Quality Payment
PROGRAM

Episode-Based Cost Measure Field Testing

Measure Development Process

October 2018 Field Testing

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Acronyms and Abbreviations

ACA	Patient Protection and Affordable Care Act of 2010
Advanced APMs	Advanced Alternate Payment Models
CIT	Clinical Input Tool
CMS	Centers for Medicare & Medicaid Services
CORE	Center for Outcomes Research and Evaluation, Yale-New Haven Health Services Corporation
CS	Clinical Subcommittees
CY	Calendar Year
E&M	Evaluation and Management
EIDM	Enterprise Identity Data Management
MACRA	Medicare Access and CHIP Reauthorization Act of 2015
MAP	Measure Applications Partnership
MIPS	Merit-based Incentive Payment System
MSPB	Medicare Spending Per Beneficiary
MUC	Measures Under Consideration
NPI	National Provider Identifier
PB	Part B Physician/Supplier
PFC	Person and Family Committee
PFS	Physician Fee Schedule
QRURs	Quality and Resource Use Reports
TEP	Technical Expert Panel
TIN	Taxpayer Identification Number
TIN-NPI	A unique Taxpayer Identification Number - National Provider Identifier pair
TPCC	Total Per Capita Cost

1.0 Introduction

This document provides the project background and details of the process for developing the 11 episode-based cost measures being field tested in October 2018. An episode-based cost measure represents the amount Medicare pays for a beneficiary's clinically related medical care during a defined episode of care for a procedure or acute inpatient medical condition. This background information about the measure development process can be read alongside the draft measure specifications, consisting of the Draft Cost Measure Methodology and the Draft Measure Codes List files, which contain the medical codes and logic used in constructing the measure.[1]

This document is being shared with stakeholders as part of a field testing period, which will begin the first week of October 2018 and continue for four weeks. During this period, clinicians who are attributed at least 10 episodes from one or more of the episode-based cost measures will receive confidential MACRA Episode-Based Cost Measure Field Test Reports on the Centers for Medicare & Medicaid Services (CMS) Enterprise Portal containing their measure performance information. All stakeholders have the opportunity to provide feedback on the draft measure specifications, a mock field test report, and supplemental documentation (e.g., fact sheet and FAQ).

As background, CMS and the measure developer Acumen, LLC (referred to as "Acumen") field tested eight episode-based cost measures in the fall of 2017. We appreciate the input that stakeholders shared with us during that field testing period and have made updates to both the measure development process and field testing as a result of your feedback.

We Heard Your Feedback from Field Testing in October and November 2017

- We shared field testing feedback with the Clinical Subcommittees who considered it when making refinements to the eight episode-based cost measures.
- We posted a report summarizing the feedback we received.[2]
- We separated the measure specifications into shorter documents so that readers can focus on the key points. They are now contained in:
  - This **measure development process** document which explains our approach and stakeholder input activities[3]
  - **Draft measure methodology** which describes how the measure is constructed
  - **Draft measure codes list files** which contains the medical codes used in the measure
- We have updated the field test reports to be more actionable and easier to understand. For example, we added an 'Understanding Your Report' tab, descriptions of metrics, and more detailed drill-down data.

[1] "Draft Cost Measure Methodology" and "Draft Measure Codes List" *MACRA Feedback Page* (October 2018), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-Feedback.html

[2] "Field Testing Feedback Summary Report for Eight MACRA Episode-Based Cost Measures" *Quality Payment Program* (October 2018), https://www.cms.gov/Medicare/Quality-Payment-Program/Resource-Library/2017-Field-testing-feedback-report.pdf

[3] The information in this process document was formerly contained in Section 1, Section 2.[#].1, and Section 2.[#].2 of the Draft Cost Measure Methodology documents posted in October 2017 for the field testing of eight episode-based cost measures.

This process document contains two sections:

- Section 1 provides an overview of the project.
- Section 2 describes the process used to develop each component of the episode-based cost measures.

Within Section 1, Section 1.1 provides background on the MACRA Episode Groups and Cost Measures project. Section 1.2 provides an overview of episode-based cost measures. Section 1.3 describes the overall process used to develop the cost measures.

1.1 Project Background

The Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) established the Quality Payment Program).

Under the Quality Payment Program, clinicians are incentivized to provide high-quality and high value care through Advanced Alternative Payment Models (APMs) or the Merit-based Incentive Payment System (MIPS). MIPS eligible clinicians will receive a performance-based adjustment to their Medicare payments. This payment adjustment is based on a MIPS final score that assesses evidence-based and practice-specific data in the following categories:

1. Quality
2. Cost
3. Improvement Activities
4. Promoting Interoperability (formerly Advancing Care Information)

CMS worked with measure development contractor Acumen, LLC (referred to as "Acumen") to develop the cost measures being field tested. Under MACRA, MIPS involves the use of a methodology for analyzing cost, as appropriate, which includes consideration of patient condition groups and care episode groups (referred to as "episode groups"). As a result, 11 episode-based cost measures are currently under development and will be field tested before consideration of their potential use in MIPS.

Acumen has implemented a measure development process that relies on input from a large number of stakeholders, including multiple groups of clinicians affiliated with a broad range of professional societies, to develop clinically appropriate and transparent measures that provide actionable information to clinicians.

We are collecting stakeholder feedback from **October 3, 2018, to October 31, 2018.** To provide feedback on any aspect of field testing please navigate to this feedback survey: https://www.surveymonkey.com/r/2018-macra-cost-measures-field-testing

1.2 Overview of Episode-Based Cost Measures

Episode-based cost measures represent the cost to Medicare for the items and services provided to a patient during an episode of care ("episode"). An episode-based cost measure is designed to inform clinicians on the cost of their beneficiary's care for which they are responsible during the timeframe specified by the episode. In the field test reports and their supplemental documentation, the term "cost" generally means the Medicare allowed amount, which includes both Medicare and trust fund payments and any applicable beneficiary deductible and coinsurance amounts on traditional, fee-for-service claims. **Payment standardization** adjusts the allowed amount for a Medicare service to facilitate cost

comparisons and limit observed differences in costs to those that may result from health care delivery choices. 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.[4]

Episode-based cost measures are based on episode groups. An *episode group* is a unit of comparison that represents a clinically coherent set of medical services rendered to treat a given medical condition. Episode groups aggregate these items and services involved in care for a defined patient cohort to assess the total cost of the care. Services assigned to the episode group might include diagnostic services, treatment services, and ancillary items and services directly related to treatment (such as anesthesia for a surgical procedure), as well as services following the initial treatment period that may be rendered to patients as routine follow-up care or to treat consequences of care. An *episode* is a specific instance of an episode group for a given patient and clinician. For example, in a given year, a clinician might be attributed 20 episodes (instances of the episode group) from the episode group for hip arthroplasty.

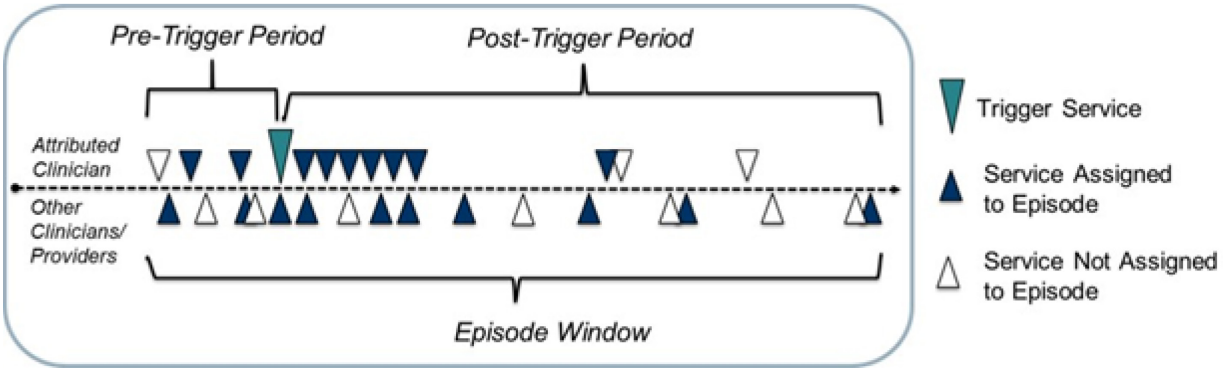
There are currently three types of episode groups that can serve as the basis for cost measures: procedural, acute inpatient medical condition, and chronic condition. *Procedural* episode groups focus on procedures of a defined purpose or type, such as hip arthroplasty or hemodialysis access creation. *Acute inpatient medical condition* episode groups represent treatment for a defined acute illness or treatment for flares or exacerbations of a condition requiring hospitalization, such as an acute exacerbation of chronic obstructive pulmonary disease (COPD). *Chronic condition* episode groups represent ongoing management of a long-term health condition, such as diabetes.[5]

Episode-based cost measures are intended to measure clinician resource use based on only those costs that occur as part of an attributed clinician's management of a defined condition or procedure. In other words, only services occurring during the episode window that are clinically related to the treatment provided by the attributed clinician are assigned to the episode and included in episode-based cost measure calculations (see Figure 1 below). For example, an episode group for elective primary hip arthroplasty would include services furnished for and complications related to this procedure, such as physical therapy or readmission for mechanical complications. As a result, the episode group for elective primary hip arthroplasty would allow comparison of clinicians providing this procedure across an episode of care.

