2023 Measure Updates and Specifications Report
Hospital Outpatient Quality Reporting Program

Risk-Standardized Hospital Visits within 7 Days After Outpatient Surgery Measure – Version 7.0
Admissions and Emergency Department Visits for Patients Receiving Outpatient Chemotherapy – Version 7.0
Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy – Version 9.0

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1. HOW TO USE THIS REPORT

This report describes updates that have been made in 2023 to the following measures: Risk-Standardized Hospital Visits within 7 Days After Outpatient Surgery Measure (henceforth referred to as the surgery measure), Admissions and Emergency Department Visits for Patients Receiving Outpatient Chemotherapy (henceforth referred to as the chemotherapy measure), and Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy (henceforth referred to as the colonoscopy measure) during annual reevaluation. The report provides background information about each measure and its development, a description of each update made since the 2022 Measure Updates and Specifications Report was released and overall measure results. Summarized updates to these measures from prior years can be found in Appendices B through D.

Specifically, in addition to this section, the report includes the following sections:

- **Section 2 – Background and Overview of Measure Methodology**
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The Appendices contain detailed measure information, including:

- **Appendix A:** Statistical approach to calculating the facility-specific risk-standardized hospital visit ratio;
- **Appendices B-D:** Summary of annual updates to the measure by year;
- **Appendix E:** Detailed description of the PAA.

The report frequently references the measure data dictionaries for detailed coding; these dictionaries are available at: https://qualitynet.cms.gov/ > Hospitals - Outpatient > Measures > Surgery Measure; Hospitals - Outpatient > Measures > Chemotherapy Measure; or Hospitals - Outpatient > Measures > Colonoscopy Measure. For additional references, the original measure technical reports are available on CMS's Hospital Quality Initiative Measure Methodology page.

2. BACKGROUND AND OVERVIEW OF MEASURE METHODOLOGIES

2.1. Background on Measures

The Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation (YNHHSC/CORE) developed these measures for the Centers for Medicare and Medicaid Services (CMS) under a contract supporting the development of hospital outpatient and ambulatory care outcome measures. CMS contracted with CORE to reevaluate these measures annually and make improvements based on stakeholder input and to incorporate advances in science and/or changes in coding. The 2023 updates described in this report were made in preparation for public reporting for the calendar year (CY) 2022 performance period (surgery and chemotherapy measure), 2020-2022 performance period (colonoscopy measure), and 2025 payment determination (January 2025 public reporting) in the Hospital Outpatient Quality Reporting (OQR) Program. For the measure specifications used for prior performance periods, please see the prior versions of the measure updates and specifications report. Section 3 describes a performance period modification due to the COVID-19 public health emergency.

Each measure has been reviewed and revised as summarized below.

Surgery Measure

In the CY 2017 Hospital Outpatient Prospective Payment System (OPPS) final rule, CMS added the surgery measure for CY 2020 payment determination in the Outpatient Quality Reporting (OQR) program. In 2017, CMS held a national confidential reporting period (dry run) for the measure in preparation for future OQR public reporting. During this dry run, CMS provided non-federal acute care hospital outpatient departments (HOPDs) with their results on the surgery measure. The surgery measure received Consensus Based Entity (CBE) endorsement in 2015 (CBE ID #2687) and was re-endorsed in 2020.

Chemotherapy Measure

In the CY 2017 OPPS final rule, CMS added the chemotherapy measure for implementation in the Outpatient Quality Reporting (OQR) program. In 2017, CMS held a national, confidential reporting period (dry run) for the measure in preparation for future OQR public reporting. During this dry run, CMS provided non-federal acute care HOPDs with their results on the chemotherapy measure. The chemotherapy measure received CBE endorsement in 2019 (CBE ID #3490).

Colonoscopy Measure

In the CY 2017 OPPS final rule, CMS added the colonoscopy measure for implementation in the OQR program. In 2015, CMS held a national, confidential reporting period (dry

run) for the measure in preparation for future OQR public reporting. During this dry run, CMS provided non-federal acute care HOPDs with their results on the colonoscopy measure. The colonoscopy measure received CBE endorsement in 2014 (CBE ID #2539) and was re-endorsed in 2020.

2.2. Overview of Measure Methodologies

This section provides a high-level summary of the current measure specifications, including updates from the 2022 reevaluation, which are discussed in detail in Section 3, Section 5, and Section 7.

Surgery Measure

This measure was developed to improve the quality of care delivered to patients undergoing hospital outpatient surgeries. To assess quality, the measure calculates the risk-standardize rate of return to a hospital for an unplanned hospital visit within seven days of an outpatient surgery or procedure. It includes a broad group of surgeries and procedures. The surgery measure includes all non-federal acute care HOPDs that performed qualifying surgeries during the performance period. Further information on the measure development process is available in the Hospital Visits After Hospital Outpatient Surgeries: Measure Technical Report (2014) and 2016 Technical Report Addendum, available on CMS's Hospital Quality Initiative Measure Methodology page, and in literature.[1]

Chemotherapy Measure

This measure was developed to assess the quality of care provided to cancer patients receiving outpatient chemotherapy and to inform quality improvement efforts to reduce potentially preventable inpatient hospital admissions and emergency department (ED) visits for this population. The measure calculates the risk-standardize rates of return for an unplanned hospital admission or ED visit within 30 days of outpatient chemotherapy treatment. The rates are calculated and reported separately for hospital admissions and ED visits. The measure includes all non-federal acute care HOPDs excluding PPS-exempt cancer hospitals. Further information on the measure development process is available in the 2016 Measure Technical Report available on CMS's Hospital Quality Initiative Measure Methodology page.

Colonoscopy Measure

This measure was developed to improve the quality of care delivered to patients undergoing outpatient colonoscopy procedures. To assess quality, the measure calculates the risk-standardize rate of return to a hospital for an unplanned hospital visit within seven days of an outpatient colonoscopy. The measure was developed for all non-federal acute care HOPDs and ambulatory surgical centers (ASCs) that performed

qualifying colonoscopies during the performance period. However, the measure scores are calculated separately for each facility type; in this report we apply the measure to HOPDs only. Further information on the measure development process is available in the 2014 Measure Technical Report available on CMS's Hospital Quality Initiative Measure Methodology page, and in literature.[2]

2.2.1. Cohorts for Each Measure

Surgery Measure Inclusion Criteria

The target population is low- to moderate-risk surgeries that can be safely performed as same-day surgeries and do not typically require an overnight stay or an inpatient admission. It includes:

- Surgeries and procedures that are substantial and are typically performed as same-day surgeries.
  Rationale: We define same-day surgeries using the CMS's list of covered ambulatory surgery center (ASC) procedures. The list is comprised of procedures for which the patients are expected to return home the same day as their procedure. The measure includes two subsets of surgeries and procedures from the covered ASC procedures list that are identified using the Global Surgical Package indicator:
  - "Substantive" surgeries performed at HOPDs (except eye surgeries).
    Rationale: Ambulatory procedures include a heterogeneous mix of non-surgical procedures, minor surgeries, and more substantive surgeries. The measure targets substantive surgeries but not very low-risk (minor) surgeries or non-surgical procedures, which typically have a high volume and a very low outcome rate. The measure defines substantive procedures using the Medicare Physician Fee Schedule (MPFS) global surgery indicator (GSI) code 090.*
  - Cystoscopy procedures with intervention.
    Rationale: All endoscopy procedures are considered non-surgical procedures based on Medicare coding (GSI code 000). However, the measure includes cystoscopy with intervention because it is a common procedure, often performed for therapeutic intervention

* GSI identifies complexity of a surgery and follow-up care based on Work Relative Value Units (RVUs). Procedures coded "000" are endoscopies or some minor surgical procedures, where no follow-up care is anticipated and covered in a bundled payment. Procedures coded "090" are major surgeries, where follow-up care during the 90-day post-operative period is covered in Medicare's bundled payment. More information on the GSI codes is available in the Global Surgery Booklet. More information on RVUs is available CMS.gov website.

by surgical teams, and the outcome rate and reasons for post-procedure hospital visits are like those for surgeries in the measure cohort.

