

Asthma/Chronic Obstructive Pulmonary Disease (COPD) Measure

Draft Cost Measure Methodology

Summer 2020 Field Testing

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1.0 Introduction

This document details the methodology for the Asthma/Chronic Obstructive Pulmonary Disease (COPD) measure and should be reviewed along with the Draft Cost Measure Methodology Appendices document, which contains additional details on the measure construction framework, and with the Asthma/Chronic Obstructive Pulmonary Disease (COPD) Draft Measure Codes List file, which contains the medical codes used in constructing the measure. These documents have been shared as part of field testing, where clinicians and clinician groups attributed at least 20 episodes received Field Test Reports containing measure performance information.

Field testing allows the Centers for Medicare & Medicaid Services (CMS) and the measure development contractor, Acumen LLC (referred to as “Acumen”), to gather feedback on new episode-based cost measures from clinicians and other stakeholders.¹ All stakeholders have the opportunity to provide feedback on the draft measure specifications and a Mock Field Test Report by reviewing this document and other publicly posted supplemental documentation. For more information about the development process for this measure please see the [Episode-Based Cost Measures Development Process document](#).²

We are collecting stakeholder feedback from **August 17 to September 18, 2020**. To provide feedback on the draft measure specifications please navigate to [this feedback survey](https://www.surveymonkey.com/r/2020-cost-measures-field-testing): <https://www.surveymonkey.com/r/2020-cost-measures-field-testing>

1.1 Measure Name

Asthma/Chronic Obstructive Pulmonary Disease (COPD) episode-based cost measure

1.2 Measure Description

Episode-based cost measures represent the cost to Medicare for the items and services provided to a patient during an episode of care (“episode”). In all supplemental documentation, the term “cost” generally means the standardized³ Medicare allowed amount,⁴ and claims data from Medicare Parts A, B, and D are used to construct the episode-based cost measures.

The Asthma/COPD episode-based cost measure evaluates a clinician’s or clinician group’s risk-adjusted cost to Medicare for patients receiving medical care to manage and treat asthma or COPD. This chronic condition measure includes the costs of services that are clinically related to the attributed clinician’s or clinician group’s role in managing care during an Asthma/COPD episode.

¹ CMS worked with Acumen to develop cost measures for potential use in MIPS.

² “Wave 3 Measure Development Process,” MACRA Feedback Page (July 2020), <https://www.cms.gov/Medicare/Quality-Payment-Program/Quality-Payment-Program/Give-Feedback>

³ Claim payments are standardized to account for differences in Medicare payments for the same service(s) across Medicare providers. Payment standardized costs remove the effect of differences in Medicare payment among health care providers that are the result of differences in regional health care provider expenses measured by hospital wage indexes and geographic price cost indexes (GPCIs) or other payment adjustments such as those for teaching hospitals. For more information, please refer to the “CMS Part A and Part B Price (Payment) Standardization - Basics” and “CMS Part A and Part B Price (Payment) Standardization - Detailed Methods” documents posted on the [CMS Price \(Payment\) Standardization Overview](#) page (<https://www.resdac.org/articles/cms-price-payment-standardization-overview>)

⁴ Cost is defined by allowed amounts on Medicare claims data, which include both Medicare trust fund payments and any applicable beneficiary deductible and coinsurance amounts.

1.3 Measure Rationale

Research has shown that both asthma and COPD are highly prevalent, costly conditions within the United States population, and their overall disease burden and financial impact continue to rise.^{5,6} COPD is the third leading cause of death in the United States.⁷ In 2014, 15.7 million Americans were diagnosed with COPD, yet this number could be an underestimation since many people with low lung function are not aware they have COPD.⁸ The Centers for Disease Control and Prevention estimated that COPD-related costs grew by nearly \$17 billion in the past decade in the United States, equating to an overall increase of 53%.^{9,10} Specifically, Medicare paid 51% of these COPD-related costs.¹¹ One study found that the mean total health care costs were \$20,500 higher among Medicare patients with COPD compared to those without COPD.¹² Among the many factors that contribute to rising health care costs associated with COPD, increasing hospitalization and readmission rates are among the highest cost drivers.¹³ COPD is the fourth leading cause of 30-day readmissions, where nearly one-fifth of patients hospitalized for an acute exacerbation of COPD were readmitted within 30 days of discharge.^{14,15,16}

More than 25 million Americans live with asthma,¹⁷ and it has been estimated that 5% of all Medicare patients have an asthma diagnosis.¹⁸ The total cost incurred for treatment of asthma was \$81.9 billion in 2013.¹⁹ Recent estimates attribute more than 10 million lost work days among employed adults and nearly 2 million emergency department (ED) visits over a single year to asthma.²⁰ Much like COPD, the burden of asthma falls heavily on adults aged 65 years

⁵ Centers for Disease Control and Prevention. "Basics About COPD." <https://www.cdc.gov/copd/basics-about.html>.

⁶ Asthma and Allergy Foundation of America. "Cost of Asthma on Society." <https://www.aafa.org/cost-of-asthma-on-society/>.

⁷ American Lung Association. "How Serious Is COPD." <https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/copd/learn-about-copd/how-serious-is-copd.html>.