[4] For more information on payment standardization, please refer to the "CMS Price (Payment) Standardization - Basics" and "CMS Price (Payment) Standardization - Detailed Methods" documents posted on QualityNet: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/QnetTier4&cid=1228772057350

[5] No chronic condition episode groups are included in this set of 11 episode-based cost measures being field tested in 2018. Chronic condition episode groups will be developed at a later stage of measure development.

Figure 1. Diagram Showing a Constructed Episode



Furthermore, to ensure a more accurate comparison of cost across clinicians, risk adjustment is applied to account for characteristics of patients that can influence spending and are outside of the clinician's control. For instance, for the elective primary hip arthroplasty cost measure, the risk adjustment model may account for multiple sclerosis.

1.3 Process for Developing the Cost Measures

Stakeholder input is critical to the development of robust, meaningful, and actionable episode-based cost measures. Throughout the measure development process, Acumen sought input from clinicians and other stakeholders to inform the development of the cost measures. Acumen incorporated input from the following stakeholder input activities:

(i) Clinical Subcommittees (CS)
(ii) Technical Expert Panel (TEP)
(iii) Person and Family Committee (PFC)
(iv) Stakeholder Feedback and Field Testing

The Clinical Subcommittees make recommendations about clinical specifications for episode-based cost measures while the TEP serves a high-level advisory role and provides guidance on the overall direction of measure development. The PFC provides feedback from persons and families to inform key components of cost measure development with patient and caregiver perspectives. The field testing and public feedback periods offer all stakeholders an opportunity to provide input on the cost measurement approach. The remaining sub-sections of this section describe each stakeholder input activity and its role in the development of episode-based cost measures for this project.

1.3.1 Clinical Subcommittees

Acumen uses a "wave" approach wherein sets of Clinical Subcommittees, each focused on a particular clinical area, convene to select episode groups to develop into cost measures and to provide input on the measures' specifications. Members of Clinical Subcommittees were nominated through a Call for Clinical Subcommittees Nominations. Future Clinical Subcommittees under this project, including Subcommittees focused on chronic condition episode group development, will be convened through separate nomination periods.

The work of the Clinical Subcommittees builds off of the previous work of the August – September 2016 Clinical Committee that was also convened as a part of this project. This Committee included more than 70 clinicians from over 50 professional societies who provided expert input on identifying a draft list of episode groups for cost measure development and

determining the billing codes that trigger each episode group. The clinical review and recommendations obtained from the Clinical Committee were used to inform CMS's posting in December 2016 of a Draft List of MACRA Episode Groups and Trigger Codes and an accompanying document on episode-based cost measure development for the Quality Payment Program (together, the "December 2016 posting").[6,7] This draft list of episode groups and episode trigger codes served as a starting point for measure development.

Wave 1 of Measure Development (May 2017 – January 2018)

For Wave 1, which took place from May 2017 to January 2018, Clinical Subcommittees convened to provide structured clinical input on the components of episode-based cost measures, including refinements to the episode groups and episode trigger codes included in the December 2016 posting. Members were nominated through a Call for Clinical Subcommittee Nominations which was posted on March 17, 2017 and closed on April 24, 2017. Wave 1 included seven Clinical Subcommittees with a total of 148 members affiliated with 98 professional societies, as summarized in Table 1 below. These Clinical Subcommittees selected and developed eight episode-based cost measures.

Table 1. Information on the Seven Wave 1 Clinical Subcommittees

Clinical Subcommittee	Episode-Based Cost Measure(s)	# of CS Members	# of Affiliated Specialty Societies
Cardiovascular Disease Management	• Elective Outpatient Percutaneous Coronary Intervention (PCI) • ST-Elevation Myocardial Infarction (STEMI) with PCI	39	29
Gastrointestinal Disease Management - Medical and Surgical	• Screening/Surveillance Colonoscopy	35	23
Musculoskeletal Disease Management - Non-Spine	• Knee Arthroplasty	28	27
Neuropsychiatric Disease Management	• Intracranial Hemorrhage or Cerebral Infarction	24	32
Ophthalmologic Disease Management	• Routine Cataract Removal with Intraocular Lens (IOL) Implantation	10	11
Peripheral Vascular Disease Management	• Revascularization for Lower Extremity Chronic Critical Limb Ischemia	22	19
Pulmonary Disease Management	• Simple Pneumonia with Hospitalization	22	23

These eight episode-based cost measures were field tested in October – November 2017, refined by the Clinical Subcommittees, and considered with additional public comment opportunities before being proposed for use in MIPS. The measures were included in the 2017 Measures Under Consideration (MUC) List for public comment. The measures and public

[6] CMS, "Draft List of MACRA Episode Groups and Trigger Codes", *MACRA Feedback Page* (December 2016), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/draft-list-of-care-episode-and-patient-condition-groups-and-codes.zip

[7] CMS, "Episode-Based Cost Measure Development for the Quality Payment Program", *MACRA Feedback Page* (December 2016), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/Episode-Based-Cost-Measure-Development-for-the-Quality-Payment-Program.pdf

comments were considered by the Measure Applications Partnership (MAP) Clinician Workgroup, followed by another public comment period. The MAP Coordinating Committee reviewed the measures and input received, and confirmed a final recommendation of conditional support for rulemaking.[8] Taking this recommendation into consideration, the eight cost measures were proposed for use in the MIPS cost performance category in the Calendar Year (CY) 2019 Physician Fee Schedule (PFS) Proposed Rule, which was open for public comment from July 27 to September 10, 2018.[9]

Wave 2 of Measure Development (April – December 2018)

Acumen refined the Clinical Subcommittee process based on feedback from the Wave 1 Clinical Subcommittee members before beginning Wave 2.

Key Updates to Clinical Subcommittee Process for Wave 2 in 2018

- Created smaller, measure-specific workgroups within each Clinical Subcommittee.
  - The Clinical Subcommittees set the overall direction of measure development: they chose the measure(s) to develop and provided input on the composition of workgroups.
  - The workgroups provided detailed input into each component of the cost measure that the Clinical Subcommittee selected for development.
- Expanded the nomination process, holding a six-week nomination period and accepting nominees after the closing date into a standing pool. This allowed the opportunity to draw from the standing pool to compose balance workgroups with targeted expertise on the selected measure for development.
- Held two sets of in-person meetings: one for the Clinical Subcommittees in April 2018 and one for the workgroups in June 2018.

Members were nominated through a Call for Clinical Subcommittee Nominations which was posted on February 6 and closed on March 20, 2018. Wave 2 included ten Clinical Subcommittees with a total of 267 members affiliated with more than 120 professional societies, as listed in Table 2 below along with the 11 episode-based cost measures that they selected for development in 2018.

Table 2. Information on the 10 Wave 2 Clinical Subcommittees

Clinical Subcommittee	Episode-Based Cost Measure(s)	# of CS Members	# of Affiliated Specialty Societies
Cardiovascular Disease Management	• Non-Emergent Coronary Artery Bypass Graft (CABG)	46	31
Gastrointestinal Disease Management - Medical and Surgical	• Femoral or Inguinal Hernia Repair • Lower Gastrointestinal Hemorrhage	52	32
Musculoskeletal Disease Management - Non-Spine	• Elective Primary Hip Arthroplasty	29	26

[8] "2018 MAP Clinicians – Final Report", *National Quality Forum* (March 2018) http://www.qualityforum.org/Publications/2018/03/2018_MAP_Clinicians_-_Final_Report.aspx

[9] CY 2019 Physician Fee Schedule Proposed Rule (83 FR 35902 through 35905). https://www.federalregister.gov/d/2018-14985/p-1274 The CY 2019 PFS final rule is expected to be released in late 2018.