Please refer to the 2023 Surgery Measure Data Dictionary tab named "*HOPD Surg Cohort*" to review the list of qualifying same-day surgeries, including cystoscopy procedures with intervention. The data dictionary tab *"HOPD Surg Eye Exclusions"* provides the list of eye surgeries that are excluded from the measure cohort.

- Surgeries on patients aged 65 or over.
  Rationale: Medicare beneficiaries under age 65, typically, are a highly diverse group with a higher burden of disability, and it is therefore difficult to adequately risk adjust for the under 65 population.
- When multiple procedures occur concurrently, only surgeries that are not performed concurrently with a high-risk procedure are included.
  Rationale: Occasionally, more than one surgery may be performed and some of these surgeries may be higher-risk procedures. When multiple procedures occur, the measure only includes surgeries that are not performed concurrently with high-risk procedures. Please refer to the 2023 Surgery Measure Data Dictionary "*HOPD Surg High Risk Excl"* tab to review the list of high-risk procedures. High-risk procedures are identified using the Hospital OPPS Addendum B.[3] A procedure is considered high-risk if it is flagged as Inpatient only (Not paid under OPPS) or Outpatient Only (Paid under OPPS, but not on the list of ASC approved procedures). Removal of these procedures aids with alignment of the measure's restriction to only include ASC-covered procedures.
- Surgeries for patients with continuous enrollment in Medicare Fee-for-Service (FFS) Parts A and B in the 12 months prior to the surgery.
  Rationale: Patients with full enrollment have all claims available for identifying comorbidities for risk adjustment.

Surgery Measure Exclusion Criteria

- Surgeries for patients without continuous enrollment in Medicare FFS Parts A and B in the seven days after the surgery.
  Rationale: We exclude these patients to ensure all patients have full data available for outcome assessment.
- Surgeries for patients who have an ED visit on the same day but billed on a separate claim, unless the ED visit has a diagnosis indicative of a complication of care.
  Rationale: It is unclear whether a same-day ED visit occurred before or after an eligible same-day surgery. However, the measure does not exclude surgeries with same-day, separate-claim ED visits if the diagnoses are

indicative of a complication of care because hospital visits for complications are unplanned and are indicative of quality.

- Surgeries that are billed on the same hospital claim as an ED visit and that occur on the same calendar day, unless the ED visit has a diagnosis indicative of a complication of care.
  Rationale: In these situations, it is not possible to use claims data to determine whether the surgery was the cause of, subsequent to, or during the ED visit. However, if the ED visit is coded with a diagnosis for a complication, the assumption is that it occurred after the surgery.
- Surgeries that are billed on the same hospital outpatient claim and that occur after the ED visit.
  Rationale: The surgery could be subsequent to the ED visit and may not represent a routine surgery.
- Surgeries that are billed on the same outpatient claim as an observation stay.
  Rationale: We do not include these cases in the calculation because the sequence of events is not clear.

Chemotherapy Measure Inclusion Criteria

The target population for this measure is Medicare FFS patients aged 18 years or older at the start of the performance period with a diagnosis of cancer receiving chemotherapy treatment in a hospital outpatient setting.

The measure includes patients meeting the following criteria:

- Patients who are aged 18 years or older at the start of the performance period;
- Patients with a cancer diagnosis; and
- Patients receiving chemotherapy in an outpatient setting.

In contrast to the surgery measure, this measure includes all adult patients, rather than only those aged 65 or older. In all measures, it is ideal to include the broadest cohort possible to incentivize better quality for the widest group of patients, and for this measure focused on cancer patients it is less technically difficult to adjust for differences in case mix than in the broad surgery measure.

Cancer diagnoses are identified using International Classification of Disease, Tenth Revision diagnosis (ICD-10-CM) codes from inpatient, outpatient, or Part B claims during the performance period (see the "*Chemo Denominator*" tab in the 2023 Chemotherapy Measure Data Dictionary for codes). These codes identify a clinically coherent group of patients with cancer using diagnoses from all available Medicare Part A and B claims during the performance period. We identify chemotherapy treatment using Healthcare Common Procedure Coding System (HCPCS)/Common Procedural Terminology® (CPT®) procedure and medication procedure codes, ICD-10-CM chemotherapy encounter diagnosis

codes, and ICD-10-PCS codes, or revenue center codes for chemotherapy administration (see 2023 Chemotherapy Measure Data Dictionary for codes). In addition, we use specific ICD-10-CM procedure codes on inpatient claims to identify chemotherapy services subject to the CMS three-day billing rule.[†] These codes identify a clinically coherent group of patients undergoing outpatient chemotherapy treatment.

We do not include oral chemotherapy because it is challenging to identify oral chemotherapy administrations without using pharmacy claims data, which is not available for all Medicare recipients; furthermore, most oral chemotherapies are associated with fewer adverse reactions that result in acute care use.

Chemotherapy Measure Exclusion Criteria

The measure excludes:

- Patients with a diagnosis of leukemia at any time during the performance period.
  Rationale: We exclude patients with leukemia from the measure cohort because the high toxicity of treatment and recurrence of disease leads to admissions among this population that do not reflect the quality of outpatient care. Patients with leukemia have an expected admission rate due to frequent relapse, which is not the type of admission the measure intends to capture. We identify leukemia diagnoses using ICD-10-CM diagnosis codes from inpatient, outpatient, or Part B claims during the performance period (see "*Chemo Denom Exclusions*" tab in the 2023 Chemotherapy Measure Data Dictionary).
- Patients who were not enrolled in Medicare FFS Parts A and B in the year before any outpatient chemotherapy treatment during the performance period.
  Rationale: The measure excludes these patients to ensure that complete patient diagnosis data will be available for the risk-adjustment model, which uses the year before the first chemotherapy treatment during the period to identify comorbidities.
- Patients who do not have at least one outpatient chemotherapy treatment followed by continuous enrollment in Medicare FFS Parts A and B in the 30 days after the treatment.

[†] The policy states that outpatient services, including some non-diagnostic services such as chemotherapy, provided by a hospital or any Part B entity wholly owned or wholly operated by a hospital (such as an HOPD) in the three calendar days before a patient's inpatient admission are considered related to the admission. For outpatient chemotherapy treatments subject to the 3-day payment policy, the outpatient chemotherapy service should be bundled and billed with the inpatient claim.

Rationale: The measure excludes these patients to ensure that full data will be available for outcome assessment.