⁸ Centers for Disease Control and Prevention. "Basics About COPD." <https://www.cdc.gov/copd/basics-about.html>.

⁹ Ford, Earl S., Louise B. Murphy, Olga Khavjou, Wayne H. Giles, James B. Holt, and Janet B. Croft. "Total and State-Specific Medical and Absenteeism Costs of COPD among Adults Aged 18 Years in the United States for 2010 and Projections Through 2020." *CHEST* 147, no. 1 (2015): 31-45.

¹⁰ Centers for Disease Control and Prevention. "COPD Costs." <https://www.cdc.gov/copd/infographics/copd-costs.html>.

¹¹ Ibid.

¹² Menzin, Joseph, Luke Boulanger, Jenő Marton, Lisa Guadagno, Homa Dastani, Riad Dirani, Amy Phillips, and Hemal Shah. "The Economic Burden of Chronic Obstructive Pulmonary Disease (COPD) in a U.S. Medicare Population." *Respiratory Medicine* 102, no. 9 (2008): 1248-56.

¹³ Parikh, Raj, Trushil G. Shah, and Rajive Tandon. "COPD Exacerbation Care Bundle Improves Standard of Care, Length of Stay, and Readmission Rates." *International Journal of Chronic Obstructive Pulmonary Disease* 11 (2016): 577-83.

¹⁴ Ibid.

¹⁵ Jencks, Stephen F., Mark V. Williams, and Eric A. Coleman. "Rehospitalizations Among Patients in the Medicare Fee-for-Service Program." *The New England Journal of Medicine* 360, no. 14 (2009): 1418-28.

¹⁶ Ibid.

¹⁷ Asthma and Allergy Foundation of America. "Asthma Facts and Figures." <https://www.aafa.org/asthma-facts/>.

¹⁸ Centers for Medicare & Medicaid Services. "Health Disparities in the Medicare Population: Asthma." <https://www.cms.gov/files/document/2016-05-cms-omh-data-snapshot-asthma-508pdf>.

¹⁹ Nurmagambetov, Tursynbek, Robin Kuwahara, and Paul Garbe. "The Economic Burden of Asthma in the United States, 2008–2013." *Annals of the American Thoracic Society* 15, no. 3 (2018): 348-56.

²⁰ American Lung Association. "Asthma in Adults Fact Sheet." <https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/asthma/learn-about-asthma/asthma-adults-facts-sheet.html>.

and older, who have the highest mortality rate for the condition compared to any other age group.

Despite the differences in etiology, symptoms, and responses to therapy between asthma and COPD, these diseases overlap in disease presentation and pathophysiologic characteristics.^{21,22} There is also a substantial 15 to 20% overlap in the reported prevalence of comorbid cases of asthma and COPD.²³ This overlapping relationship places an important role on clinicians to follow appropriate guidelines and utilize proper management strategies to classify and treat patients accurately.²⁴ Given the high impact in terms of patient population and Medicare spending, the Asthma/COPD measure represents an opportunity for improvement on overall cost performance.

The Asthma/COPD episode-based cost measure was recommended for development by an expert clinician committee—the Chronic Condition and Disease Management Clinical Subcommittee—because of its high impact in terms of patient population and Medicare spending, and the opportunity for incentivizing cost-effective, high-quality clinical care in this area. Based on the initial recommendations from the Clinical Subcommittee, the subsequent measure-specific clinician expert workgroup provided extensive, detailed input on this measure.

1.4 Measure Numerator

The measure numerator is the sum of the ratio of the winsorized²⁵ annualized observed cost to the annualized expected²⁶ cost for all Asthma/COPD episodes attributed to a clinician group (identified by Tax Identification Number [TIN]) or individual clinicians (identified by combination of TIN and National Provider Identifier [TIN-NPI]), where each ratio is weighted by each episode's number of days assigned to a TIN or TIN-NPI. This sum is then multiplied by the national average winsorized annualized observed episode cost to generate a dollar figure.

1.5 Measure Denominator

The measure denominator is the total number of days from Asthma/COPD episodes assigned to the TIN or TIN-NPI across all patients.

1.6 Data Sources

The Asthma/COPD measure uses the following data sources:

- Medicare Parts A, B, and D claims data from the Common Working File (CWF),
- Enrollment Database (EDB), and
- Long Term Care Minimum Data Set (LTC MDS).²⁷

²¹ Guarascio, Anthony J., Shauntá M. Ray, Christopher K. Finch, and Timothy H. Self. "The Clinical and Economic Burden of Chronic Obstructive Pulmonary Disease in the USA." *ClinicoEconomics and Outcomes Research* 5 (2013): 235-45.

²² Cukic, Vesna, Vladimir Lovre, Dejan Dragisic, and Aida Ustamujic. "Asthma and Chronic Obstructive Pulmonary Disease (COPD) - Differences and Similarities." *Materia Socio-Medica* 24, no. 2 (2012): 100-05.

²³ Global Initiative for Chronic Obstructive Lung Disease. "Diagnosis of Diseases of Chronic Airflow Limitation: Asthma, COPD, and Asthma-Copd Overlap Syndrome (ACOS)." https://goldcopd.org/wp-content/uploads/2016/04/GOLD_ACOS_2015.pdf.