Clinical Subcommittee	Episode-Based Cost Measure(s)	# of CS Members	# of Affiliated Specialty Societies
Musculoskeletal Disease Management – Spine	• Lumbar Spine Fusion for Degenerative Disease, 1-3 Levels	22	19
Neuropsychiatric Disease Management	• Psychoses / Related Conditions	27	26
Oncologic Disease Management – Medical, Radiation, and Surgical	• Lumpectomy, Partial Mastectomy, Simple Mastectomy	40	32
Peripheral Vascular Disease Management	• Hemodialysis Access Creation	32	22
Pulmonary Disease Management	• Inpatient Chronic Obstructive Pulmonary Disease (COPD) Exacerbation	25	23
Renal Disease Management	• Acute Kidney Injury Requiring New Inpatient Dialysis	17	14
Urologic Disease Management	• Renal or Ureteral Stone Surgical Treatment	24	22

The Wave 2 Clinical Subcommittee members met in-person in April 2018 to select an episode group for development in 2018. They discussed the intended scope of the episode group and provided input on the necessary composition of the smaller, measure-specific workgroups that would be composed to provide detailed input on each component of the measures. Clinical Subcommittee members who were not part of a workgroup were encouraged to remain involved in the measure development process by reviewing materials for the workgroup and participating on discussion boards on a secure Web Portal.

1.3.2 Measure-Specific Workgroups

The measure-specific workgroups were made to be smaller groups in order to facilitate focused discussions that provide detailed input on each component of the episode-based cost measures. They were created based on feedback from the Wave 1 Clinical Subcommittees. These measure-specific workgroups comprised of clinicians with expertise directly relevant to the selected episode groups. Acumen worked with CMS to compose balanced workgroups reflecting the Clinical Subcommittees' suggestions of the specialties and types of expertise and experience that would be most relevant to the selected episode group and the clinicians who would be attributed the measure. Workgroup membership was composed by drawing from Clinical Subcommittee membership, and supplemented by additional clinicians, with additional outreach and from the standing pool of nominees.

The workgroups met in person in June 2018 to discuss measure specifications for all components of the measure, followed by a webinar in July/August 2018 for follow-up discussions on service assignment and risk adjustment. After field testing, the workgroups will revisit and refine the draft measure specifications in webinars in late 2018 based on the stakeholder feedback received.

Each measure-specific workgroup made detailed recommendations on the following: (i) the codes that will be used to open/trigger episodes, (ii) the length of the episode window, (iii) the sub-groups to compare like patients, (iv) the services whose costs are included in the cost measure, (v) the variables to include in the risk adjustment model, and (vi) the measure exclusion criteria.

Wave 2 included 11 workgroups with a total of 138 members affiliated with 79 professional societies, as listed in Table 3 below, along with the 11 episode-based cost measures chosen by the Clinical Subcommittees for development. The table also includes the short form name of each measure used in the file names of the Draft Measure Methodology and Draft Codes List files, which can be read alongside this document.

Table 3. Information on the 11 Measure-Specific Workgroups in Wave 2

Episode-Based Cost Measures [Short Form Name]	# of Workgroup Members	# of Affiliated Specialty Societies
Procedural		
Acute Kidney Injury Requiring New Inpatient Dialysis [aki_new_hd]	11	9
Elective Primary Hip Arthroplasty [el_ha]	15	14
Femoral or Inguinal Hernia Repair [fihr]	9	8
Hemodialysis Access Creation [hd_access]	12	9
Lumbar Spine Fusion for Degenerative Disease, 1-3 Levels [l_fusion]	13	13
Lumpectomy, Partial Mastectomy, Simple Mastectomy [lump_mast]	13	15
Non-Emergent Coronary Artery Bypass Graft (CABG) [ne_cabg]	14	14
Renal or Ureteral Stone Surgical Treatment [rn_stone]	12	9
Acute Inpatient Medical Condition		
Inpatient Chronic Obstructive Pulmonary Disease (COPD) Exacerbation [ip_copd]	13	14
Lower Gastrointestinal Hemorrhage [lgi_bleed]	13	11
Psychoses / Related Conditions [psych]	14	14

1.3.3 Technical Expert Panel

Acumen convened five TEP meetings to gather high-level guidance on measure development process from expert stakeholders. The advisory panel, which consists of 19 expert stakeholders representing specialty societies, academia, health care administration, and patient and family member organizations, was selected following a public call for nominations.[10] Each TEP meeting centered on particular topics to gather comprehensive feedback that could be operationalized throughout the episode group and cost measure development process. Table 4 below summarizes the five TEP meetings to date. Future TEP meetings are planned to gather essential expert input on topics such as chronic condition episode group development.

Table 4 MACRA Episode-Based Cost Measures TEP Meetings (August 2016 – May 2018)

Meeting Information	Date	Meeting Topics
TEP 1 (In-Person Meeting)	August 2016	• Concepts of episode-based cost measure development • Alignment of cost measures and quality measures • Prioritization of cost measures for development

[10] CMS, "Quality Measures Call for Technical Expert Panel Members," *CMS Measures Management System* (modified October 2017), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Technical-Expert-Panels.html

Meeting Information	Date	Meeting Topics
TEP 2 (In-Person Meeting)	December 2016	• Methodological approaches to cost measure development and service assignment for procedural and acute inpatient medical condition episode groups
TEP 3 (Webinar)	March 2017	• Clinical area prioritization into waves for future episode-based cost measure development (led by Acumen) • Alignment of cost measures and quality measures (led by Yale-New Haven Health Services Corporation, Center for Outcomes Research and Evaluation (CORE))
TEP 4 (In-Person Meeting)	August 2017	• Risk adjustment • Measure maintenance and re-evaluation for other cost measures (i.e., Medicare Spending Per Beneficiary (MSPB) measure for clinicians and the Total Per Capita Cost (TPCC) measure)
TEP 5 (In-Person Meeting)	May 2018	• Measure score reporting for episode-based cost measures • Incorporating person and family perspectives into the measure development process • Measure maintenance and re-evaluation for other cost measures (i.e., MSPB measure for clinicians and the TPCC measure)

1.3.4 Person and Family Committee

Acumen and its subcontractor, Westat, have been convening a PFC since spring 2017 to gather actionable input from patients and caregivers for the cost measure development process. The PFC comprises Medicare beneficiaries and caregiver/family members of a Medicare beneficiary who have experience with health care and/or patient advocacy, health care delivery, concepts of value, and outcomes that are important to patients across delivery/disease/episodes of care.

Throughout the measure development process, the PFC has provided different levels of input. Initial conversations with the PFC focused on the broad concepts of health care quality and value. Subsequent discussions focused on patient and caregiver perspectives on the types of episodes that should be prioritized for development. This feedback was summarized and provided to the Clinical Subcommittees for their consideration when selecting episode groups to develop in Wave 2.

The PFC also provided more detailed input on pre- and post-trigger periods, inclusion of services and costs for attributed clinicians, and services perceived as aiding recovery or helping to avoid unnecessary costs and complications. This feedback was specific to the type of care represented by the episode groups under development; for example, the PFC provided input on acute hospitalizations which the Inpatient COPD Exacerbation and Lower Gastrointestinal Hemorrhage measure-specific workgroups considered in the June 2018 in-person meetings and subsequent webinars. Acumen also gathered questions from the workgroup to bring back to the PFC.

The final round of PFC discussions for Wave 2 were conducted in September 2018. This involved interviews and focus groups for 5-9 PFC members per measure. PFC members had the opportunity to:

- Respond to patient experience questions raised by workgroup members; and

- Provide input on salient areas of measure development and refinement as identified by the workgroup chairs and Acumen's clinician team.

The input collected during these September 2018 interviews and focus groups will be shared with workgroup members for the Post-Field Test Refinement Webinars in late 2018. Future PFC meetings are planned to inform future cost measure development.

1.3.5 Stakeholder Feedback and Field Testing

CMS and Acumen sought and incorporated feedback from multiple public feedback periods over the course of the episode group and cost measure development process. Stakeholder feedback has been received through public comments during the formal rulemaking process (such as public comments on the CY 2018 Quality Payment Program proposed rule) as well as through other avenues.

