode window)	0.1746
Substance Abuse: Opioid or barbiturate dependence (Comorbidity risk marker, full window) or Substance Abuse (During the 180 days prior to the episode or during the episode window)	0.1256

**Table 3
Acute Gastroenteritis**

Risk Marker	Risk Weight
All Age 0 to 12	0.5324
All Age 13 to 17	0.6739
All Age 18 to 25	0.7197
All Age 26 to 35	0.8294
All Age 36 to 45	0.8687
All Age 46 to 55	0.9960
All Age 56 and above	1.1240
Cardiac congenital disorder dependence (Comorbidity risk marker, full window)	0.2836
Chronic pancreatitis dependence (Comorbidity risk marker, prior window)	0.3330
Chronic renal failure dependence (Comorbidity risk marker, full window)	0.2780
Bacterial Infection (During the 60 days prior to the episode or during the trigger window)	0.2566
Cardiac Arrhythmias (During the 365 days prior to the episode or during the episode window)	0.1732
Disorders of Blood Cells (During the 365 days prior to the episode or during the episode window)	0.1467
Fever (During the trigger window)	0.1283
Gastrointestinal Hemorrhage (During the 60 days prior to the episode or during the trigger window)	0.4765
Fluid Disorders: Fluid and Electrolyte Disorders (During the 60 days prior to the episode or during the episode window) or Dehydration (Episode risk marker window)	0.5612

Table 3 (Con't) Acute Gastroenteritis	
Risk Marker	Risk Weight
Biliary Disorders: Cholelithiasis (Episode risk marker window) or Biliary Disease (During the 60 days prior to the episode or during the episode window)	0.5347
Kidney Stones (During the 60 days prior to the episode or during the episode window)	0.2194
Other GI disorders: Gastritis and/or duodenitis (Episode risk marker window), Ulcer (Episode risk marker window), Inflammation of esophagus (Episode risk marker window) or Bowel obstruction duodenitis (Episode risk marker window)	0.3713
Other high cost low incident conditions: Appendicitis (Episode risk marker window), Acute renal failure (Episode risk marker window), Hypotension (During the 60 days prior to the episode or during the episode window), Diverticulitis & diverticulosis (Episode risk marker window), or Clostridium Difficile infection (During the 60 days prior to the episode or during the trigger window)	0.6481

**Table 4
Pediatric Pneumonia**

Risk Marker	Risk Weight
All Ages	0.8265
Dehydration (Episode risk marker window)	1.1954
Cardiac Arrhythmias (During the 365 days prior to the episode or during the episode window)	0.1353
Other Lower Respiratory Diseases (During the 365 days prior to the episode or during the episode window)	0.6666
Asthma: Asthma (During the 365 days prior to the episode or during the episode window) or Asthma (Comorbidity risk marker, full window)	0.1440

Table 5 Bronchiolitis	
Risk Marker	Risk Weight
All Ages	0.7539
Dehydration (Episode risk marker window)	1.4378
Asthma (Comorbidity risk marker, full window)	0.1833
Inflammation of esophagus (Episode risk marker window)	0.3365
Other neonatal disorders, perinatal origin (Comorbidity risk marker, full window)	0.1036
Cardiac Arrhythmias (During the 365 days prior to the episode or during the episode window)	0.2004
Other Lower Respiratory Diseases (During the 60 days prior to the episode or during the trigger window)	1.1914
Congenital or Acquired Anomalies: Congenital & acquired anomalies of ear/nose/throat (Comorbidity risk marker, full window) or Orthopedic deformity - head & face (Comorbidity risk marker, full window)	0.1849
Severe Respiratory Disorders: Acute Respiratory Distress Syndrome (Episode risk marker window) or Acute Respiratory Failure (During the 60 days prior to the episode or during the trigger window)	1.0085

Table 6 Colposcopy	
Risk Marker	Risk Weight
All Ages	0.7223
AIDS (Comorbidity risk marker, full window)	0.2716
Ischemic Heart Disease (Comorbidity risk marker, full window)	0.2934
Hypertension (Comorbidity risk marker, full window)	0.0904
Asthma (Comorbidity risk marker, full window)	0.0724
Infection of ovary /fallopian tubes (Episode risk marker window)	0.2159
CIN 1 (During the 365 days prior to the episode or during the episode window)	0.0688
CIN 2 or 3 (During the 365 days prior to the episode or during the episode window)	0.3451
Diseases of Female Genital Organs (During the 365 days prior to the episode or during the episode window)	0.1439
Arthritis: Adult rheumatoid arthritis (Comorbidity risk marker, full window) or Major joint inflammation – back (Comorbidity risk marker, full window)	0.3770
Excision (During the episode window) with Malignant Cancer (Comorbidity risk marker, full window)	1.7425
Excision (During the episode window) without Malignant Cancer (Comorbidity risk marker, full window)	1.5460
Malignant Cancer (Comorbidity risk marker, full window) without Excision (During the episode window)	0.1316