²⁴ Guarascio, Anthony J., Shauntá M. Ray, Christopher K. Finch, and Timothy H. Self. "The Clinical and Economic Burden of Chronic Obstructive Pulmonary Disease in the USA." *ClinicoEconomics and Outcomes Research* 5 (2013): 235-45.

²⁵ For information on how costs are winsorized, please refer to Section 4.7.

²⁶ Expected costs refer to costs predicted by the risk adjustment model. For more information on expected costs and risk adjustment, please refer to Section 4.7.

²⁷ For information on how LTC MDS data are used in risk adjustment, please refer to Section 4.5

1.7 Care Settings

Methodologically, the Asthma/COPD measure can be triggered based on claims data from several settings. The most frequent settings in which an Asthma/COPD episode is triggered include: Office; Skilled Nursing Facility (SNF); Outpatient Hospital.

1.8 Cohort

The cohort for this cost measure consists of patients who are Medicare beneficiaries enrolled in Medicare fee-for-service that receive asthma or COPD care.

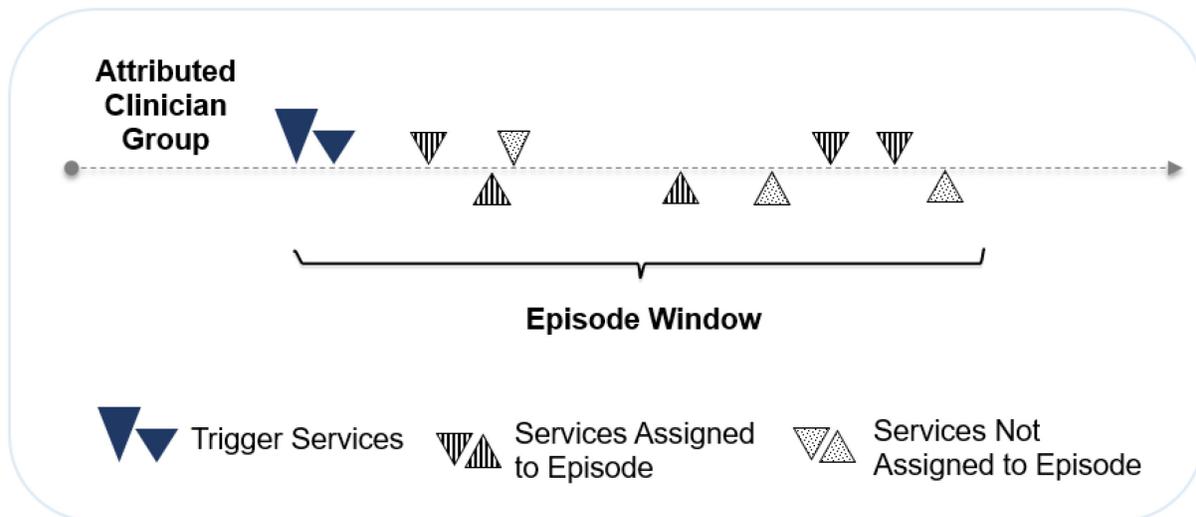
The cohort for this cost measure is also further refined by the definition of the episode group and measure-specific exclusions (see Section 4).

2.0 Methodology Steps

There are 2 overarching processes in calculating chronic condition episode-based cost measure scores: episode construction (Steps 1-5) and measure calculation (Steps 6-8). This section provides a brief summary of these processes and Section 4 describes them in detail.

- 1. Identify patients receiving care:** A trigger event identifies the start or continuation of a clinician group's management of a patient's chronic disease. A trigger event is identified by the occurrence of 2 Part B Physician/Supplier (Carrier) claims billed by the same clinician group practice within 180 days of one another. The pair of services must include a trigger claim and a confirming claim. The trigger claim is an initial "primary care" evaluation and management (E&M) code with a relevant chronic condition diagnosis. The confirming claim can be either another "primary care" E&M code with a chronic condition diagnosis, or a chronic condition-related Current Procedural Terminology/Healthcare Common Procedure Coding System (CPT/HCPCS) code for related services with a relevant chronic condition diagnosis. Once a trigger event is identified, this opens a one-year attribution window from the point of the trigger claim, in which the patient's chronic disease care will be monitored by a clinician group.
- 2. Identify the total length of care between a patient and a clinician group:** A reaffirming claim is a service billed during an open attribution window (from Step 1) by the same clinician group that billed the trigger event, which reaffirms and extends a clinician group's responsibility for managing a patient's chronic disease. A reaffirming claim is either a "primary care" E&M code with a relevant chronic condition diagnosis, or a chronic condition-related CPT/HCPCS code for related services with a relevant chronic condition diagnosis. After all reaffirming claims are identified, each attribution window is extended by 1 year from the point of any reaffirming claim billed during an open attribution window. The total attribution window begins with the trigger claim and concludes 1 year after the final reaffirming claim. Therefore, the total attribution window can span multiple years and vary in length for different patients. This requires that the total attribution window is measured incrementally and periodically across multiple measurement periods.
- 3. Define an episode:** Episodes are, at a minimum, one-year segments of the total attribution window that are measured in a respective measurement period. Under this definition, clinician groups are measured on a patient each time 1 year of the total attribution window elapses and/or when the total attribution window ultimately concludes. Episodes are assessed in the measurement period in which they conclude and will only attribute days not previously measured in preceding measurement periods. After episodes are constructed, they are placed into more granular, mutually exclusive and exhaustive sub-groups based on clinical criteria to enable meaningful clinical comparisons. Figure 1 below depicts how an episode is constructed.