Public Comments

To directly incorporate public feedback in the measure development process, Acumen created episode group-specific public comment summary reports, which were shared in May 2017 with Wave 1 Clinical Subcommittees and March 2018 with Wave 2 Clinical Subcommittees. These reports summarized feedback about specific episode groups from the following postings for public comment:

- CMS Episode Groups Posting in October 2015[11]
- Supplemental CMS Episode Groups Posting in April 2016[12]
- Posting of draft list of episode groups and trigger codes in December 2016[13]

A public comment summary report for the December 2016 Posting is available.[14,15]

Field Testing

Field testing allows the Centers for Medicare & Medicaid Services (CMS) to gather feedback on new episode-based cost measures and re-evaluated measures from clinicians and other stakeholders. CMS and Acumen conducted field testing for measures developed in Wave 1 from October 16 to November 20, 2017. During this time, clinicians and clinician groups who

[11] CMS, "CMS Episode Groups," *MACRA Feedback page* (October 2015), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/Episode-groups-summary.pdf
[12] CMS, "Supplemental CMS Episode Groups Posting," *MACRA Feedback Page* (April 2016), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/Supplemental-CMS-Episode-Groups-Posting.pdf
[13] CMS, "Draft List of MACRA Episode Groups and Trigger Codes", *MACRA Feedback Page* (December 2016), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/draft-list-of-care-episode-and-patient-condition-groups-and-codes.zip
[14] CMS, "Episode-Based Cost Measure Development for the Quality Payment Program: Public Comment Summary Report," *MACRA Feedback Page* (October 2017), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/Public-Comment-Summary-Report.pdf
[15] CMS, "Episode-Based Cost Measure Development for the Quality Payment Program: Public Comment Summary Report: Verbatim Comments," *MACRA Feedback Page* (October 2017), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/verbatim-comments-report.pdf

were attributed 10 or more episodes from at least one of the eight cost measures during the measurement period (June 1, 2016 to May 31, 2017) had the opportunity to view a report on the CMS Enterprise Portal with information about their performance. During field testing, a total of 973 Enterprise Identity Management (EIDM) users logged into this portal, selected the Cost Measure Field Testing option, and completed the required attestation language. These 973 EIDM users were associated with a total of 1,364 clinician group (TIN) level reports and 10,628 clinician (TIN-NPI) level reports.

During the field testing period, CMS and Acumen sought and collected feedback on the draft measure specifications for the eight measures that were in development in Wave 1 and on the supplemental documentation. Two National Provider Calls were held during field testing to engage stakeholders; both webinars covered the same content and across two webinars, approximately 1,000 people attended. CMS and Acumen received 219 submissions of stakeholder feedback during the field testing period through an online survey, including 53 comment letters. Acumen analyzed the episode group-specific field testing feedback and provided summary reports to the Clinical Subcommittees to inform post-field testing measure refinements. A field testing feedback summary report is publicly available.[16]

In January 2018, CMS posted the operational list of the Wave 1 episode-based cost measures.[17] This file outlines the final list of the Wave 1 episode group trigger codes after incorporating feedback from the October – November 2017 field testing.

For Wave 2, clinicians who receive a Field Test Report are encouraged to submit their feedback through an online field testing feedback survey.[18] CMS and Acumen encourages all stakeholders, including those who did not receive a Field Test Report, to review and provide feedback on the materials that are publicly posted.[19] The materials include: the Draft Cost Measure Methodology for each measure, the Draft Measure Codes List file for each measure, the FAQ document, a field testing Fact Sheet, and a mock Field Test Report.

[16] "Field Testing Feedback Summary Report for Eight MACRA Episode-Based Cost Measures," *Quality Payment Program* (June 2018), https://www.cms.gov/Medicare/Quality-Payment-Program/Resource-Library/2017-Field-testing-feedback-report.pdf

[17] CMS, "2018 Operational List of Care Episodes & Patient Condition Codes," *MACRA Feedback Page* (January 2018), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/2018-Operational-List-of-Care-Episode-and-Patient-Condition-Codes.zip

[18] Stakeholders can submit feedback through this online field testing feedback survey: https://www.surveymonkey.com/r/2018-macra-cost-measures-field-testing

[19] These materials are publically posted on the MACRA Feedback Page: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-Feedback.html

2.0 Components of Episode-Based Cost Measures

The measure development approach incorporates extensive stakeholder input on each component of the episode-based cost measures.

Episode-based cost measures have five essential components:

- Defining the episode group
- Attributing the episode group to the responsible clinician(s)
- Assigning costs to the episode group
- Risk adjusting episode group costs
- Aligning episode group costs with quality

The following sub-sections describe each component and summarize the process used for developing that component in Wave 2. Please see the Draft Cost Measure Methodology documents for further details on the construction of each episode-based cost measure.

2.1 Definition of the Episode Group

This sub-section describes the first component of episode-based cost measures: the definition of the episode group.

2.1.1 Description of this Component

Episodes are defined by the codes that trigger (or open) the episode, as these codes determine the patient cohort that is included in the episode group. These episode trigger codes are identifiable on Medicare claims in a patient's history and indicate the occurrence of the episode. To enable meaningful clinical comparisons, episode groups may also be divided into more granular, mutually exclusive episode sub-groups based on clinical criteria (e.g., information available on the beneficiary's trigger claim), wherever appropriate. Episode sub-groups are useful in ensuring clinical comparability so that the corresponding cost measure fairly compares clinicians with a similar patient case-mix. Sub-groups must be balanced against the need to have an adequate number of cases that can be attributed to a clinician.

2.1.2 Process for Developing this Component

The measure-specific workgroups provided detailed input on the episode trigger codes for the scope of the episode group selected by the Clinical Subcommittee for development. Using the episode trigger codes originally listed in the December 2016 posting as a starting point, Acumen sought workgroup volunteers to provide input on a set of trigger codes on which analyses were run and presented for discussion and a vote at the June in-person meetings. The workgroups will also have the opportunity to refine the episode triggers further after considering stakeholder feedback collected during field testing.

In advance of the June in-person meetings, workgroup members provided input via an online survey on sub-populations of patients that they believed the episode group should take into consideration to ensure clinical comparability. Acumen provided statistics on the frequency and costs associated with these different sub-populations for discussion during the in-person meeting. Members used this as a starting point to consider the appropriate method of accounting for these sub-populations of patients—by risk adjusting, creating sub-groups, excluding, or monitoring for field testing—and also identified other sub-populations of interest for further investigation.

Workgroup members provided their input via a poll, which Acumen's clinicians used as guidance on how to implement these sub-populations into the measure specifications. These were brought back to the workgroups for discussion with further analyses and confirmation of how the measure would account for each sub-population through a poll at a subsequent webinar.

2.2 Attribution of the Episode Group to Clinicians

The second component of a cost measure is attribution: the assignment of responsibility for episode costs.

2.2.1 Description of this Component

Episodes are attributed to a clinician based on the trigger event, and the attributed clinician is held responsible for the assigned costs of care during the episode window. Information from claims (i.e., services billed on the claim) are used to identify the clinician being considered for attribution.

Future attribution rules may also benefit from the implementation of patient relationship categories and codes. In April 2016, CMS posted a draft list of patient relationship categories for public comment, followed by the posting of a modified list for comment in December 2016 and an operational list in May 2017.[20] An FAQ document on patient relationship categories and codes is also publically available.[21] Beginning January 1, 2018, clinicians may voluntarily report their patient relationships on claims. As required by section 101(f) of MACRA, 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. During the voluntary reporting period, CMS will collect data on the use and submission of the patient relationship codes for validity and reliability testing before considering their potential future use in the attribution methodology for MIPS cost measures. Patient relationship categories and codes were not utilized during the development of this measure but may be used in conjunction with other claims-based attribution rules in the future.

2.2.2 Process for Developing for this Component

As a part of defining the episode group (Section 2.1 above), the Clinical Subcommittee considered the scope of the episode group, and provided input on the types of clinicians who should be on the measure-specific workgroup to reflect those who would be attributed the selected episode group. Workgroup members were also encouraged to consider which clinician(s) would likely be responsible for the costs and care during the episode when considering which episode trigger codes to select, given the types of clinicians who bill those codes.

The method of attribution is as follows:

- For procedural episode groups, the attributed clinician is the clinician billing the Part B Physician/Supplier (PB) claims for the service(s) provided during the trigger event.

