TENNCARE Bundled Payment Initiative: Description of Bundle Risk Adjustment For Wave 6 Episodes

Neonatal (Age 31 weeks or less), Neonatal (Age 32 to 36 weeks), Neonatal (Age 37 weeks or greater)-(Excluded For Further Review), Skin and Soft Tissue Infection, HIV, Pancreatitis, Diabetes Acute Exacerbation

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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 seven care bundles: **Neonatal (Age 31 weeks or less), Neonatal (Age 32 to 36 weeks), Neonatal (Age 37 weeks or greater)-(Excluded For Further Review) ,** Skin and Soft Tissue Infection, HIV, Pancreatitis, Diabetes Acute Exacerbation. 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 preliminary risk scores for *risk score neutrality*

Example 1: Pancreatitis Episode Risk Adjustment

- A facility serves as the quarterback for ten (10) pancreatitis episodes during calendar year 2018;
- 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 pancreatitis 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 facility'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 facilities and with targets to determine performance under the program.

Each of these steps is described below.

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. Three of the seven 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 **Neonatal (Age 31 weeks or less), Neonatal (Age 32 to 36 weeks), Neonatal (Age 37 weeks or greater)-(Excluded For Further Review)** or HIV 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 1-7. 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 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 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 UnitedHealthcare is 1.00.
- The application of the risk neutrality factor will make the final risk score different that the sum of risk weights listed in tables 1-7 below
- For example, if the risk neutrality factor an HIV episode was 0.987 then a 47 year old woman without other clinical risk factors would have a final risk score of (0.987 * 0.6305 = 0.6223).

Tables 1 – 4 below show the risk weights for **Neonatal (Age 31 weeks or less), Neonatal (Age 32 to 36 weeks), Neonatal (Age 37 weeks or greater)-(Excluded For Further Review),** Skin and Soft Tissue Infection, HIV, Pancreatitis, Diabetes Acute Exacerbation. 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
Skin and Soft Tissue Infection Risk Markers and Weights

Risk Marker	Risk Weight
All Ages 0-5	0.8175
All Ages 6-17	0.7300
All Ages 18-25	0.8565
All Ages 26-64	0.8892
Cirrhosis (During 365 days prior to trigger or during episode window)	0.3855
Diabetes (During 365 days prior to trigger or during episode window)	0.0738
Lymph Node Presentation (During trigger window)	0.2755
Malignant Cancer ETGs (Episode risk marker window)	0.1604
History of MRSA (During 365 days prior to trigger)	0.2756
Immunocompromised (During 365 days prior to trigger or during episode window)	0.2009
MRSA (During trigger window)	0.7122
Psoriasis (During 365 days prior to trigger or during episode window)	0.2301
Superficial Injuries (During trigger window)	0.1728
Venous Insufficiency (During 365 days prior to trigger or during episode window)	0.2922
Septicemia and other systemic signs or symptoms : Systemic Sign or Symptom (During trigger window) or Septicemia (Episode risk marker window) or Dehydration (Episode risk marker window)	1.0033
Drug/Alcohol abuse: Acute alcohol intoxication (Comorbidity risk marker, full window) or Opioid or barbiturate dependence (Comorbidity risk marker, full window) or Other drug dependence	0.3994

(Comorbidity risk marker, full window)	
Lung Disorders: Other inflammatory lung diseases (Comorbidity risk marker, full window) or Chronic obstructive pulmonary disease (Comorbidity risk marker, full window)	0.1011
Open wounds (During trigger window)	0.5371
Vascular and nervous system conditions: Cerebral vascular disease (Comorbidity risk marker, full window) or Hereditary & degenerative diseases of central nervous system, other (Comorbidity risk marker, full window) or Neurological diseases signs & symptoms (Comorbidity risk marker, full window)	0.1057
Embolism & thrombosis of veins (Comorbidity risk marker, full window)	0.5537
Infection of rectum or anus (Comorbidity risk marker, full window)	0.4336
Parasitic skin infection (Episode risk marker window)	0.2852