Figure 1: Asthma/COPD Episode Framework



4. **Attribute the episode to the clinician group and clinician(s):** For this chronic condition measure, an attributed clinician group is the clinician group that bills the trigger and confirming claims for the total attribution window. An attributed clinician is any clinician within the attributed clinician group that bills at least 30% of “primary care” E&M codes with a relevant chronic condition diagnosis and/or chronic condition-related CPT/HCPCS codes for related services with a relevant chronic condition diagnosis on Part B Physician/Supplier claim lines during the episode.
5. **Assign costs to the episode and calculate the episode annualized observed cost:** Clinically related services that occur during the episode are assigned. The cost of the assigned services is summed and averaged across the number of days in an episode. This average daily cost is then multiplied by 365 to determine each episode’s annualized observed cost.
6. **Exclude episodes:** Exclusions remove unique groups of patients or episodes from cost measure calculation in cases where it may be impractical or unfair to compare the costs of caring for these patients to the costs of caring for the cohort at large.
7. **Calculate the annualized expected cost for risk adjustment:** Risk adjustment predicts the expected costs by adjusting for factors outside of the clinician’s or clinician group’s reasonable influence (e.g., accounting for patient age, comorbidities, and other factors). The episode group’s annualized observed costs are winsorized at the 1st and 99th percentiles for each model to handle extreme observations. A regression is then run using the risk adjustment variables as covariates to estimate the expected cost of each episode. Statistical techniques are applied to reduce the effects of extreme outliers on measure scores.
8. **Calculate the measure score:** For each episode, the ratio of winsorized annualized standardized observed cost to annualized expected cost (both of which are from Step 7) is calculated. The measure is calculated as a weighted average of these ratios across all of a clinician’s or clinician group’s attributed episodes, where the weighting is each episode’s number of assigned days. The weighted average episode cost ratio is then multiplied by the national average winsorized annualized observed episode cost to generate a dollar figure for the cost measure score.

3.0 Measure Specifications Quick Reference

This page provides a quick, at-a-glance reference for the Asthma/COPD measure specifications. More details on each component can be found in Section 4, and the full list of codes and logic used to define each component can be found within the Draft Measure Codes List file.

Episode Window: During what time period are costs measured?

The episode window is the portion of the overall time period of a clinician's or clinician group's responsibility for managing a patient that is assigned to a measurement period.

- The episode window length for Asthma/COPD is between 1 year (365 days) and 2 years minus 1 day (729 days), and varies in length between clinicians or clinician groups.

Triggers: Patients receiving what medical care are included in the measure?

- Patients receiving medical care for treatment of their asthma or COPD are included in the measure.
- The start or continuation of a clinician group's management of a patient's asthma or COPD is identified by the appearance of a pair of services within 180 days.
- This pair of services includes (i) an initial "primary care" E&M code with a relevant asthma or COPD diagnosis, and (ii) either:
 - Another "primary care" E&M code with a relevant asthma or COPD diagnosis, or
 - A chronic condition-related CPT/HCPCS code for related services accompanied by a relevant asthma or COPD diagnosis.

Sub-Group: What are the mutually exclusive types of episodes?

1. Asthma
2. COPD
3. Both Asthma and COPD

Service Assignment: Which clinically related costs are included in the measure?

Assigned services fall within the following 14 clinical themes:

- Asthma/COPD exacerbation; asthma/COPD chronic care; lung surgery; nebulizers and home oxygen; arrhythmias; sepsis; non-specific symptoms.
- Pulmonary imaging; home health, physical therapy, occupational therapy, and pulmonary rehabilitation.
- Other respiratory complications; other post-acute care.
- Outpatient medications for chronic care of asthma/COPD; outpatient medications for asthma/COPD exacerbations; outpatient medications for tobacco cessation.

Risk Adjustors: Which risk factors are accounted for in the risk adjustment model?

- Standard risk adjustors, including comorbidities captured by 79 Hierarchical Condition Category (HCC) codes that map with over 9,500 diagnosis codes, interaction variables accounting for a range of comorbidities, patient age category, patient disability status, patient end-stage renal disease status, and recent use of institutional long-term care.
- Measure-specific risk adjustors including but not limited to smoking, obstructive sleep apnea, home oxygen, or prior intubation for respiratory issue.
- For the full list of standard and measure-specific risk adjustment variables, please reference the "RA" and "RA_Details" tabs of the Draft Measure Codes List file.
- A separate linear regression is run for each sub-group and Medicare Part D enrollment status combination to ensure fair comparison. The episode group's annualized observed costs are winsorized at the 1st and 99th percentiles prior to the regression for each model to handle extreme observations.

Exclusions: Which populations are excluded from the measure?