[20] CMS, "Patient Relationship Categories and Codes," *MACRA Feedback Page,* https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-Feedback.html

[21] CMS, "MACRA Patient Relationship Categories and Codes: Frequently Asked Questions (FAQ)," *MACRA Feedback Page,* https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/Patient-Relationship-Categories-and-Codes-webinar-FAQ.PDF

- For acute inpatient medical condition episode groups, an episode is attributed (i) to a clinician group (identified by Taxpayer Identification Number, or TIN) if the TIN billed at least 30 percent of the inpatient evaluation and management (E&M) codes on identified PB claim lines during the trigger inpatient stay, and (ii) to a clinician (identified by unique within an attributed TIN if the clinician billed any of the inpatient E&M codes on identified PB claim lines during the inpatient stay.

For a detailed discussion of the attribution method, please see the Draft Cost Measure Methodology.[22]

2.3 Assignment of Costs to the Episode Group

This section describes the third component of episode-based cost measures: the assignment of costs (i.e., assignment of services) to the episode group.

2.3.1 Description of this Component

Services, and their respective Medicare costs, are assigned to the episode group if they are considered to be clinically related to the attributed clinician's role in managing patient care during an episode. Assigned services might include diagnostic services, treatment services, and ancillary items and services directly related to treatment (such as anesthesia for a surgical procedure), as well as services following the initial treatment period that may be rendered to patients as follow-up care. Services furnished as a consequence of care, such as complications, readmissions, unplanned care, and emergency department visits may also be included. The episode group does not include clinically unrelated services, such as care for a chronic condition that occurs in the episode window for a procedure or acute inpatient medical condition but is not related to the clinical management of the patient relative to the procedure or condition.

2.3.2 Process for Developing this Component

To inform the specifications for the assignment of costs to the episode group, workgroup members reviewed an analysis of the utilization and timing of all Medicare Parts A and B services in broad timeframes extending before and after the episode trigger. Using this and an initial set of categories of services that Acumen clinicians prepared for the in-person meetings, workgroup members discussed and provided input through a poll on whether services should be assigned to the episode group, the timeframe for assigning services relative to the episode trigger, and whether there should be any additional criteria. After the in-person meetings, Acumen clinicians used the Clinical Input Tool (CIT), a web-based tool developed by Acumen to specify an initial set of service assignment rules. At a subsequent webinar, Acumen clinicians asked targeted follow-up questions to members on topics where further discussion was needed. Acumen clinicians then used the input from this webinar to create the draft service assignment rules for the episode group.

The draft service assignment rules were used to determine episode costs for the Field Test Reports. After field testing, workgroups will have the opportunity to refine their decisions on service assignment rules and provide updated input after considering stakeholder feedback. Acumen clinicians will use this refined input to finalize the service assignment rules for the episode group. As a part of measure maintenance, service assignment rules will be revisited in

[22] "Draft Cost Measure Methodology" *MACRA Feedback Page* (October 2018), https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-Feedback.html

the future to ensure the codes for assigned services are up-to-date and remain clinically relevant.

2.4 Risk Adjustment

This section describes the fourth component of episode-based cost measures: risk adjustment.

2.4.1 Description of this Component

Risk adjustment aims to facilitate a more accurate comparison of cost across clinicians by adjusting for factors outside of the clinician's control that can influence spending such as a beneficiary's age and comorbidities. Risk adjustment aims to isolate the variation in clinicians' costs to Medicare to those costs that clinicians can reasonably influence. Accounting for these factors is one way to ensure the validity of cost measures and mitigate potential unintended consequences.

Similarly, certain patients or episodes with particular clinical characteristics may be excluded from episode-based cost measure calculation altogether. Exclusions remove a small, unique group of patients from cost measure calculation in cases where it may be both impractical and unfair to compare the costs of caring for these patients to the costs of caring for the cohort at large. Exclusions, like risk adjustment, help improve the validity of the cost measure by removing sources of variation outside of clinician control and prevent unintended consequences of measuring clinician cost performance when treating unique patient populations.

2.4.2 Process for Developing this Component

Acumen received broad feedback on risk adjustment used in episode-based cost measure calculation during the August 2017 TEP meeting. Acumen solicited TEP feedback on the proposed approach and materials used to gather workgroup input on risk adjustment and incorporated that feedback into the materials provided to the workgroup. Other recommendations gathered during the risk adjustment TEP will be evaluated by CMS and considered in future waves of episode-based cost measure development.

During the in-person meeting in June 2018, workgroup members discussed and provided input on how to account for patient sub-populations to create clinically homogenous groups of patients to allow for accurate comparisons of clinician performance (see section 2.1.2). Acumen clinicians used the input gathered through polls during the in-person meeting to create an initial set of risk adjustors. At a subsequent webinar, members were provided an analysis of Medicare claims specific to the measure to help identify which services and diagnoses occurring in the 120 days before an episode may predict high episode costs. Based on their review of this analysis, as well as their clinical experience and expertise, workgroup members shared their recommendations on the risk adjustment and exclusion specifications through polls. Workgroup members also considered whether any of the sub-populations needed further consideration or information; these were designated to be monitored and potentially revisited after field testing. The workgroup will also have the opportunity to further refine risk adjustors and measure exclusions after considering stakeholder feedback collected during field testing.

2.5 Alignment of Cost with Quality

This section describes the fifth and final component of episode-based cost measures: the alignment of cost with quality.

2.5.1 Description of this Component

This component involves the consideration of how to align cost measure performance with quality measures. Such quality measures include outcomes, processes of care, and patient engagement and experience. These quality measures need to be considered along with cost measures to ensure that clinicians throughout a patient's care trajectory are incentivized to provide high-value, patient-centered care, with the goal of mitigating potential unintended consequences. For instance, pairing cost measure performance with quality measures that share similar characteristics would allow for patient outcomes such as functional status and mortality to be interpreted alongside with cost.

2.5.2 Process for Developing this Component

To assist with the approach for aligning cost and quality, Acumen provided Clinical Subcommittee members with Episode Group Prioritization Workbooks, which highlighted areas for quality alignment, at the beginning of measure development activities in April 2018. These workbooks listed all procedural and acute inpatient medical condition episode groups within each Clinical Subcommittee's clinical area based on the draft list of episode groups and episode trigger codes from the December 2016 posting. The report then detailed which episode groups had potential to align with existing quality measures in the Quality Payment Program.

Members were able to refer to these workbooks to inform their input throughout the measure development process. For instance, the Clinical Subcommittees could use the alignment reports to consider the potential of episode groups to align with quality measures as a factor when selecting which episode group to develop. Members could also reference the detailed information about the specifications of a quality measure's patient cohort while making their recommendations on episode trigger codes for the episode-based cost measures.

Appendix

Tables A-1 through A-10 list the members of each Clinical Subcommittee along with their specialty, city, and state.[23] Clinical Subcommittee co-chairs are denoted with an asterisks (*).[24] The composition list of each measure-specific workgroup is included in each Draft Cost Measure Methodology document.

Table A-1. Composition of the Cardiovascular Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Adam Kingeter, MD	Anesthesiology	Nashville, TN
Alice Bell, PT, DPT	Physical Therapist	Alexandria, VA
Brad Sutton, MD, MBA	Cardiac Electrophysiology	Louisville, KY
Brian Ghoshhajra, MD, MBA	Diagnostic Radiology	Boston, MA
Connie Lewis, MSN, ACNP-BC, NP-C, CCRN, CHFN, FHFSA	Nurse Practitioner	Franklin, TN
Cynthia Cox, MS, MBA, NP-C, ACNS-BC	Certified Clinical Nurse Specialist	Loganville, GA
Daniel Kramer, MD, MPH	Cardiac Electrophysiology	Boston, MA
Dheeraj Mahajan, MD, FACP, CIC, CMD, CHCQM	Internal Medicine	Chicago, IL
Donna Kucharski, MD	Anesthesiology	Pittsburgh, PA
Elizabeth Schulwolf, MD	Internal Medicine	Chicago, IL
Ellen Hummel, MD	Hospice and Palliative Care	Ann Arbor, MI
Emily Zeitler, MD, MHS	Cardiac Electrophysiology	Durham, NC
Emran Rouf, MD, MBA, FACP	Internal Medicine	Temple, TX
Ewen Nicol, PA-C	Geriatric Medicine	Livonia, MI
Faisal Bakaeen, MD	Cardiac Surgery	Cleveland, OH
Frank Kim, MD	Interventional Cardiology	Quincy, IL
Heather Smith, PT, MPH	Physical Therapist	Alexandria, VA
Jaan Sidorov, MD	Internal Medicine	Harrisburg, PA
James Blankenship, MD, MHCM	Interventional Cardiology	Danville, PA
James Scharff, MD	Thoracic Surgery	St. Louis, MO
Jayesh Shah, MD	Internal Medicine	San Antonio, TX
*Jeff Rich, MD	Cardiac Surgery	Virginia Beach, VA
Jennifer Bracey, MD	Internal Medicine	Charleston, SC
Jeremy Collins, MD	Diagnostic Radiology	Chicago, IL
Kathleen Blake, MD, MPH	Cardiac Electrophysiology	Washington, DC
Keith Horvath, MD	Cardiac Surgery	Washington, DC
Linda Gillam, MD, MPH	Cardiology	Morristown, NJ
Lloyd W. Klein, MD	Cardiology	Chicago, IL
Maghee Disch, MSN, RN, CNL, CHFN, AACC	Cardiology	Washington, DC
Mark Drazner, MD, MSc	Cardiology	Dallas, TX
Martha Radford, MD	Cardiology	New York, NY
Marvin Konstam, MD	Cardiology	Boston, MA