**Table 7
Hysterectomy**

Risk Marker	Risk Weight
All Age 0 to 54	1.0971
All Age 55 to 64	1.2756
Obesity: Obesity (Comorbidity risk marker, full window) or Morbid Obesity (During the 365 days prior to the episode or during the episode window)	0.0736
Urinary Incontinence: Urinary incontinence (Episode risk marker window) or Stress Incontinence (During the 60 days prior to the episode, during the pre-trigger window or during the trigger window)	0.1780

Table 8 Gastrointestinal (GI) Obstruction	
Risk Marker	Risk Weight
All Ages	0.5460
Septicemia (Episode risk marker window)	0.8636
Inflammatory bowel disease (Comorbidity risk marker, full window)	0.3074
Vascular diseases of intestines & abdomen (Comorbidity risk marker, full window)	0.5082
Chronic pancreatitis (Comorbidity risk marker, full window)	0.3163
Gastric Disorder With Obstruction)During the 60 days prior to the episode or during the trigger window)	0.4014
Intestinal Perforation (During the 60 days prior to the episode or during the trigger window)	0.9427
Obstruction from Procedural Complication (During the 60 days prior to the episode or during the trigger window)	0.5663
Nutritional deficiency (Episode risk marker window)	0.5050
Heart Disease: Ischemic heart diseases (Comorbidity risk marker, full window) or Coronary Heart Disease (During the 365 days prior to the episode or during the episode window)	0.3004
Severe Respiratory Disorders: Acute respiratory distress syndrome (Comorbidity risk marker, full window) or Respiratory Insufficiency (During the 365 days prior to the episode or during the trigger window)	0.2037
Kidney Disorders: Acute Kidney Failure (During the 60 days prior to the episode or during the trigger window) or Chronic Kidney Failure (During the 365 days prior to the episode or during the episode window)	0.4314
Malignant Cancers: Malignant Cancer (Comorbidity risk marker, full window), Primary Gastrointestinal And Abdominal Cancers (During the 365 days prior to the episode or during the episode window), or Metastatic Cancers (During the 365 days prior to the episode or during the episode window)	0.3009

**Table 9
Appendectomy**

Risk Marker	Risk Weight
All Age 0 to 6	1.1296
All Age 7 or greater	0.8284
Abdominal Adhesions (During the 60 days prior to the episode or during the trigger window)	0.4163
Peritonitis (During the 60 days prior to the episode or during the trigger window)	0.1003
Dehydration: Dehydration (Episode risk marker window) or Fluid And Electrolyte Disorders (During the 60 days prior to the episode or during the trigger window)	0.4777
Other high cost low incident conditions: Septicemia (Episode risk marker window), Respiratory Insufficiency (During the 365 days prior to the episode or during the trigger window), (Comorbidity risk marker, full window), Acute Kidney Failure (During the 60 days prior to the episode or during the trigger window), or Coronary Heart Disease (During the 365 days prior to the episode or during the episode window)	1.8234

**Table 10
Hernia Repair**

Risk Marker	Risk Weight
All Ages	0.9494
Cholelithiasis (Episode risk marker window)	0.2175
Abdominal Adhesions (During the 60 days prior to the episode, during the pre-trigger window or during the trigger window)	0.2582
Bilateral Groin Hernias (During the 60 days prior to the episode, during the pre-trigger window or during the trigger window)	0.2008
Congenital Male Genitourinary Disorders (During the 365 days prior to the episode or during the episode window)	0.2044
History Of Abdominopelvic Surgery (During the 365 days prior to the episode or during the episode window)	0.0983
Incisional Hernias (During the 60 days prior to the episode, during the pre-trigger window or during the trigger window)	0.1214
Obesity - BMI 40 Or Greater (During the 365 days prior to the episode or during the episode window)	0.1520
Other Abdominal Hernias (During the 60 days prior to the episode, during the pre-trigger window or during the trigger window)	0.0603
Pregnancy (During the 180 days prior to the episode or during the episode window)	0.1229
Substance Abuse: Cocaine or amphetamine dependence (Comorbidity risk marker, full window), Alcohol dependence ((Comorbidity risk marker, full window), or Opioid or barbiturate dependence (Comorbidity risk marker, full window)	0.1461