- Standard exclusions to ensure data completeness:
 - The patient has a primary payer other than Medicare for any time overlapping the episode window or 120-day lookback period prior to the episode window.
 - The patient was not enrolled in Medicare Parts A and B for the entirety of the lookback period plus episode window, or was enrolled in Part C for any part of the lookback plus episode window.
 - The patient was not found in the Medicare Enrollment Database (EDB).
 - The patient was covered by the Railroad Retirement Board.
 - The patient resided outside the United States or its territories during the episode window.
 - The patient has an episode window shorter than one year.
- Measure-specific exclusions including patients with sickle cell disease, cystic fibrosis, interstitial pulmonary fibrosis, or prior lung cancer, surgery, or transplant. For the full list of measure-specific exclusions, please reference the “Exclusions” and “Exclusions_Details” tabs of the Draft Measure Codes List file.

4.0 Detailed Measure Methodology

This section contains the technical details for the 2 overarching processes in calculating the Asthma/COPD episode-based cost measure in more detail: Sections 4.1 through 4.5 describe episode construction and Sections 4.6 through 4.8 describe measure calculation.

4.1 Identify Patients Receiving Asthma/COPD Care

A **trigger event** is used to indicate the start of a clinician group's management of a patient's chronic disease and is identified by the occurrence of 2 Part B Physician/Supplier claims billed by the same clinician group practice. There are 2 different sets of CPT/HCPCS codes used to identify a trigger event: "primary care" E&M codes and chronic condition-related CPT/HCPCS codes.

- "Primary care" E&M codes are a specific set of E&M codes for clinician visits in the outpatient setting, clinician's office, nursing facility, or assisted living. The services fall into the following category:
 - Other diagnostic procedures (interview, evaluation, consultation).
- Chronic condition-related CPT/HCPCS codes are procedure codes related to the treatment of asthma or COPD. The services fall into the following categories:
 - Laboratory - Chemistry and Hematology;
 - Medications (Injections, infusions and other forms);
 - Other diagnostic procedures of respiratory tract and mediastinum;
 - Other diagnostic procedures on lung and bronchus;
 - Other respiratory therapy;
 - Radioisotope pulmonary scan; and
 - Routine chest X-ray.

To identify a trigger event, the following 2 claims must be billed within 180 days of one another:

- A **trigger claim**, which is a "primary care" E&M code with a relevant asthma or COPD diagnosis;
- A **confirming claim**, which is either (i) another "primary care" E&M code with a relevant asthma or COPD diagnosis or (ii) a chronic condition-related CPT/HCPCS code for related services with a relevant asthma or COPD diagnosis.

See the "Triggers_EM" and "Triggers_CPT_HCPCS" tabs of the Asthma/COPD Draft Measure Codes List file for the list of the CPT/HCPCS codes that identify "primary care" E&M codes and chronic condition-related CPT/HCPCS codes, respectively. Additionally, see the "Triggers_DGN" tab of the Asthma/COPD Draft Measure Codes List file for the list of the asthma or COPD diagnoses.

Once the trigger event is identified, this opens an **attribution window**, which is a year-long time period that begins on the date of the trigger claim. The attribution window defines a time period during which the patient's asthma or COPD care will be monitored by a clinician group. Appendix A of the Draft Cost Measure Methodology Appendices document contains an illustration of the relationship between a trigger event and an attribution window.

4.2 Identify the Total Length of Care Between a Patient and a Clinician Group

When the beginning of the clinician-patient relationship is identified, there might be evidence of a continuation of this relationship, represented in the data by the reaffirming claims. A **reaffirming claim** is a service billed during an open attribution window by the same clinician

group that billed the trigger event, and it reaffirms and extends a clinician group's responsibility for managing a patient's chronic disease.

A reaffirming claim is either:

- A "primary care" E&M code with a relevant asthma or COPD diagnosis, or
- A chronic condition-related CPT/HCPCS code for related services with a relevant asthma or COPD diagnosis.

Every time a reaffirming claim is identified during an open attribution window, the attribution window will be extended by 1 year from the point of the reaffirming claim. The resulting overall time period of responsibility is defined as the **total attribution window**, which begins with the trigger claim and concludes 1 year after the final reaffirming claim. Therefore, the total attribution window can span multiple years and vary in length for different patients.

4.3 Define an Episode

Once the total attribution window has been constructed, episodes are defined to measure costs of clinically related services rendered in a given measurement period.²⁸ An **episode** is defined, at a minimum, as a one-year segment of the total attribution window that is assessed in the measurement period in which it concludes. Clinicians or clinician groups are measured on a patient each time 1 year of the total attribution window elapses and/or when the total attribution window ends. The episode window lengths may vary depending on the length of the total attribution window and the number of days that have not been assessed in preceding measurement periods.

After the episode windows are constructed, the number of assigned days for each episode is determined and used as a weighting factor at the measure score calculation step. Only days not previously measured in preceding episodes would be assigned to an episode. Appendix A contains a simplified example of episode construction, while Appendix C provides a more detailed illustration of episode construction and assignment of days.