[23] The Clinical Subcommittee list is current as of September 13, 2018.
[24] Co-chairs facilitated discussions and assisted in reaching consensus on cost measure development recommendations during Clinical Subcommittee meetings, webinars, and activities.

Name and Credentials	Specialty	City, State
Mary Bedell, ACNS-BC	Certified Clinical Nurse Specialist	Monrovia, CA
Matthew Crim, MD, MSc, MA	Cardiology	Athens, GA
Michael Malone, MD	Geriatric Medicine	Milwaukee, WI
Nathan Goldstein, MD	Hospice and Palliative Care	New York, NY
Nishant Shah, MD, MPH	Cardiology	Providence, RI
Pascha Schafer, MD	Cardiology	Augusta, GA
Peggy Kalowes, PhD, RN, CNS, FAHA	Certified Clinical Nurse Specialist	Long Beach, CA
Peter Rahko, MD	Cardiology	Madison, WI
Sanjay Samy, MD	Cardiac Surgery	Albany, NY
Shyam Bhakta, MD	Interventional Cardiology	Solon, OH
Suma Thomas, MD, MBA	Cardiology	Cleveland, OH
Susan Dresser, APRN-CNS	Certified Clinical Nurse Specialist	Edmond, OK
Susan Mayer, MD	Cardiology	Baltimore, MD
*William Van Decker, MD	Cardiology	Philadelphia, PA

Table A-2. Composition of the Gastrointestinal Disease Management – Medical and Surgical Clinical Subcommittee

Name and Credentials	Specialty	City, State
Amanda Chaney, APRN, FAANP	Nurse Practitioner	Jacksonville, FL
Ammar Sarwar, MD	Interventional Radiology	Boston, MA
Andrew Boryan, MD	Anesthesiology	Chambersburg, PA
Brett Bernstein, MD	Gastroenterology	New York, NY
C. Matthew Hawkins, MD	Interventional Radiology	Decatur, GA
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA
Carol Rees Parrish, MS, RD	Registered Dietitian or Nutrition Professional	Charlottesville, VA
*Caroll Koscheski, MD, FACG	Gastroenterology	Hickory, NC
Catherine Bauer, RN, MSN, CGRN	Gastroenterology	Kents Store, VA
Christopher Senkowski, MD	General Surgery	Savannah, GA
*Colleen Schmitt, MD, MHS	Gastroenterology	Chattanooga, TN
David Bernstein, MD	Gastroenterology	Manhasset, NY
Dawn Francis, MD	Gastroenterology	Jacksonville, FL
Donald Fry, MD	General Surgery	Chicago, IL
Edward Sun, MD	Gastroenterology	New York, NY
Eric Haas, MD	Colorectal Surgery	Houston, TX
Fasiha Kanwal, MD, MSHS	Gastroenterology	Houston, TX
Frances Wilson, RN, CNS-BC	Certified Clinical Nurse Specialist	Orange, CA
Gaurav Singhvi, MD, MBA	Gastroenterology	Los Angeles, CA
Gene Lambert, MD, MBA	Internal Medicine	Boston, MA
Glenn Littenberg, MD	Gastroenterology	Pasadena, CA
Guy Orangio, MD	Colorectal Surgery	New Orleans, LA
Helen Gelly, MD	Emergency Medicine	Marietta, GA
J. Brent Box, MD	Internal Medicine	Altamonte Springs, FL
James Richter, MD	Gastroenterology	Boston, MA
Jayme Lieberman, MD, MBA, FACS	General Surgery	Allentown, PA
Jeffrey Cohen, MD	Colorectal Surgery	Wethersfield, CT

Name and Credentials	Specialty	City, State
Jennifer Broder, MD	Diagnostic Radiology	Burlington, MA
Joel Brill, MD	Gastroenterology	Paradise Valley, AZ
John Howington, MD	Thoracic Surgery	Nashville, TN
Jonathan Gal, MD, FASA	Anesthesiology	New York, NY
Judy Dusek, DNP, MSN, APRN-CNS	Orthopedic Surgery	Wichita, KS
Lauren Beste, MD, MSc	Internal Medicine	Seattle, WA
Lukejohn Day, MD	Gastroenterology	San Francisco, CA
Manish Thapar, MD	Gastroenterology	Philadelphia, PA
Manjil Chatterji, MD	Diagnostic Radiology	New York, NY
Mark Levine, MD	Geriatric Medicine	Aurora, CO
Mark Savarise, MD	General Surgery	South Jordan, UT
Mary Bedell, ACNS-BC	Certified Clinical Nurse Specialist	Monrovia, CA
Mary Cathleen Shellnutt, DNP, RN, AGCNS-BC, CGRN	Gastroenterology	Plano, TX
Michael Volk, MD	Gastroenterology	Loma Linda, CA
Nishita Kothary, MD	Interventional Radiology	Stanford, CA
Ofor Ewelukwa, MD, MSc, DLSHTM	Gastroenterology	Houston, TX
Richard Dutton, MD, MBA	Anesthesiology	Dallas, TX
Salomao Faintuch, MD	Interventional Radiology	Boston, MA
Sarah Eakin, MD	Pathology	Erie, PA
Shazia Siddique, MD	Gastroenterology	Philadelphia, PA
Srinath Chinnakotla, MD, MBA	General Surgery	Minneapolis, MN
Steven Carpenter, MD	Gastroenterology	Savannah, GA
Susan Nedza, MD	Emergency Medicine	Chicago, IL
Vinod Rustgi, MD, MBA	Gastroenterology	New Brunswick, NJ
Walter Peters, MD, MBA	Colorectal Surgery	Dallas, TX

Table A-3. Composition of the Musculoskeletal Disease Management - Non-Spine Clinical Subcommittee

Name and Credentials	Specialty	City, State
Adam Rana, MD	Orthopedic Surgery	Falmouth, ME
*Adolph Yates, MD	Orthopedic Surgery	Pittsburgh, PA
Alex Limanni, MD	Rheumatology	Dallas, TX
*Andrew Gordon, MD, PhD	Physical Medicine and Rehabilitation	Silver Spring, MD
Anita Bemis-Dougherty, PT, DPT, MAS	Physical Therapist	Alexandria, VA
Bela Pandit, DPM	Podiatry	Chicago, IL
Daniel Moon, MD, MS, MBA	Orthopedic Surgery	Denver, CO
Daniel Wessell, MD, PhD	Diagnostic Radiology	Jacksonville, FL
David Jevsevar, MD, MBA	Orthopedic Surgery	Lebanon, NH
David Prologo, MD	Interventional Radiology	Atlanta, GA
Dennis Rivenburgh, MS, ATC, PA-C, DFAAPA	Sports Medicine	Cockeysville, MD
Dheeraj Mahajan, MD, FACP, CIC, CMD, CHCQM	Internal Medicine	Chicago, IL
Edward Mariano, MD, MAS	Anesthesiology	Palo Alto, CA
Harold Rees, MD	Orthopedic Surgery	Oak Park, IL

