

TennCare Episodes of Care: Detailed description of episode risk adjustment for Wave 8 episodes

Acute seizure, syncope, acute gastroenteritis, pediatric pneumonia, bronchiolitis, colposcopy, hysterectomy, gastrointestinal obstruction, appendectomy, hernia repair

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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 3 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 3 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 9 care bundles: femur/pelvis fracture, non-operative shoulder injury, non-operative knee injury, non-operative ankle injury, non-operative wrist injury, back/neck pain, spinal fusion, spinal decompression without fusion, knee arthroscopy. It describes the general approach used to measure risk across all 9 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 2 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

When assigning a risk score to a bundle, 5 major steps are followed:

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 served as the quarterback for 10 hernia repair episodes during calendar year 2019

Example 1: (cont.)

Hernia repair episode risk adjustment

- 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 hernia repair episode that, based on its clinical and patient factors, is expected to have a 10% 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:

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

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 durable medical equipment (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.

2. Identify initial risk markers

Based on the diagnoses observed on qualified services, 2 sets of clinical risk markers are considered for use in risk-adjusting episodes. 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.)

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.
- **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.

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. In the final risk model, 5 of the 10 bundle types include 2 or more demographic risk markers – 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 help ensure 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 help 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 help ensure that the average risk score for UnitedHealthcare 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 1–10 below
- For example, if the risk neutrality factor of 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 log in to the UnitedHealthcare Provider Portal at UHCprovider.com. Click Sign In at the top-right corner and log in using your One Healthcare ID and password. Once signed in, you can access the most current TennCare Episodes of Care risk neutrality factors.

Tables 1-10 below show the risk weights for acute seizure, syncope, acute gastroenteritis, pediatric pneumonia, bronchiolitis, colposcopy, hysterectomy, 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	
Description of risk marker	Risk weight
All ages, 0 to 45	0.9175
All ages, 0 to 45	0.9399
All ages, 56-64	1.0016
Diabetes (comorbidity risk marker, full window)	0.0983
Mental disorders, organic and drug-induced (episode risk marker window)	0.0904
Alcohol dependence (comorbidity risk marker, full window)	0.1067
Other conduction disorders (comorbidity risk marker, full window)	0.1135
Bacterial lung infections (episode risk marker window)	0.2142
Altered mental status (during the 60 days prior to the episode or during the trigger window)	0.2807
Conversion and dissociative disorders (during the 365 days prior to the episode or during the episode window)	0.0125
Degenerative nervous system conditions (during the 365 days prior to the episode or during the episode window)	0.1174
Encephalopathy (during the 365 days prior to the episode or during the episode window)	0.1782
Hyponatremia (during the 60 days prior to the episode or during the trigger window)	0.3020
Intractable epilepsy (during the 365 days prior to the episode or during the episode window)	0.0684
Partial seizures (during the 60 days prior to the episode or during the trigger window)	0.0754
Status epilepticus (during the 60 days prior to the episode or during the trigger window)	0.3293

**Table 1 (cont.)
Acute seizure**

Description of risk marker	Risk weight
High-cost, low-incident conditions: Alzheimer’s disease (comorbidity risk marker, full window), hypernatremia (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), heart failure, diastolic (comorbidity riskmarker, full window), septicemia (episode risk marker window) or acute respiratory distress syndrome (episode risk marker window)	0.2116
Chromosomal anomalies (comorbidity risk marker, full window) or other congenital anomalies (during the 365 days prior to the episode or during the episode window)	0.1339

**Table 2*
Syncope**

Description of risk marker	Risk weight
All ages, 0-64	0.6891
Other conduction disorders (comorbidity risk marker, full window)	0.1008
Abnormal EKG (during the 60 days prior to the episode or during the episode window)	0.2316
Acute MI (during the 365 days prior to the episode or during the episode window)	0.1916
Altered mental status (during the 60 days prior to the episode or during the episode window)	0.2131
Chest pain (during the 60 days prior to the episode or during the episode window)	0.2483
Fluid and electrolyte disorders (during the 60 days prior to the episode or during the episode window)	0.3861
Headache (during the 60 days prior to the episode or during the episode window)	0.1377
Hypertension (during the 365 days prior to the episode or during the episode window)	0.0969
Shortness of breath (during the 60 days prior to the episode or during the episode window)	0.1558
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)	0.1145
Acute alcohol intoxication (episode risk marker window)	0.2848
Heart failure with exclusively diastolic dysfunction (episode risk marker window)	0.3851
Other hematologic diseases (episode risk marker window)	0.3199