1. 365-day episode window, with sufficient number of days not previously assessed in the total attribution window
 - The episode **start date** is set as (i) the start date of the total attribution window if it is the first episode of the total attribution window, or (ii) the day after the end date of the preceding episode if it is a subsequent episode with at least 365 days' worth of claims data.
 - The episode **end date** is set as 365 days after the episode start date if it is the first episode of the total attribution window or a subsequent episode with 365 days' worth of claims data.
 - **Assign** the total number of days that have not been previously measured in the preceding episodes. In this case, the number of assigned days equals to the number of days in the episode.
2. 366- to 729-day episode window
 - The episode **start date** is set as (i) the start date of the total attribution window if it is the first episode of the total attribution window, or (ii) the day after the end date of the preceding episode if it is a subsequent episode with at least 365 days' worth of claims data.

²⁸ A measurement period is a static year-long period (calendar year) in which a clinician or clinician group will be measured.

- The episode **end date** is set as 366 to 729 days after the episode start date if it is the last segment of the total attribution window and the remaining number of days have not been assessed in previous episodes.
 - **Assign** the total number of days that have not been previously measured in the preceding episodes. In this case, the number of assigned days equals to the number of days in the episode.
3. 365-day episode window, with insufficient number of days not previously assessed in the total attribution window
- The episode **start date** is set as 365 days prior to the total attribution window end date if the remaining number of assigned days in the total attribution window is less than 365 days.
 - The episode **end date** is set as the end date of the total attribution window.
 - **Assign** the total number of days that have not been previously measured in the preceding episodes. In this case, the number of assigned days is smaller than the number of days in the episode, since the episode window would partially overlap with the preceding episode window and only days not previously measured are assigned to the episode.²⁹

Once an Asthma/COPD episode window is defined, the episode is placed into one of the episode sub-groups to enable meaningful clinical comparisons. Sub-groups represent more granular, mutually exclusive and exhaustive patient populations defined by clinical criteria collected from claims found during a year of the patient’s data. Sub-groups are useful in ensuring clinical comparability so that the corresponding cost measure fairly compares clinicians with a similar patient case-mix.

Appendix B contains an illustration of the Asthma/COPD sub-grouping methodology. Codes used to define the sub-groups can be found in the “Sub_Groups” and “Sub_Groups_Details” tabs of the Draft Measure Codes List file. This cost measure has 3 sub-groups:

- Asthma
- COPD
- Both Asthma and COPD

4.4 Attribute the Episode to a Clinician Group or a Clinician

Once an episode has been defined, it is attributed to one or more clinicians of a specialty that is eligible for MIPS. The episodes are attributed to clinician groups, who are identified by their unique TIN, and individual clinicians, who are identified by their TIN and NPI pair (TIN-NPI). For codes relevant to this section, please see the “Attribution” tab of the Asthma/COPD Draft Measure Codes List.

TIN level attribution: An episode is attributed to the clinician group that billed the trigger and confirming claims for the total attribution window. The clinically related costs from the total number of assigned days are attributed to that clinician group.

TIN-NPI level attribution: An episode is attributed to any clinician within the attributed clinician group that billed at least 30% of “primary care” E&M codes with a relevant chronic condition diagnosis and/or chronic condition-related CPT/HCPCS codes for related services with a relevant chronic condition diagnosis on Part B Physician/Supplier claim lines during the

²⁹ Note: In this case, the latter episode would only contain the days not measured in the preceding measurement period.

episode.³⁰ Only clinically related services from the assigned days during which the attributed clinician was involved with the patient's episode are attributed to that clinician. Future attribution rules may benefit from the implementation of patient relationship categories³¹ and codes.³² As required by section 101(f) of the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA), the CMS will consider how to incorporate the patient relationship categories into episode-based cost measurement methodology as clinicians and billing experts gain experience with them.³³

4.5 Assign Costs to an Episode and Calculate Episode Annualized Observed Costs

Medicare Parts A, B, and D services, and their costs, are assigned to an episode only when clinically related to the management and treatment of the patient's asthma or COPD during the episode. Assigned services may include treatment and diagnostic services, ancillary items, services directly related to treatment, and those furnished as a consequence of care (e.g., complications, readmissions, unplanned care, and emergency department visits). Unrelated services are not assigned to the episode. For example, the cost of care for a procedure that occurs during the episode but is not clinically related to the management and treatment of the patient's chronic disease would not be assigned to the episode.

To ensure that only clinically related services are included, services during the episode window are assigned to the episode based on a series of service assignment rules, which are listed in the "Service_Assignment_AB" and "Service_Assignment_D" tabs of the Draft Measure Codes List file.

For the Asthma/COPD episode group, services performed in the following service categories are considered for assignment to the episode:

- Outpatient (OP) Facility and Clinician Services
- Emergency Department (ED)
- Inpatient (IP) – Medical
- IP – Surgical
- Inpatient Rehabilitation Facility (IRF)
- Long Term Care Hospital (LTCH)
- SNF³⁴
- Durable Medical Equipment, Prosthetics, Orthotics, and Supplies (DME)

³⁰ For the diagram illustrating an example of attribution to a TIN and TIN-NPI, please refer to Appendix D.