Table 2 HIV Risk Markers and Weights Risk Marker	Risk Weight
All Ages	0.6305
AIDS-Defining Illnesses (During 90 days prior to or 30 days after trigger	0.3081
Bipolar (During episode window) or Depression (During episode window)	0.1591
Metabolic Disorders: Other metabolic disorders (Comorbidity risk marker, full window) or Organic drug or metabolic disorders (Episode risk marker window)	0.2926
Dehydration (Comorbidity risk marker, full window)	0.4233
Iron deficiency anemia (Episode risk marker window)	0.3799
Bacterial lung infections (Episode risk marker window)	0.1613
Cardiovascular diseases signs & symptoms (Comorbidity risk marker, full window)	0.2071
Acute bronchitis (Episode risk marker window)	0.4069
Sexually transmitted diseases, primary (Episode risk marker window)	0.1619
Infection of lower genitourinary system, not sexually transmitted (Episode risk marker window)	0.2494
Bacterial infection of skin (Episode risk marker window)	0.1526
Infectious hepatitis (Comorbidity risk marker, full window)	0.4387
Viral skin infection (Episode risk marker window)	0.3510
Rare high cost conditions, concurrent (Episode risk marker window or During episode window) : Septicemia , Sickle-cell anemia, Anemia of chronic diseases, Fungal & other pneumonia, Diverticulitis & diverticulosis, Other infectious diseases of intestines & abdomen or Homelessness	1.0862
Rare high cost conditions, prior window (Comorbidity risk marker, prior window): Agranulocytosis, Cirrhosis, or Autoimmune rheumatologic diseases, except lupus	0.3973
Rare high cost conditions, full window (Comorbidity risk marker, full window): Congenital disorders of central nervous system, Non-diabetic vascular retinopathy, Cardiac infection, Embolism & thrombosis of veins, Inflammation of oral cavity, Infection of upper genitourinary system or Pregnancy, with delivery	0.6378

Table 3 Pancreatitis Risk Markers and Weights	
Risk Marker	**Risk Weight**
All Ages 0-17	0.9849
All Ages 18-64	0.6630
Active Management of Cancer (During 365 days prior to trigger or during episode window)	0.1472
Cholecystitis (During 7 days prior to trigger or during episode window) or Gallstone (During 7 days prior to trigger or during episode window)	0.4875
Cirrhosis (During 365 days prior to trigger or during episode window)	0.1069
DKA/HHNK (During 7 days prior to trigger or during episode window)	0.4553
Malnutrition on day one (On the trigger start date)	0.5080
Pancreatic cyst/pseudocyst (During 7 days prior to trigger or during episode window)	0.3869
Sepsis on day one (On the trigger start date)	0.1887
Dehydration (Comorbidity risk marker, full window)	0.0800
Mood disorder, bipolar (Episode risk marker window)	0.1589
Congenital disorders of central nervous system (Comorbidity risk marker, full window)	0.3507
Bacterial lung infections (Episode risk marker window)	0.5050
Chronic renal failure(Comorbidity risk marker, full window)	0.1625

Table 4 Diabetes Acute Exacerbation Risk Markers and Weights	
Risk Marker	**Risk Weight**
All Ages 0-17	0.9702
All Ages 18-55	0.7301
All Ages 56-64	0.9315
Abscess (During 365 days prior to trigger or during episode window)	0.2199
Cirrhosis (During 365 days prior to trigger or during episode window)	0.1837
Depression (During episode window)	0.1238
Gastritis (During 7 days prior to trigger or during episode window)	0.2733
Gastroenteritis (During 7 days prior to trigger or during episode window)	0.1746
History of UTI (During 365 days prior to trigger)	0.1153
Pancreatitis (During 7 days prior to trigger or during episode window)	0.3832
Pneumonia (During 365 days prior to trigger or during episode window)	0.2506
Sepsis on day one (On the trigger start date)	0.1741
History of Septicemia (Comorbidity risk marker, prior window)	0.2137
Infectious hepatitis (Episode risk marker window)	0.2806
Bacterial infection of skin (Episode risk marker window)	0.2131