**Table 2* (cont.)
Syncope**

Description of risk marker	Risk weight
Aortic aneurysm (comorbidity risk marker, full window)	0.3967
Atrial fibrillation & flutter (comorbidity risk marker, full window)	0.2796
Cardiomyopathy (comorbidity risk marker, full window)	0.3619
Opioid or barbiturate dependence (comorbidity risk marker, full window)	0.1307
Severe ventricular rhythms (comorbidity risk marker, full window)	0.4971

* In 2024, the SYNC risk model was updated to test new risk markers and incorporate 2024 episode design and configuration file maintenance changes.

**Table 3
Acute gastroenteritis**

Description of risk marker	Risk weight
All ages, 0-12	0.3306
All ages, 13-17	0.4627
All ages, 18-25	0.4552
All ages, 26-35	0.5169
All ages, 36-45	0.5786
All ages, 46-55	0.6732
All ages, 56 and above	0.9299
Bacterial infection (during the 60 days prior to the episode or during the trigger window)	0.5631
Cardiac arrhythmias (during the 365 days prior to the episode or during the episode window)	0.1688
Fever (during the trigger window)	0.0631
Gastrointestinal hemorrhage (during the 60 days prior to the episode or during the trigger window)	0.4974
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)	0.6990
Biliary disorders: Cholelithiasis (episode risk marker window) or biliary disease (during the 60 days prior to the episode or during the episode window)	0.6435
Kidney stones (during the 60 days prior to the episode or during the episode window)	0.1326
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)	0.3158

**Table 3 (cont.)
Acute gastroenteritis**

Description of risk marker	Risk weight
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 and diverticulosis (episode risk marker window) or clostridium difficile infection (during the 60 days prior to the episode or during the trigger window)	1.1455
Septicemia (episode risk marker window)	1.5778
Thrombocytopenia (episode risk marker window)	0.7069
Iron deficiency anemia (comorbidity risk marker, full window)	0.1888
Other conduction disorders (episode risk marker window)	0.2898
Other inflammation of intestines and abdomen (episode risk marker window)	0.2385
Hernias, except hiatal (comorbidity risk marker, full window)	0.1678
Other diseases of intestines and abdomen (episode risk marker window)	0.3799
Gastroenterology diseases signs and symptoms (episode risk marker window)	0.2588
Acute pancreatitis (episode risk marker window)	0.6382
Infection of lower genitourinary system, not sexually transmitted (episode risk marker window)	0.1475

**Table 4
Pediatric pneumonia**

Description of risk marker	Risk weight
All ages	0.5805
Dehydration (episode risk marker window)	2.2190
Cardiac arrhythmias (during the 365 days prior to the episode or during the episode window)	0.2864
Other lower respiratory diseases (during the 365 days prior to the episode or during the episode window)	0.6367
Acute respiratory distress syndrome (episode risk marker window)	0.8872
Pulmonology diseases signs and symptoms (episode risk marker window)	0.4001

**Table 5
Bronchiolitis**

Description of risk marker	Risk weight
All ages	0.5662
Dehydration (episode risk marker window)	1.7028
Asthma (episode risk marker window)	0.3586

**Table 5 (cont.)
Bronchiolitis**

Description of risk marker	Risk weight
Inflammation of esophagus (episode risk marker window)	0.5167
Cardiac arrhythmias (during the 365 days prior to the episode or during the episode window)	0.1649
Other lower respiratory diseases (during the 60 days prior to the episode or during the trigger window)	1.1997
Congenital or acquired anomalies: Congenital and acquired anomalies of ear/nose/throat (comorbidity risk marker, full window) or orthopedic deformity – head and face (comorbidity risk marker, full window)	0.1363
Bacterial lung infections (episode risk marker window)	0.3230
Acute respiratory distress syndrome (episode risk marker window)	1.6757