- Cases in which patients receive chemotherapy to treat conditions other than cancer, such as treatment of auto-immune diseases.
  Rationale: The measure is intended to assess the quality of care provided to cancer patients receiving outpatient chemotherapy. Cases are identified using ICD-10, HCPCS, and CPT® chemotherapy codes and ICD-10 diagnoses for auto-immune diseases (see "*Chemo Denom Exclusions*" tab in the 2023 Chemotherapy Measure Data Dictionary for full list).

Colonoscopy Measure Inclusion Criteria

The target population for this measure is Medicare FFS patients aged 65 years or older undergoing outpatient colonoscopies. It includes:

- Patients undergoing routine (not high-risk) colonoscopies, identified using HCPCS codes and CPT® codes (see 2023 Colonoscopy Measure Data Dictionary). Qualifying colonoscopy procedures were not included in the measure if they were concurrently billed with a high-risk colonoscopy procedure code (see 2023 Colonoscopy Measure Data Dictionary tab "*Colonos Cohort*").
  Rationale: These codes identify a clinically coherent group of patients undergoing low-risk outpatient colonoscopy for colorectal cancer screening, diagnostic evaluation for symptoms and signs of disease, and biopsies or removal of pre-cancerous lesions or polyps.
- Patients aged 65 or over at the time of the procedure.
  Rationale: Medicare beneficiaries under age 65 typically are a highly diverse group with a higher burden of disability, and it is therefore difficult to adequately risk adjust for the under 65 population.
- Patients with continuous enrollment in Medicare FFS Parts A and B in the 12 months prior to the procedure.
  Rationale: Patients with full enrollment have all claims available for identifying comorbidities for risk adjustment.

Colonoscopy Measure Exclusion Criteria

The exclusions for the colonoscopy measure are narrowly targeted and necessary to ensure that the cohort is clinically coherent, and that complete data are available to capture outcomes that occur following the colonoscopy. The measure's exclusions rely on clinical rationale and prevent unfair distortion of performance results.

The measure excludes:

- Procedures for patients who lack continuous enrollment in Medicare FFS Parts A and B in the seven days after the procedure.
  Rationale: We exclude these patients to ensure all patients have full data available for outcome assessment.
- Colonoscopies that occur concurrently with high-risk upper gastrointestinal (GI) endoscopies.
  Rationale: Patients undergoing concurrent high-risk upper GI endoscopies, such as upper GI endoscopies for control of bleeding or treatment of esophageal varices, are at higher risk for subsequent hospital visits than patients undergoing a typical colonoscopy. Patients undergoing these procedures are often unwell and have a higher risk profile than typical colonoscopy patients. Please refer to the 2023 Colonoscopy Data Dictionary tab *"Colonos Exclusions"* to review the list of codes used to identify these conditions.
- Colonoscopies for patients with a history of inflammatory bowel disease (IBD) or diverticulitis in the year preceding the colonoscopy, or a diagnosis of these conditions at the time of the index colonoscopy and/or on a claim for a hospital visit within seven days of the colonoscopy.
  Rationale: Patients with a history or diagnosis of IBD or diverticulitis at the time of colonoscopy often include both stable and actively unwell patients, and we likely could not fully characterize and adjust for their pre-procedure risk of needing a post-procedure hospital visit. Post-procedure admissions for IBD or diverticulitis are indicative of active disease at the time of the colonoscopy and are thus also used to exclude these types of patients. Please refer to the 2023 Colonoscopy Data Dictionary tab *"Colonos Exclusions"* to review the list of codes used to identify these conditions.
- Colonoscopies followed by a subsequent outpatient colonoscopy procedure within seven days.
  Rationale: In these situations, the two colonoscopies are considered part of a single episode of care, for which the subsequent colonoscopy is considered the index procedure.

In addition, for colonoscopies performed at HOPDs, the measure excludes:

- Colonoscopies that occur on the same day and at the same hospital as an ED visit that is billed on a different claim than the index colonoscopy, unless the ED visit has a diagnosis indicative of a complication of care.[‡]
  Rationale: It is unclear whether the colonoscopy or ED visit occurred first. If

[‡] Complications of care are defined by four Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) categories: CCS 238: Complications of surgical procedures or medical care; CCS 257: Other aftercare; CCS 2616: Adverse effects of medical care; or CCS 2617: Adverse effects of medical drugs and one ICD-10 diagnosis code: G8918: Acute postprocedural pain

the ED visit is coded with a diagnosis indicative of a complication of care, the measure assumes the ED visit occurred after the colonoscopy procedure and is counted in the measure. It is unlikely that a patient would experience an ED visit for an acute diagnosis at one facility and then travel to another facility for a routine colonoscopy on the same day. Accordingly, ED visits billed on the same day as a colonoscopy but at a different facility are included because they likely represent a routine procedure followed by a complication of care.

- Colonoscopies that are billed on the same hospital claim as an ED visit and that occur on the same calendar day, unless the ED visit has a diagnosis indicative of a complication of care.[§]
  Rationale: In these situations, it is not possible to use claims data to determine whether the colonoscopy was the cause of, subsequent to, or during the ED visit. However, if the ED visit is coded with a diagnosis for a complication, the assumption is that it occurred after the colonoscopy procedure.
- Colonoscopies that are billed on the same hospital outpatient claim and that occur after the ED visit.
  Rationale: In these situations, we assume that the colonoscopy was subsequent to the ED visit and may not represent a routine colonoscopy procedure. Timing of the ED visits is determined using revenue center dates from the outpatient claim.
- Colonoscopies that are billed on the same hospital outpatient claim as an observation stay.
  Rationale: In these situations, it is not possible to use claims data to determine whether the colonoscopy was the cause of, subsequent to, or during the observation stay.

2.2.2. Outcome

Surgery Measure

The outcome is any (one or more) unplanned hospital visits to a Rural Emergency Hospital, Critical Access Hospital (CAH), or other acute care facility within seven days of an outpatient surgery. A hospital visit includes any ED visit, observation stay, or unplanned inpatient admission. This includes FFS patients who are

[§] Complications of care are defined by four Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) categories: CCS 238: Complications of surgical procedures or medical care; CCS 257: Other aftercare; CCS 2616: Adverse effects of medical care; or CCS 2617: Adverse effects of medical drugs and one ICD-10 diagnosis code: G8918: Acute postprocedural pain

admitted directly following the surgery or are discharged home and within seven days return to the hospital with an unplanned hospital visit.

Unplanned Hospital Visits

- Inpatient admissions directly following surgery.
  Rationale: The measure includes admissions directly after surgery (Day 0 or Day 1) because an admission is typically unexpected for the surgeries and procedures included in the measure, and our overall goal is to illuminate variation in admissions following these same-day outpatient surgeries to improve quality.
- Any ED visit, observation stay, or unplanned inpatient admission occurring after discharge from the HOPD.
  Rationale: Major and minor adverse events, such as uncontrolled pain, urinary retention, infection, bleeding, and venous thromboembolism, are well-documented to occur post- discharge and result in unanticipated hospital visits.[4-6] Please see the 2023 Surgery Data Dictionary tab *"HOPD Surg ED Obs Stay"* data set for the list of the billing and revenue center codes used to define ED visits and observation stays considered as outcomes in the measure.