³¹ The MACRA Patient Relationship Categories aim to distinguish the relationship and responsibility of a clinician with a patient at the time of furnishing an item or service, thereby facilitating the attribution of patients and episodes to one or more clinicians for purposes of measure score calculations. For more information on Patient Relationship Categories, please refer to the Patient Relationship Categories and codes operational list. (<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/CMS-Patient-Relationship-Categories-and-Codes.pdf>)

³² The MACRA Patient Relationship Codes are HCPCS Level II modifier codes that clinicians report on claims to identify their patient relationship category. For the Patient Relationship Codes, please see Table 27 of the CY 2018 Physician Fee Schedule final rule. (<https://www.federalregister.gov/d/2017-23953/p-2203>)

³³ For more information on the Patient Relationship Categories and Codes, please download the Patient Relationship Categories and Codes FAQ. (<https://qpp-cm-prod-content.s3.amazonaws.com/uploads/236/Patient-Relationship-Categories-and-Codes-webinar-FAQ.pdf>)

³⁴ Services performed in the IRF, LTCH, and SNF settings are assigned to an episode based on their association with the grouped IP stay.

- Home Health (HH)
- Part D drugs

In addition to service category, service assignment rules may be modified based on the service category in which the service is performed, as listed above. Service assignment rules can also be defined based on specific service information alone or service information combined with diagnosis information. Services may be assigned to the episode based on the following combinations:

- High level service code alone
- High level service code combined with first 3 digits of the International Classification of Diseases – 10th Revision diagnosis code (3-digit ICD-10 diagnosis code)
- High level service code combined with full ICD-10 diagnosis code
- High level service code combined with more specific service code
- High level service code combined with more specific service code and with 3-digit ICD-10 diagnosis code
- High level service code combined with more specific service code and with full ICD-10 diagnosis code

The steps for assigning costs are as follows:

- **Identify** all services on claims with positive standardized payment that occur within the episode window.
- **Assign** identified services to the episode based on the types of service assignment rules described above.
- **Assign** all trigger and reaffirming Part B Physician/Supplier claims occurring during the episode window.
- **Assign** all SNF stays based on the following criteria:
 - Identify SNF stays where both (i) the SNF stay's qualifying IP stay is assigned to episode and (ii) the SNF stay occurs during the episode window.
 - For those identified SNF stays, determine the number of days that overlap with the episode window; if the overlap is greater than 30 days, cap claim amount assigned to the episode at 30 days.
- **Assign** all IRF and LTCH stays based on the following criteria:
 - Identify IRF and LTCH stays for which (i) there is a preceding IP stay discharged within 7 days prior to the stay's start date, (ii) the preceding IP stay is assigned to the episode, and (iii) the IRF and LTCH stays occur during the episode window.
- **Assign** all inpatient E&M claims during IP stays assigned to episode.
- **Sum** the standardized Medicare allowed amounts for all claims assigned to each episode to obtain the total standardized episode observed cost.
- **Average** the total standardized episode observed cost over the number of days in the episode to get the episode average daily standardized observed cost.
- **Multiply** the episode average daily standardized observed cost by 365 to get the episode annualized standardized observed cost.

Service Assignment Example

- Clinician group A has been providing continuous care management for Patient K's asthma, and is attributed an episode with Patient K during the measurement year.
- Clinician group A performs a pulmonary stress test for Patient K during the episode window. Because the pulmonary stress test is considered a clinically related service, its costs will be assigned to clinician group A's Asthma/COPD episode with Patient K.

4.6 Exclude Episodes

Before measure calculation, episode exclusions are applied to remove certain episodes from measure score calculation. Certain exclusions are applied across all chronic condition episode groups, and other exclusions are specific to this measure, based on consideration of the clinical characteristics of a homogenous patient cohort. All measure-specific exclusions are listed in the "Exclusions" and "Exclusions_Details" tabs in the Asthma/COPD Draft Measure Codes List file.

Episodes are excluded from the Asthma/COPD measure if they meet any of the following conditions:

- The patient has a primary payer other than Medicare for any time overlapping the episode window or 120-day lookback period prior to the episode window;
- The patient was not enrolled in Medicare Parts A and B for the entirety of the 120-day lookback period plus episode window, or was enrolled in Part C for any part of the 120-day lookback period plus episode window;
- The patient is not found in Medicare EDB;
- The patient has an episode window shorter than 1 year;
- The patient was covered by the Railroad Retirement Board;
- The patient resided outside the United States or its territories during the episode window.

4.7 Estimate Annualized Expected Costs For Risk Adjustment

Risk adjustment is used to estimate episode expected costs in recognition of the different levels of care beneficiaries may require due to comorbidities, disability, age, and other risk factors. The risk adjustment model includes variables from the CMS Hierarchical Condition Category Version 22 (CMS-HCC V22) 2016 Risk Adjustment Model,³⁵ as well as other standard risk adjustors (e.g., patient age) and variables for clinical factors that may be outside the attributed clinician's reasonable influence. A full list of risk adjustment variables can be found in the "RA" and the "RA_Details" tabs of the Draft Measure Codes List file.

Steps for defining risk adjustment variables and estimating the risk adjustment model are as follows:

- **Define** HCC and episode group-specific risk adjustors using service and diagnosis information found on the patient's Medicare claims history in the 120-day period prior to the episode start date for certain billing codes that indicate the presence of a procedure, condition, or characteristic.

³⁵ CMS uses an HCC risk adjustment model to calculate risk scores. The HCC model ranks diagnoses into categories that represent conditions with similar cost patterns. Higher categories represent higher predicted healthcare costs, resulting in higher risk scores. There are over 9,500 ICD-10-CM codes that map to one or more of the 79 HCC codes included in the CMS-HCC V22 model.