**Table 6
Colposcopy**

Description of risk marker	Risk weight
All ages	0.4832
Mood disorder, bipolar (comorbidity risk marker, full window)	0.1436
Ischemic heart disease (comorbidity risk marker, full window)	0.2047
Hypertension (comorbidity risk marker, full window)	0.0462
CIN 1 (during the 365 days prior to the episode or during the episode window)	0.0525
CIN 2 or 3 (during the 365 days prior to the episode or during the episode window)	0.2572
Diseases of female genital organs (during the 365 days prior to the episode or during the episode window)	0.1241
Excision (during the episode window) without malignant cancer (comorbidity risk marker, full window)	2.2298
Malignant cancer (comorbidity risk marker, full window) without excision (during the episode window)	0.1857

**Table 7*
Hysterectomy**

Description of risk marker	Risk weight
All ages, 0-64	0.7425
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)	0.0771
Bowel obstruction	0.2368
Endometriosis	0.0593
Infection of ovary &/or fallopian tubes	0.0750

* In 2024, the HYST risk model was updated to test new risk markers and incorporate 2024 episode design and configuration file maintenance changes.

**Table 8
Gastrointestinal (GI) obstruction**

Description of risk marker	Risk weight
All ages	0.6477
Septicemia (episode risk marker window)	0.2357
Congenital anomalies of intestines and abdomen (comorbidity risk marker, full window)	0.6531
Intestinal perforation (during the 60 days prior to the episode or during the trigger window)	0.7478
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)	0.4066
Non-malignant immunodeficiency (during the 365 days prior to the episode or during the episode window)	0.1432
Obstruction from procedural complication (during the 60 days prior to the episode or during the trigger window)	0.6647
Substance abuse: Cocaine or amphetamine dependence (comorbidity risk marker, full window), alcohol dependence (comorbidity risk marker, full window), or acute alcohol intoxication (comorbidity risk marker, full window), opioid or barbiturate dependence (comorbidity risk marker, full window) or other drug dependence (comorbidity risk marker, full window)	0.0366
Cardiovascular conditions (comorbidity risk marker, full window): Ischemic heart disease, pulmonary heart disease, congestive heart failure, cardiomyopathy, aortic aneurysm, heart failure – diastolic, valvular disorder, severe heart block or other conduction disorders	0.0896
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)	0.3033
Hiatal hernia (episode risk marker window) or ulcer (episode risk marker window)	0.5183

**Table 9*
Appendectomy**

Description of risk marker	Risk weight
All ages, 0–6	1.0256
All ages, 7 or greater	0.7805
Abdominal adhesions (during the 60 days prior to the episode or during the trigger window)	0.1838

**Table 9* (cont.)
Appendectomy**

Description of risk marker	Risk weight
Peritonitis (during the 60 days prior to the episode or during the trigger window)	0.0851
Dehydration: Dehydration (episode risk marker window) or fluid and electrolyte disorders (during the 60 days prior to the episode or during the trigger window)	0.1037
Bowel obstruction (Episode risk marker window)	0.3919
Sepsis (Episode risk marker window)	0.5464

* In 2024, the APP risk model was updated to test new risk markers and incorporate 2024 episode design and configuration file maintenance changes.

**Table 10*
Hernia repair**

Description of risk marker	Risk weight
All ages	0.7855
Abdominal adhesions (during the 60 days prior to the episode, during the pre- trigger window)	0.1902
Bilateral groin hernias (during the 60 days prior to the episode, during the pre- trigger window or during the trigger window)	0.2915
Congenital male genitourinary disorders (during the 365 days prior to the episode or during the episode window)	0.1870
History of abdominopelvic surgery (during the 365 days prior to the episode or during the episode window)	0.1584
Incisional hernias (during the 60 days prior to the episode, during the pre- trigger window or during the trigger window)	0.2519
Obesity - BMI 40 or greater (during the 365 days prior to the episode or during the episode window)	0.1184
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)	0.1256
Bowel Obstruction (episode risk marker window)	0.2286
Ischemic Heart Disease (comorbidity risk marker, full window)	0.1252

* In 2024, the HERNIA risk model was updated to test new risk markers and incorporate 2024 episode design and configuration file maintenance changes.

¹ The methodology described here uses the clinical constructs of Episode Treatment Groups® (ETGs®) to categorize diagnosis code 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.