Some post-discharge hospital visits are scheduled follow-up care provided after surgery (for example, visits for rehabilitation). We remove "planned" hospital visits from the outcome using an algorithm that identifies planned visits for specific procedures and surgeries that do not reflect quality (see Appendix E for details about the planned admission algorithm). The measure does not consider observation stays or ED visits as planned.

Outcome Time Frame

The measure limits the outcome of hospital visits to seven days, as existing literature suggests that most adverse events after surgery occur within the first seven days following the surgery,[6,7] and our empirical analyses during measure development indicated that the highest rates of hospital visits were within seven days of surgery. Thus, based on existing literature and empirical findings, as well as input from the Technical Expert Panel (TEP) and public comment, the measure development team concluded that unplanned hospital visits within seven days is the optimal outcome to ensure capture of surgery-related adverse events and to minimize capture of hospital visits unrelated to the surgery.

Chemotherapy Measure

The chemotherapy measure evaluates two outcomes: unplanned inpatient admissions and ED or observation stay visits to a Rural Emergency Hospital, Critical Access Hospital (CAH), or other acute care facility within 30 days of any

chemotherapy treatment. A hospital visit includes any ED visit, observation stay, or unplanned inpatient admission.

The measure calculates the two rates separately because the severity and cost of an inpatient admission differ from those of an ED visit or stand-alone observation stay, but both adverse events are important signals of quality and represent outcomes of care that are important to patients.

Inpatient Admissions

The first outcome is any (one or more) inpatient admission, including those that began with an observation stay, within 30 days of any chemotherapy treatment in an HOPD with either a:

1. principal discharge diagnosis of any of ten conditions – anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis; or
2. principal discharge diagnosis of cancer and a secondary diagnosis of one of the ten conditions on the same claim.

These ten conditions are potentially preventable through appropriately managed outpatient care. The 2023 Chemotherapy Measure Data Dictionary shows the qualifying diagnosis codes for each of these conditions in the "*Chemo Numerator*" tabs.

Inpatient admissions that are considered "always planned" do not qualify as outcomes for the measure. Planned admissions are defined as those planned by providers for anticipated medical treatment or procedures that must be provided in the inpatient setting. The measure only counts unplanned admissions in the outcome because variation in planned admissions does not reflect quality differences. For the chemotherapy measure, inpatient hospital admissions with the following Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) procedures or diagnoses are considered always planned and do not qualify for the measure outcome.

Procedure CCS Categories Considered Always Planned

- AHRQ CCS 64 – Bone marrow transplant
- AHRQ CCS 105 – Kidney transplant
- AHRQ CCS 176 – Other organ transplantation (other than bone marrow corneal or kidney)

Diagnosis CCS Categories Considered Always Planned

- AHRQ CCS 45 – Maintenance chemotherapy; radiotherapy

- AHRQ CCS 254 – Rehabilitation care; fitting of prostheses; and adjustment of devices

ED Visits

The second outcome is any ED visit within 30 days of any chemotherapy treatment with the same ten qualifying diagnoses listed for the inpatient admissions outcome (anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis) either in the principal diagnosis position or as a secondary diagnosis with cancer as principal diagnosis.

The ED visit outcome includes any ED visit that was billed alone, with observation stays, or as a stand-alone observation stay. Stand-alone observation stays are defined as observation stays in which either the patient (1) was discharged without being admitted as an inpatient or (2) did not have an ED visit on the same claim. The measure groups ED visits with or without observation stays and stand-alone observation stays into a single ED visit outcome. The measure only assesses the ED visit outcomes for patients who did not experience a qualifying inpatient admission. The measure does not consider observation stays or ED visits as planned.

Multiple Events

A patient can experience only one qualifying outcome event. If the patient experiences a qualifying inpatient admission following the first treatment and a qualifying ED visit following the second treatment, the patient qualifies only for the inpatient admission outcome. As a result, the rates provide a comprehensive performance estimate of patients' quality of care following hospital-based outpatient chemotherapy treatment.

Outcome Time Frame

The measure limits the outcome time frame to the 30 days (including the day of treatment) following the date of each chemotherapy treatment in an outpatient setting for four reasons:

1. Existing literature suggests that the vast majority of adverse events occur within 30 days after treatment,[4-6] indicating that a 30-day period is a reasonable time frame to observe the side effects of treatment.[7-9]
2. We observed that the highest rates of hospital visits occur within 30 days after chemotherapy treatment.[10]
3. Restricting the time frame links patients' experiences more closely to the hospitals that provided their recent treatment while accounting for variations in duration between outpatient treatments.

4. Relating the timeframe to a specific chemotherapy administration supports the idea that the admission stems from the management of side effects of treatment and ongoing care, rather than progression of the disease or other unrelated events.

Colonoscopy Measure

ED Visits

The measure defines the outcome as any (one or more) unplanned hospital visit to a Rural Emergency Hospital, Critical Access Hospital (CAH), or other acute care facility within seven days of an outpatient colonoscopy. A hospital visit includes any ED visit, observation stay, or unplanned inpatient admission.

The measure focuses on the outcome of unplanned hospital visits for several reasons. First, ED visits are a broad outcome that captures the full range of potentially serious adverse events related to preparing for, undergoing, and recovering from the colonoscopy. Second, ED visits are easily identifiable and measurable from claims data. Third, this broad outcome is consistent with a patient-centered view of care that prompts providers to fully account for and fully minimize all acute complications, such as syncope or abdominal pain, as opposed to those narrowly related to procedural technique. Finally, ED visits are costly; reducing ED visits following colonoscopy may lead to substantial healthcare savings for patients and/or the payer (CMS).

The measure defines ED visits and observation staysusing billing codes or revenue center codes identified in Medicare Part B outpatient hospital claims. The 2023 Colonoscopy Measure Data Dictionary tab "*Colonos Outcome ED Obs Stay*" provides the specific codes used to identify ED visits and observation stays. The measure does not consider observation stays or ED visits as planned.

Outcome Time Frame

The measure limits the outcome of hospital visits to seven days, as existing literature suggests that the vast majority of adverse events after colonoscopy occur within the first seven days following the procedure,[11] and our empirical analyses during measure development indicated that the highest rates of hospital visits were within seven days of colonoscopy. Thus, based on existing literature and empirical findings, as well as input from the TEP and public comment, the measure development team concluded that unplanned hospital visits within seven days is the optimal outcome to ensure capture of procedure-related adverse events and to minimize capture of hospital visits unrelated to the procedure.

2.2.3. Planned Admissions Algorithm

The surgery and colonoscopy measures identify unplanned admissions through an evidenced-based algorithm.[12] To identify admissions as planned or unplanned we adapted an algorithm we previously developed for CMS's hospital readmission measures, CMS Planned Readmission Algorithm (PRA) Version 4.0. In brief, the algorithm uses the procedure codes and principal discharge diagnosis code on each hospital claim to identify admissions that are typically planned and may occur after a surgery. A few specific, limited types of care are always considered planned (for example, major organ transplant, rehabilitation, or maintenance chemotherapy). Otherwise, a planned admission is defined as a non-acute admission for a scheduled procedure (for example, total hip replacement or cholecystectomy). Post-discharge admissions for an acute illness or for complications of care are never considered planned.

Appendix E provides a detailed description of the planned admission algorithm adapted for the surgery and colonoscopy measures, outlines the algorithm-specific contents of the data dictionary, and describes measure-specific differences.