- **Define** other risk adjustors that rely upon Medicare beneficiary enrollment and assessment data as follows:
 - Identify beneficiaries who are originally “Disabled without end-stage renal disease (ESRD)” or “Disabled with ESRD” using the original reason for joining Medicare field in the Medicare beneficiary EDB.
 - Identify beneficiaries with ESRD if their enrollment indicates ESRD coverage, ESRD dialysis, or kidney transplant in the Medicare beneficiary EDB in the 120-day lookback period.
 - Identify beneficiaries who have spent at least 90 days in a long-term care institution without having been discharged to the community for 14 days, based on LTC MDS assessment data, during the 120-day lookback period.
- **Drop** risk adjustors that are defined for less than 15 episodes nationally for each sub-group to avoid using very small samples.
- **Categorize** beneficiaries into age ranges using their date of birth information in the Medicare beneficiary EDB. If an age range has a cell count less than 15, collapse this in the next adjacent age range category towards the reference category (65-69).

The following steps are performed separately for each sub-group and Part D enrollment status combination:

- **Winsorize**³⁶ the episode annualized observed cost as follows:
 - **Assign** the value of the 1st percentile to all episode annualized observed costs below the 1st percentile; similarly, assign the value of the 99th percentile to all episode annualized observed costs above the 99th percentile.
- **Run** an ordinary least squares (OLS) regression model to estimate the relationship between all the risk adjustment variables and the dependent variable, the episode winsorized annualized observed cost calculated from the previous step, to obtain the episode annualized expected cost.
- **Winsorize** the episode annualized expected cost as follows:
 - **Assign** the value of the 0.5th percentile to all episode annualized expected costs below the 0.5th percentile.
 - **Renormalize**³⁷ values by multiplying each episode’s winsorized annualized expected cost by the average annualized expected cost, and dividing the resultant value by the average winsorized annualized expected cost.
- **Exclude** episodes with outliers as follows:
 - **Calculate** each episode's residual as the difference between the re-normalized, winsorized annualized expected cost computed above and the winsorized annualized observed cost.
 - **Exclude** episodes with residuals below the 1st percentile or above the 99th percentile of the residual distribution.
 - **Renormalize** the resultant annualized expected cost values by multiplying each episode’s winsorized annualized expected costs by the average winsorized

³⁶ Winsorization aims to limit the effects of extreme values on expected costs. Winsorization is a statistical transformation that limits extreme values in data to reduce the effect of possible outliers. Winsorization of the lower end of the distribution (i.e., bottom coding) involves setting extremely low predicted values below a predetermined limit to be equal to that predetermined limit, and similarly for the higher end of the distribution involves setting extremely high predicted values above a predetermined limit to be equal to that predetermined limit.

³⁷ Renormalization is performed after adjustments are made to the episode’s expected cost, such as winsorization or residual outlier exclusion. This process multiplies the adjusted values by a scalar ratio to ensure that the resulting average is equal to the average of the original value.

annualized observed cost (after excluding outliers), and dividing by the average winsorized annualized expected cost (after excluding outliers).

4.8 Calculate Measure Score

Measure scores are calculated for a clinician or clinician group practice as follows:

- **Calculate** the ratio of winsorized annualized observed to annualized expected episode cost for each episode attributed to the clinician or clinician group.
- **Calculate** the measure as a weighted average of these ratios across all of a clinician’s or a clinician group’s attributed episodes, where the weighting is the number of assigned days for a clinician or a clinician group during the episode.
- **Multiply** the weighted average episode cost ratio by the national average winsorized annualized observed episode cost to generate a dollar figure for the cost measure score.

The clinician-level (or clinician group practice-level) risk-adjusted cost for any attributed clinician (or clinician group practice) “j” can be represented mathematically as:

$$Measure\ Score_j = \left[\frac{1}{n_j} \sum_{i \in \{I_j\}} \left(\frac{Y_{ij}}{\hat{Y}_{ij}} \times n_{ij} \right) \right] * \left(\frac{1}{N} \sum_{i \in \{I\}} Y_i \right)$$

Where:

Y_{ij}	is the winsorized annualized observed payment for episode i and attributed clinician (or clinician group practice) j
\hat{Y}_{ij}	is the annualized expected payment for episode i and attributed clinician (or clinician group practice) j
n_{ij}	is the number of assigned days for episode i and attributed clinician (or clinician group practice) j
n_j	is the total number of days assigned to attributed clinician (or clinician group practice) j across all episodes (summation of n_{ij})
N	is the total number of episodes attributed to clinicians (or clinician group practices) nationally
Y_i	is the winsorized annualized observed payment for episode i
$i \in \{I_j\}$	is all episodes attributed to clinician (or clinician group practice) j
$i \in \{I\}$	is all episodes attributed to clinicians (or clinician group practices) nationally

A diagram demonstrating a visual depiction of an example measure calculation can be found in Appendix C.

A lower measure score indicates that the observed episode costs are lower than or similar to expected costs for the care for the particular patients and episodes included in the calculation.

A higher measure score indicates that the observed episode costs are higher than expected for the care provided for the particular patients and episodes included in the calculation.