Name and Credentials	Specialty	City, State
Heather Smith, PT, MPH	Physical Therapist	Alexandria, VA
Jeremy Furniss, OTD, OTR/L, BCG	Occupational Therapist	Little Rock, AR
Judy Dusek, DNP, MSN, APRN-CNS	Orthopedic Surgery	Wichita, KS
Luis Rodriguez, MD	Sports Medicine	Miami, FL
Marc DeHart, MD	Orthopedic Surgery	San Antonio, TX
Mark Levine, MD	Geriatric Medicine	Aurora, CO
Michael Zychowicz, DNP	Nurse Practitioner	Durham, NC
Peter Sanderson, MD, MBA	Family Medicine	Stevens Point, WI
Phillip Ward, DPM	Podiatry	Bethesda, MD
Raymond Sullivan, MD	Orthopedic Surgery	Hartford, CT
Richard Dutton, MD, MBA	Anesthesiology	Dallas, TX
Robin Kamal, MD	Orthopedic Surgery	Redwood City, CA
Steven Schmitt, MD	Infectious Disease	Cleveland, OH
Susan Nedza, MD	Emergency Medicine	Chicago, IL
Vasili Karas, MD, MS	Orthopedic Surgery	Chicago, IL

Table A-4. Composition of the Musculoskeletal Disease Management - Spine Clinical Subcommittee

Name and Credentials	Specialty	City, State
Allen Chen, MD	Physical Medicine and Rehabilitation	New York, NY
Anand Rughani, MD	Neurosurgery	Cape Elizabeth, ME
Byron Schneider, MD	Physical Medicine and Rehabilitation	Nashville, TN
David Prologo, MD	Interventional Radiology	Atlanta, GA
*David Seidenwurm, MD, FACR	Diagnostic Radiology	Sacramento, CA
Erica Bisson, MD, MPH	Neurosurgery	Salt Lake City, UT
Gregory Nicola, MD	Diagnostic Radiology	Hackensack, NJ
Heather Smith, PT, MPH	Physical Therapist	Alexandria, VA
J. Mark Bailey, DO, PhD, FACN	Neurology	Birmingham, AL
Jay Nathan, MD	Neurosurgery	Ann Arbor, MI
John Caridi, MD	Neurosurgery	New York, NY
Jonathan Gal, MD, FASA	Anesthesiology	New York, NY
Kimberly Lenington, OTD, OTR/L	Occupational Therapist	Los Angeles, CA
Lawrence Frank, MD	Physical Medicine and Rehabilitation	Elmhurst, IL
Mark Levine, MD	Geriatric Medicine	Aurora, CO
Matthew Smith, MD, EMHL	Physical Medicine and Rehabilitation	East Greenwich, RI
Mohamad Bydon, MD	Neurosurgery	Rochester, MN
Morgan Lorio, MD, FACS	Orthopedic Surgery	Nashville, TN
Peter Sanderson, MD, MBA	Family Medicine	Stevens Point, WI
*Philip Schneider, MD	Orthopedic Surgery	Chevy Chase, MD
Steven Beer, MD	Neurosurgery	Cheyenne, WY
Virtaj Singh, MD	Physical Medicine and Rehabilitation	Seattle, WA

Table A-5. Composition of the Neuropsychiatric Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Alice Coombs, MD	Critical Care	Sharon, MA

Name and Credentials	Specialty	City, State
Allan Anderson, MD	Psychiatry	Cambridge, MD
Anand Rughani, MD	Neurosurgery	Cape Elizabeth, ME
Ann Hackman, MD	Psychiatry	Baltimore, MD
Bonnie Zima, MD, MPH	Psychiatry	Los Angeles, CA
C. Vaile Wright,	Clinical Psychologist	Washington, DC
Clemens Schirmer, MD, PhD, FAANS, FACS, FAHA	Neurosurgery	Wilkes-Barre, PA
Cynthia Peacock, MD	Internal Medicine	Houston, TX
Dale Schumacher, MD, MPH	Internal Medicine	Elkridge, MD
Dheeraj Mahajan, MD, FACP, CIC, CMD, CHCQM	Internal Medicine	Chicago, IL
Gregory Nicola, MD	Diagnostic Radiology	Hackensack, NJ
Heather Smith, PT, MPH	Physical Therapist	Alexandria, VA
Jennifer Cowart, MD	Internal Medicine	Jacksonville, FL
John Cook, MD	Internal Medicine	Leesburg, VA
*Joshua Hirsch, MD	Diagnostic Radiology	Boston, MA
Kathleen McCoy, DNSc, APRN, PMHNP-BC, FNP-BC, PMHCNS-BC, FAANP	Nurse Practitioner	McMinnville, TN
*Marc Raphaelson, MD	Neurology	Upperville, VA
Martin Radvany, MD	Interventional Radiology	Little Rock, AR
Melinda Lantz, MD	Psychiatry	New York, NY
Michael Flaum, MD	Psychiatry	Iowa City, IA
Michael Malone, MD	Geriatric Medicine	Milwaukee, WI
Naakesh Dewan, MD	Psychiatry	Palm Harbor, FL
Nicholas Breitborde, PhD	Clinical Psychologist	Columbus, OH
Patricia Lane, RN	Neurology	Midlothian, VA
Renee Kinder, CCC-SLP	Speech Language Pathologist	Lexington, KY
Sabrena McCarley, MBA-SL, OTR/L, CLIPP, RAC-CT	Occupational Therapist	Napa, CA
Tracy Murphy, AuD	Audiologist	Highland Park, IL

Table A-6. Composition of the Oncologic Disease Management - Medical, Radiation, and Surgical Clinical Subcommittee

Name and Credentials	Specialty	City, State
Aamir Siddiqui, MD	Plastic and Reconstructive Surgery	Detroit, MI
Aileen Chen, MD, MPP	Radiation Oncology	Boston, MA
Amanda Wheeler, MD	General Surgery	Stanford, CA
Amar Rewari, MD, MBA	Radiation Oncology	Rockville, MD
Andrew Boryan, MD	Anesthesiology	Chambersburg, PA
Anees Chagpar, MD, MSc, MPH, MA, MBA	Surgical Oncology	New Haven, CT
Anne Voss, PhD, RD	Registered Dietitian or Nutrition Professional	Palm Bay, FL
Brent Braveman, PhD, OTR/L, FAOTA	Occupational Therapist	Houston, TX
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA

Name and Credentials	Specialty	City, State
Deborah Schrag, MD, MPH	Medical Oncology	Boston, MA
Emeline Aviki, MD, MBA	Gynecological Oncology	New York, NY
Haejin In, MD, MBA, MPH	Surgical Oncology	New York, NY
Heather Smith, PT, MPH	Physical Therapist	Alexandria, VA
Hon Pak, MD, MBA	Dermatology	Clarksburg, MD
*Howard Rogers, MD, PhD	Dermatology	Mystic, CT
*James Gajewski, MD	Hematology-Oncology	Portland, OR
Jeffery Ward, MD	Medical Oncology	Edmonds, WA
Jon Ver Halen, MD, FACS	Plastic and Reconstructive Surgery	Dallas, TX
Kristina Newport, MD	Hospice and Palliative Care	Lancaster, PA
Lauren Golding, MD	Diagnostic Radiology	Winston-Salem, NC
Linda Barney, MD	General Surgery	Dayton, OH
Manjil Chatterji, MD	Diagnostic Radiology	New York, NY
Mark Levine, MD	Geriatric Medicine	Aurora, CO
Michael Hassett, MD, MPH	Medical Oncology	Boston, MA
Michael Kuettel, MD, MBA, PhD	Radiation Oncology	Buffalo, NY
Michele Ann Manahan, MD, FACS	Plastic and Reconstructive Surgery	Baltimore, MD
Miroslav Djokic, MD	Pathology	Pittsburgh, PA
Nader Massarweh, MD, MPH	Surgical Oncology	Houston, TX
Paul Wallner, DO	Radiation Oncology	Moorestown, NJ
Resmi Charalel, MD	Interventional Radiology	New York, NY
Richard Fine, MD, FACS	General Surgery	Memphis, TN
Robin Zon, MD, FACP, FASCO	Medical Oncology	South Bend, IN
Sarah Eakin, MD	Pathology	Erie, PA
Stephen Grubbs, MD, FASCO	Medical Oncology	Alexandria, VA
Stephen Schleicher, MD, MBA	Medical Oncology	Nashville, TN
Terry Sarantou, MD, FACS	General Surgery	Charlotte, NC
Therese Mulvey, MD	Medical Oncology	Boston, MA
Tracey Weisberg, MD	Medical Oncology	Portland, ME
Vance Broach, MD	Gynecological Oncology	New York, NY
Vicky Whelchel, APRN	Certified Clinical Nurse Specialist	Jonesboro, AR