2.2.4. Risk-Adjustment Variables

Surgery Measure

The risk-adjustment model includes 25 patient-level variables, including age, clinical comorbidities, and indicators of surgical complexity obtained from inpatient, outpatient, and physician claims 12 months prior to index procedure. 2023 Surgery Data Dictionary tab *"HOPD Surg Risk Factors CCs"* presents the definition of these variables, based on CMS's hierarchical condition categories (CCs). The selection of risk factors was informed by the peer-reviewed literature, an open review process including comments from stakeholders and the public, and empirical analyses. CORE also convened stakeholders through a public process of a national TEP consisting of patients, surgeons, methodologists, researchers, and providers.

The risk-adjustment methodology does not adjust for specific acute conditions if they occur only during the index procedure because they could be considered complications of care; please see 2023 Surgery Data Dictionary tab "*HOPD Surg RF CoC*" for a list of these diagnoses. For a detailed description of the development and refinement of the risk-adjustment model, see the Hospital Visits after Hospital Outpatient Surgery: Measure Technical Report (2014) and 2016 Technical Report Addendum, available at CMS's Hospital Quality Initiative Measure Methodology page.

Chemotherapy Measure

To account for differences in case mix among hospitals, the measure adjusts for variables that are clinically relevant and have associations with the outcomes. The measure calculates the two mutually exclusive outcomes using two separate risk-adjustment models, both of which include patient-level variables, including age, clinical comorbidities, and cancer diagnosis categories. After the measure's initial development, and as a result of the measure's adoption into the PPS-Exempt Cancer Hospital Quality Reporting (PCHQR) and OQR programs, results are calculated separately for PCH and non-PCH HOPDs. The same set of risk-adjustment variables is used when calculating results for both PCHs and non-PCH HOPDs, but the coefficients are estimated separately for each facility type so vary across the two models. The results for PCHs are found in a separate report available here on *QualityNet*.

The risk-adjustment model for inpatient admissions has 25 patient-level risk-adjustment variables (age, sex, exposure to chemotherapy, exposure to concurrent radiotherapy, nine comorbidity variables, and 12 cancer diagnosis categories). Refer to the *"Chemo Risk Model Variables"* tab in the 2023 Chemotherapy Measure Data Dictionary for the list of variables.

The risk-adjustment model for ED visits and observation stays has 20 patient-level risk-adjustment variables (age, sex, exposure to chemotherapy, exposure to concurrent radiotherapy, six comorbidity variables, and ten cancer diagnosis categories). The ED visit model does not include the variables for renal disease, diabetes, metabolic disorder, lymphoma, or prostate cancer that the inpatient admission model includes because these variables were not predictive of risk for this outcome. Refer to the "*Chemo Risk Model Variables*" tab in the 2023 Chemotherapy Measure Data Dictionary for the list of variables. For a detailed description of the development of the risk-adjustment models, see the Admissions and Emergency Department Visits for Patients Receiving Outpatient Chemotherapy Measure Technical Report (Methodology Report, 2016), available at CMS's Hospital Quality Initiative Measure Methodology page.

Colonoscopy Measure

The risk-adjustment model includes 15 patient-level variables, including age, concomitant upper GI endoscopy, polypectomy during procedure, and 12 comorbidity variables obtained from inpatient, outpatient, and physician claims 12 months prior to index procedure. The 2023 Colonoscopy Measure Data Dictionary tab *"Colonos Risk Factor CCs"* presents the definition of these variables, based on CMS's hierarchical CCs. The measure does not include certain diagnoses that occur only at the time of the colonoscopy procedure toward risk adjustment because these diagnoses may represent complications of care; see the 2023 Colonoscopy Measure Data Dictionary tab *"Colonos CoC CCs"* for a

summary of these diagnoses. For a detailed description of the development of the risk-adjustment model, see the Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy Measure Technical Report (Methodology Report, 2014), available at CMS's Hospital Quality Initiative Measure Methodology page.

2.2.5. Data Sources

Surgery Measure

We use Medicare FFS claims to identify surgeries performed in the outpatient setting and subsequent hospital visits, as well as CMS enrollment and demographic data. Patient history is also assessed using claims data collected in the 12 months prior to the eligible same-day surgery.

We identify outpatient surgeries using Medicare's list of covered ASC procedures. CMS reviews and updates this list of surgeries annually. The process includes a transparent public comment submission and review process for addition and/or removal of procedures codes. The lists are posted at: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ASCPayment/11_Addenda_Updates.html (refer to Addendum AA of the respective link). Procedures listed on Medicare's list of covered ASC procedures are defined using HCPCS and CPT® codes.

The measure attributes surgeries to an HOPD if a Part B physician claim is present and the claim can be linked to Medicare outpatient or inpatient institutional data. We first identify physician claims as Outpatient Hospital Department or Physician Office by the Line Place of Service Code in the Part B Carrier claims file. Place of Service coding is used to specify the entity where service(s) were rendered.[13] We then link the physician claims to a hospital outpatient claim with the surgery indicated to identify the HOPD where the surgery took place.

Physician claims with no match to a hospital outpatient claim are then matched to hospital inpatient claims with an inpatient admission date within zero to three days after the date of surgery, to capture surgical procedures billed per the CMS 3-day payment window policy.[14] The HOPD of the admitting hospital is where the case is attributed.

Chemotherapy Measure

CMS uses Medicare FFS claims to identify chemotherapy treatments performed in the outpatient setting and subsequent inpatient hospital admissions, ED visits, and observation stays, as well as CMS enrollment and demographic data. Patient

history is also assessed using claims data collected in the 12 months prior to the chemotherapy treatment. Using claims data allows for consistent identification of chemotherapy administration in HOPDs and aligns with the CBE criteria[15] and CMS standards for claims-based models for publicly reported measures.[16]

Colonoscopy Measure

CMS uses Medicare FFS claims to identify colonoscopies performed in the outpatient setting and subsequent hospital visits, as well as CMS enrollment and demographic data. Patient history is also assessed using claims data collected in the 12 months prior to the colonoscopy procedure.

The measure includes outpatient colonoscopy procedures identified using HCPCS codes and CPT® codes (see the 2023 Colonoscopy Measure Data Dictionary tab "*Colonos Cohort*"). HOPD-based colonoscopies are identified using physician bills for outpatient-based colonoscopies matched to hospital bills. Physician bills for colonoscopies are first matched to outpatient hospital bills. Physician bills with no match to an outpatient facility record are also matched to inpatient hospital bills with an inpatient admission date within zero to three days after the date of the colonoscopy, to capture colonoscopies billed per the CMS 3-day billing rule.

2.2.6. Measure Score Calculation

Each of the measures described in this report are calculated by fitting a hierarchical logistic regression model to the data. The two-level hierarchical logistic regression model accounts for the clustering of patients within hospital facilities and variation in sample size. The measure score calculates the facility-specific risk-adjusted rate as the ratio of a facility's "predicted" number of outcomes to "expected" number of outcomes multiplied by the national observed outcome rate. Note, for the surgical measure, the measure score is the ratio itself. The model estimates the expected number of outcomes for each facility using the facility's patient mix and the average facility-specific intercept (that is, the average intercept among all facilities in the sample). The measure also estimates the predicted number of outcomes for each facility using the same patient mix, but with an estimated facility-specific intercept. Operationally, the measure obtains the expected number of outcomes for each facility by summing the expected probabilities of the outcome for all patients treated at the facility. The expected probability of an outcome for each patient is calculated as a function of the estimated beta coefficients, a patient's observed characteristics, and the average of the facility-specific intercept. It calculates the predicted number of outcomes for each facility by summing the predicted probabilities for all patients in the facility. The predicted probability of an outcome for each patient is calculated as a function of the estimated beta coefficients, a patient's observed characteristics, and the facility-specific

intercept. See Appendix A for more information on the statistical risk-adjustment models and the calculation of facility risk-standardized rates.

For the surgery measure, the measure score, the risk-standardized hospital visit ratio (RSHVR), is the ratio of the number of predicted unplanned hospital visits to the number of expected unplanned hospital visits (P/E). The chemotherapy and colonoscopy measure scores also use the P/E ratio, but for these two measures the score is converted from the P/E ratio into a rate. For the chemotherapy measure, the risk-standardized admission rates (RSAR) and risk-standardized emergency department visit rates (RSEDR) are calculated by multiplying the P/E ratios for each outcome by the national rate (all preventable admissions divided by all patients times 100, and all ED visits divided by all patients times 100, respectively). For the colonoscopy measure score, the risk-standardized hospital visit (RSHV) rate is calculated by multiplying the individual HOPD risk ratios (P/Es) by the national visit rate, multiplied by 1,000.

2.2.7. Categorizing Facility Performance

Each of the measures use bootstrapping to empirically construct a 95% interval estimate for risk-standardized measure score calculation. See details of the statistical approach in Appendix A. Measure scores are categorized by comparing each facility's 95% interval estimate with the national rate or in the case of the surgery measure, the expected RSHVR of 1.00. The interval estimate represents the range of probable values for the measure score. A 95% interval estimate indicates that there is 95% probability that the true value of the score lies between the lower limit and the upper limit of the interval.

Surgery Measure

Since the surgery measure score is a ratio of a HOPD's predicted hospital visits to the expected hospital visits, the measure compares the interval estimate for each HOPD to 1.00, the ratio for an average hospital that is performing as expected.

The measure assigns the performance categories as follows:

- "Better than expected" if the HOPD's entire interval estimate was below 1.00.
- "No different than expected" if the HOPD's interval estimate included 1.00.
- "Worse than expected" if the HOPD's entire interval estimate was above 1.00.

If a facility did not have the minimum number of same-day surgeries for the measure (N=30), we cannot reliably tell how well the facility is performing, and the facility is assigned to a separate category of "Number of cases too small."

Chemotherapy Measure

The performance categories for the RSAR and RSEDR (Appendix A), are classified as follows:

- "Better than the national rate" if the facility's entire interval estimate is below the national observed admission rate or national observed ED visit rate.
- "No different than the national rate" if the facility's interval estimate includes the respective national rate.
- "Worse than the national rate" if the entire interval estimate is above the respective national rate.

If a facility did not have the minimum number of eligible patients receiving chemotherapy for the measure (N=25), CMS cannot reliably tell how well the facility is performing and assigns the facility a separate category of "Number of cases too small."

Colonoscopy Measure

The risk-standardized hospital visit rates (RSHV) are classified into performance categories as follows:

- "Better than expected performance" if the facility's entire interval estimate is below the national observed 7-day unplanned hospital visit rate.
- "No different than expected" if the facility's interval estimate includes the national rate.
- "Worse than expected performance" if the entire interval estimate is above the national rate.

Since this approach calculates a relative performance rate, the rates calculated separately for HOPDs and ASCs (presented in an additional report) should not be compared directly; this is because they are standardized to a different national rate within each type of facility.

3. UPDATES TO SURGERY MEASURE FOR 2023 REPORTING

3.1. Background and Rationale for Surgery Measure Updates

The measure aims to improve the quality of care delivered to patients undergoing outpatient surgeries. The measure is reevaluated annually, and in 2023, minor refinements were made to the outpatient surgery measure specifications to account for any coding changes.

Section 3.2 details the measure updates instituted during the measure reevaluation period and the impact of these updates on the measure cohort and outcome.

3.2. Surgery Measure Updates

3.2.1. Updates to Measure Code Sets

The following updates were made to the code sets, which is the resource used for implementation of the measure specifications:

- Cohort Inclusion
  - The addition of 172 CPT codes
  - The removal of 11 CPT codes
- Cohort Exclusions
  - The removal of two CPT codes from the eye exclusions
  - The addition of 13 CPT codes from the high-risk exclusions
  - The removal of 25 CPT codes from the high-risk exclusions

The PAA v4.0_2022 was updated to PAA v4.0_2023. This change is detailed in Section 3.2.2.

3.2.2. Updates to the Planned Admission Algorithm

The surgery measure outcome does not include planned inpatient admissions because they are not a signal of poor-quality care. The PAA excludes inpatient admissions occurring within two to seven days of the surgery if:

- The inpatient claim contains a procedure code or diagnosis that maps to the AHRQ CCS procedure or diagnosis category that is considered "always planned" (data dictionary tabs *"PAA1 Always Plnnd Px"* and *"PAA2 Always Plnnd Dx");* or
- The inpatient claim contains a procedure code that maps to an AHRQ CCS procedure category that is considered "potentially planned" (data dictionary

tab "*PAA3 Pot Plnnd Px*"), and the principal diagnosis on the claim is not in an AHRQ CCS diagnosis group or an individual ICD-10 code that is considered acute (data dictionary tab "*PAA4 Acute Dx*").

We consider admissions occurring on the day of the surgery (Day 0) and Day 1 post-surgery as "unplanned" since most of these admissions directly follow surgery. ED visits and observation stays are never considered planned.

The surgery measure PAA uses the same coding as the planned readmission algorithm developed for CMS's hospital readmission measures. The planned readmission algorithm v4.0 is updated annually to reflect coding updates and clinical expert review, and the PAA for the surgery measure is updated to align with the planned readmission algorithm.

For calendar year 2025 payment determination, the surgery measure will adopt version 4.0_2023 of the planned readmission algorithm, which updates the v4.0_2022 version used in this report (identified in the data dictionary tables for potentially planned procedures and acute diagnoses). This section describes updates to v4.0_2023. Appendix E provides more detailed information on the algorithm.

Update to V4.0_2023:

In September 2019 and December 2020, the AHRQ Healthcare Cost and Utilization Project (HCUP) released new versions of the CCS for ICD-10-CM and ICD-10-PCS codes, respectively, called the CCS-Refined (CCS-R). The magnitude of changes from the CCS beta versions to the CCS-R is extensive. Until comprehensive testing can be completed on the CCS-R, we will continue utilizing the existing beta version v2019.1 of the CCS for ICD-10-CM/PCS as the basis for the planned readmission algorithm specifications, updating it as appropriate with clinical expert input.

For current public reporting, we first reviewed the new ICD-10-CM and ICD-10-PCS codes in the FY 2022 code set to determine the most appropriate categorizations for the newly implemented ICD-10 codes, using the existing v2019.1 beta version of the CCS for ICD-10-CM/PCS.

We confirmed the clinical appropriateness of the CCS categorizations of the newly implemented ICD-10 codes in relation to the planned readmission algorithm, and whether any changes were warranted. This led to the following changes in the algorithm:

- Potentially planned procedures:
  - The addition of new ICD-10-PCS codes (associated with AHRQ CCS procedure categories 48 and 49) to the singular ICD-10-PCS code list.