Table A-7. Composition of the Peripheral Vascular Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Brad Johnson, MD	Vascular Surgery	Tampa, FL
Bryan Wells, MD, FACC, FSVM, FASE	Cardiology	Atlanta, GA
Caitlin Hicks, MD, MS	Vascular Surgery	Baltimore, MD
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA
Christopher Goltz, MD	Vascular Surgery	Flint, MI
Clemens Schirmer, MD, PhD, FAANS, FACS, FAHA	Neurosurgery	Wilkes-Barre, PA
Daniel Simon, MD	Interventional Radiology	Morristown, NJ
David Stroman, MD	Vascular Surgery	Fort Worth, TX
Demetrios Macris, MD	Peripheral Vascular Disease	San Antonio, TX
Dirk Hentschel, MD	Nephrology	Boston, MA
*Evan Lipsitz, MD, MBA	Vascular Surgery	Bronx, NY

Name and Credentials	Specialty	City, State
*Ezequiel Silva, MD	Interventional Radiology	San Antonio, TX
Frances Wilson, RN, CNS-BC	Certified Clinical Nurse Specialist	Orange, CA
Francesco Aiello, MD	Vascular Surgery	Worcester, MA
Jay Nathan, MD	Neurosurgery	Ann Arbor, MI
Jeffrey Martinez, MD	Peripheral Vascular Disease	San Antonio, TX
Jon Ver Halen, MD, FACS	Plastic and Reconstructive Surgery	Dallas, TX
Kimon Bekelis, MD	Neurosurgery	Lebanon, NH
Marc Robins, DO	Family Medicine	Pleasant Grove, UT
Marlin Schul, MD, RVT, FACPh, CPI	Emergency Medicine	Lafayette, IN
Martin Radvany, MD	Interventional Radiology	Little Rock, AR
Matthew Sideman, MD	Vascular Surgery	San Antonio, TX
Mitchell Weinberg, MD	Interventional Cardiology	Manhasset, NY
Patrick Ryan, MD	Vascular Surgery	Nashville, TN
Paula Shireman, MD, MS	Vascular Surgery	San Antonio, TX
Richard Gray, MD	Interventional Radiology	Philadelphia, PA
Robert Lookstein, MD	Interventional Radiology	New York, NY
Rocco Ciocca, MD	Vascular Surgery	Cleveland, OH
Susan Dresser, APRN-CNS	Certified Clinical Nurse Specialist	Edmond, OK
Timothy Pflederer, MD	Nephrology	Peoria, IL
Tushar Vachharajani, MD, FASN, FACP	Nephrology	Salisbury, NC
Yazan Duwayri, MD	Vascular Surgery	Atlanta, GA

Table A-8. Composition of the Pulmonary Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Aaron Cheng, MD	Thoracic Surgery	Seattle, WA
Akhilesh Sista, MD	Interventional Radiology	New York, NY
*Alice Coombs, MD	Critical Care	Sharon, MA
Amit Gupta, MD	Interventional Radiology	Stony Brook, NY
Amy Aronsky, DO	Pulmonary Disease	Hartford, CT
Bibb Allen, MD	Diagnostic Radiology	Birmingham, AL
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA
*Carolyn Fruci, MD	Pulmonary Disease	Fall River, MA
Chet McCauley, DNP, RN, ACNS-BC, CRN	Certified Clinical Nurse Specialist	Newport Beach, CA
Don Bukstein, MD	Allergy	Madison, WI
Gary Steven, MD, PhD	Allergy	Greenfield, WI
Gregg Pane, MD	Emergency Medicine	Washington, DC
Jamieson Wilcox, OTD, OTR/L	Occupational Therapist	Los Angeles, CA
Jayesh Kanuga, MD	Allergy	Edison, NJ
Jennifer Bracey, MD	Internal Medicine	Charleston, SC
Judy Dusek, DNP, MSN, APRN-CNS	Orthopedic Surgery	Wichita, KS
Katherine Courtright, MD, MS	Pulmonary Disease	Philadelphia, PA
Kathleen Ellstrom, PhD, ACNS-BC	Pulmonary Disease	Grand Terrace, CA
Manjil Chatterji, MD	Diagnostic Radiology	New York, NY
Rob Zipper, MD	Internal Medicine	Bend, OR
Salomao Faintuch, MD	Interventional Radiology	Boston, MA
Sarah Eakin, MD	Pathology	Erie, PA

Name and Credentials	Specialty	City, State
Aaron Cheng, MD	Thoracic Surgery	Seattle, WA
Sarah Peterson, PhD, RD	Pulmonary Disease	Chicago, IL
Shannon Butkus, PhD, CCC-SLP	Speech Language Pathologist	Houston, TX
Taison Bell, MD	Critical Care	Charlottesville, VA

Table A-9. Composition of the Renal Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA
Daniel Lam, MD	Nephrology	Seattle, WA
*David Roer, MD, FACP, FASH, FASN	Nephrology	Middlebury, CT
Devika Nair, MD	Nephrology	Nashville, TN
*Eileen Brewer, MD, FAAP	Pediatric Medicine	Houston, TX
Geoffrey Teehan, MD, MS, FACP	Nephrology	Wynnewood, PA
Jaan Sidorov, MD	Internal Medicine	Harrisburg, PA
Jane Schell, MD	Hospice and Palliative Care	Pittsburgh, PA
Jennifer Scherer, MD	Hospice and Palliative Care	New York, NY
Jessie Pavlinac, MS, RD	Registered Dietitian or Nutrition Professional	Portland, OR
Manjil Chatterji, MD	Diagnostic Radiology	New York, NY
Namirah Jamshed, MD	Geriatric Medicine	Dallas, TX
Prasad Shankar, MD	Diagnostic Radiology	Ann Arbor, MI
Salomao Faintuch, MD	Interventional Radiology	Boston, MA
Scott Bieber, DO	Nephrology	Seattle, WA
Srinath Chinnakotla, MD, MBA	General Surgery	Minneapolis, MN
Terry Ketchersid, MD, MBA	Nephrology	Waltham, MA

Table A-10. Composition of the Urologic Disease Management Clinical Subcommittee

Name and Credentials	Specialty	City, State
Adam Weinstein, MD	Nephrology	Stevensville, MD
Alec Koo, MD	Urology	Hermosa Beach, CA
Ammar Sarwar, MD	Interventional Radiology	Boston, MA
Andrew Rosenkrantz, MD, MPA	Diagnostic Radiology	New York, NY
Brian Matlaga, MD, MPH	Urology	Baltimore, MD
C. Ryan Barnes, MD	Urology	Richmond, VA
Carlos Ledezma, MD	Interventional Radiology	Palm Springs, CA
Darryl Zuckerman, MD	Interventional Radiology	St. Louis, MO
Deborah Kaye, MD, MSc	Urology	Ann Arbor, MI
Frances Wilson, RN, CNS-BC	Certified Clinical Nurse Specialist	Orange, CA
Jaime Long, MD	Obstetrics & Gynecology	West Reading, PA
*Jeremy Shelton, MD, MSHS	Urology	Los Angeles, CA
Juana Hutchinson-Colas, MD	Obstetrics & Gynecology	Teaneck, NJ
Kevin McVary, MD	Urology	Springfield, IL
Lindsey Herrel, MD, MS	Urology	Ann Arbor, MI
Louis Potters, MD, FACR, FASTRO	Radiation Oncology	Lake Success, NY
Michael MacKinnon, MSN, FNP-C, CRNA	Certified Registered Nurse Anesthetist	Show Low, AZ

Name and Credentials	Specialty	City, State
Parth Modi, MD	Urology	Ann Arbor, MI
Purushottam Dixit, MD	Interventional Radiology	Royal Oak, MI
Richard Dutton, MD, MBA	Anesthesiology	Dallas, TX
Robert Dowling, MD	Urology	Ocala, FL
Ronald Chen, MD, MPH	Radiation Oncology	Chapel Hill, NC
Sarah Eakin, MD	Pathology	Erie, PA
*Tanaz Ferzandi, MD, MBA, MA	Urology	Boston, MA