- Acute diagnoses:
  - The removal of ICD-10-CM codes (associated with AHRQ CCS diagnosis categories 237 and 661) from the singular ICD-10-CM code list;
  - The addition of whole 237 and 661, and the addition of ICD-10-CM codes (associated with AHRQ CCS diagnosis categories 155, 233, 238, 253, and 662).

Analyses of the changes to the planned readmission algorithm specifications suggest minimal impact to readmission measure rates.

The complete set of codes reflected in the v4.0_2023 planned readmission algorithm adopted as the PAA for the surgery measure are available in the data dictionary tabs *"PAA1 Always Plnnd Px,"* "*PAA2 Always Plnnd Dx,*" "*PAA3 Pot Plnnd Px,"* and *"PAA4 Acute Dx.*"

4. SUMMARY OF SURGERY MEASURE PERFORMANCE

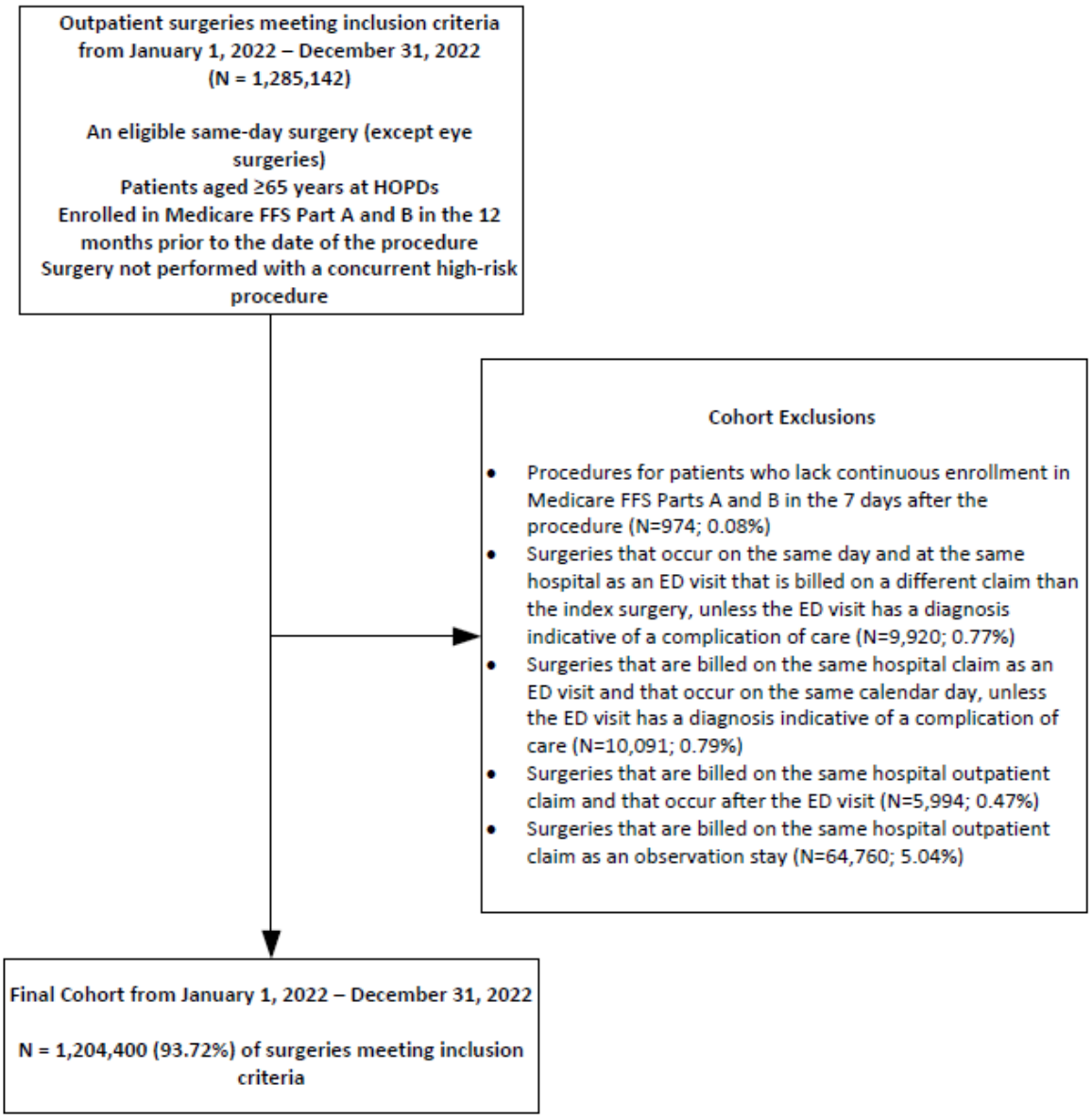
This section presents updated information on the frequency and effect of model risk factors, model performance, facility-level surgery volume, and risk-standardized rates across facilities after incorporating the changes described in Section 3.

The dataset included Medicare FFS claims for surgeries performed from January 1, 2022 – December 31, 2022. All analyses were performed on data from this respective performance period. Specifically, we examined changes in (1) measure cohort, (2) frequency of risk variables, (3) risk variable odds ratios, (4) outcome rates, (5) distribution of facility-level RSHVRs, and (6) model performance after updates.

4.1. Final Surgery Cohort

Figure 4.1.1 illustrates the final cohort using the January 1, 2022 – December 31, 2022 performance period data after applying all updates to inclusion and exclusion criteria described in Section 3.

Figure 4.1.1. HOPD Surgery Measure Cohort



4.2. Surgery Measure Model Parameters and Performance

We computed two summary statistics to assess model performance: the predictive ability according to deciles of patient risk and the area under the receiver operating characteristic (ROC) curve (c-statistic). The c-statistic is an indicator of the model's discriminant ability or ability to correctly classify those who did and did not have an unplanned hospital visit within seven days of their surgery. Potential values range from 0.5, meaning no better than chance, to 1.0, meaning perfect discrimination. Perfect prediction implies patients' outcomes can be predicted completely by their risk factors,

and physicians and hospitals play no role in patients' outcomes. The frequency of model risk factors and model parameters and performance are presented below. In Section 4.2, we present the distributions of surgery procedure volumes and RSHVRs across facilities.

Table 4.2.1 below shows the frequency of the demographic and clinical risk variables used in the risk-adjustment model. Note that the Work Relative Value Units (RVUs) approximate surgical procedural complexity by incorporating elements of physician time and effort. For patients with multiple concurrent CPT® procedure codes, we risk adjust for the CPT® code with the highest work RVU value. Additionally, anatomical body system groups are defined using AHRQ CCS codes and are maintained by AHRQ. Table 4.2.2 presents the logistic regression model variable odds ratios. Table 4.2.3 presents the surgery model performance values.

Table 4.2.1. Frequency of Surgery Model Risk Factors Among HOPDs

Risk Factor (CC)	Mean (SD) or %
Total N	1,204,400
Age (years above 65)	9.77 (6.50)
Work Relative Value Units – Mean (SD)	10.34 (5.18)
Comorbidities:	
Cancer (CC 8-14)	34.23
Diabetes and DM Complications (CC 17-19, 122, 123)	31.70
Disorders of Fluid/Electrolyte/Acid-Base (CC 24)	15.51
Intestinal Obstruction/Perforation (CC 33)	2.17
Inflammatory Bowel Disease (CC 35)	1.33
Bone/Joint/Muscle Infections/Necrosis (CC 39)	1.71
Hematological Disorders Including Coagulation Defects and Iron Deficiency (CC 46, 48, 49)	29.67
Dementia or Senility (CC 51-53)	6.49
Psychiatric Disorders (CC 57-63)	21.57
Hemiplegia, Paraplegia, Paralysis, Functional Disability (CC 70, 71, 73, 74, 103-105, 189, 190)	3.21
Other Significant CNS Disease (CC 77-80)	4.24
Cardiorespiratory Arrest, Failure and Respiratory Dependence (CC 82-84)	6.40
Congestive Heart Failure (CC 85)	16.24
Ischemic Heart Disease (CC 86-89)	28.85
Hypertension and Hypertensive Disorders (CC 94, 95)	69.86
Arrhythmias (CC 96, 97)	34.19
Vascular Disease (CC 106-109)	27.12
Chronic Lung Disease (CC 111-113)	19.00
UTI and Other Urinary Tract Disorders (CC 144, 145)	34.74

Risk Factor (CC)	Mean (SD) or %
Pelvic Inflammatory Disease and Other Specified Female Genital Disorders (CC 147)	3.90
Chronic Ulcers (CC 157-161)	4.17
Cellulitis, Local Skin Infection (CC 164)	7.67
Prior Significant Fracture (CC 169-171)	5.67
Morbid Obesity (CC 22)	5.93
Surgical Body System:	
Cardiovascular	10.41
Digestive	12.22
Ear	0.57
Endocrine	1.31
Female Genitalia	1.75
Hemic-Lymphatic	0.44
Skin & Breast	10.61
Male Genitalia	4.37
Musculoskeletal	31.58
Nervous	7.33
Nose-Throat-Pharynx	1.12
Respiratory	0.08
Urinary	18.21
Miscellaneous Diagnostic and Therapeutic Procedures	0.01

Notes: Results based on January 1, 2022 – December 31, 2022 performance period. CC-related risk factors are defined by v24 of CC map.

Table 4.2.2. Surgery Logistic Regression Model Variable Odds Ratios with 95% Confidence Intervals Among HOPDs

Parameter	Odds Ratio (95% CI)
Age minus 65 (years above 65)	1.03 (1.03-1.03)
Work Relative Value Units	1.12 (1.11-1.12)
Comorbidities:	
Cancer (CC 8-14)	1.00 (0.98-1.02)
Diabetes and DM Complications (CC 17-19, 122, 123)	1.12 (1.11-1.14)
Disorders of Fluid/Electrolyte/Acid-Base (CC 24)	1.15 (1.13-1.18)
Intestinal Obstruction/Perforation (CC 33)	1.25 (1.20-1.31)
Inflammatory Bowel Disease (CC 35)	1.04 (0.98-1.10)
Bone/Joint/Muscle Infections/Necrosis (CC 39)	1.34 (1.28-1.41)
Hematological Disorders Including Coagulation Defects and Iron Deficiency (CC 46, 48, 49)	1.12 (1.10-1.14)
Dementia or Senility (CC 51-53)	1.18 (1.15-1.21)

Parameter	Odds Ratio (95% CI)
Psychiatric Disorders (CC 57-63)	1.15 (1.13-1.17)
Hemiplegia, Paraplegia, Paralysis, Functional Disability (CC 70, 71, 73, 74, 103-105, 189-190)	1.21 (1.17-1.26)
Other Significant CNS Disease (CC 77-80)	1.18 (1.14-1.22)
Cardiorespiratory Arrest, Failure and Respiratory Dependence (CC 82-84)	1.11 (1.08-1.14)
Congestive Heart Failure (CC 85)	1.12 (1.09-1.14)
Ischemic Heart Disease (CC 86-89)	1.11 (1.09-1.13)
Hypertension and Hypertensive Disorders (CC 94, 95)	1.08 (1.06-1.10)
Arrhythmias (CC 96, 97)	1.13 (1.11-1.15)
Vascular Disease (CC 106-109)	1.13 (1.11-1.15)
Chronic Lung Disease (CC 111-113)	1.13 (1.10-1.15)
UTI and Other Urinary Tract Disorders (CC 144, 145)	1.15 (1.13-1.17)
Pelvic Inflammatory Disease and Other Specified Female Genital Disorders (CC 147)	0.96 (0.92-1.00)
Chronic Ulcers (CC 157-161)	1.12 (1.08-1.16)
Cellulitis, Local Skin Infection (CC 164)	1.16 (1.13-1.19)
Prior Significant Fracture (CC 169-171)	1.26 (1.22-1.30)
Morbid Obesity (CC 22)	1.12 (1.08-1.15)
Surgical Body System:	
Cardiovascular	0.97 (0.89-1.06)
Digestive	1.47 (1.35-1.61)
Ear	Reference
Endocrine	0.73 (0.66-0.82)
Female Genitalia	0.94 (0.84-1.05)
Hemic-Lymphatic	1.00 (0.85-1.18)
Skin & Breast	0.64 (0.58-0.70)
Male Genitalia	1.87 (1.71-2.05)
Musculoskeletal	1.17 (1.07-1.28)
Nervous	1.33 (1.21-1.45)
Nose-Throat-Pharynx	1.15 (1.03-1.29)
Respiratory	1.40 (1.10-1.78)
Urinary	2.03 (1.86-2.22)
Miscellaneous Diagnostic and Therapeutic Procedures	0.41 (0.14-1.20)

Notes: Results based on January 1, 2022 – December 31, 2022 performance period. CC-related risk factors are defined by v24 of CC map.

Table 4.2.3. Surgery Logistic Regression Model Performance Among HOPDs

Characteristic	HOPDs
Predictive ability, % (lowest decile – highest decile)	1.74-16.06
c-statistic	0.694

Note: Results based on January 1, 2022 – December 31, 2022 performance period data.
SD=standard deviation

4.3. Distribution of Surgery Measure Facility-Level Measure Scores

Table 4.3.1 presents the distribution of index surgeries for HOPDs in the cohort. There were 3,818 HOPDs after the updates with at least one qualifying index surgery. The mean number of qualifying procedures was 315.45. The number of qualifying procedures varied widely across facilities, ranging from 1 to 5,329, with a median value of 160 surgeries (interquartile range [IQR] = 30 – 428).

Table 4.3.2 shows the median risk-standardized hospital visit ratio (RSHVR) was 0.99; the range was 0.44 – 6.13. The wide variation in performance across HOPDs highlights continuing opportunities for quality improvement.

Finally, Table 4.3.3 presents the between-facility variance of 0.126 (SE: 0.005). If there were no systematic differences between facilities, the between-facility variance would be 0. The median odds ratio represents the median increase in odds of a hospital visit if a surgery on a single patient was performed at a higher risk facility compared to a lower risk facility. The estimated median odds ratio suggests a meaningful increase in the risk of a hospital visit if a surgery was performed at a higher risk facility compared to a lower risk facility. The odds ratio was 1.40, indicating that a patient had a 40% increase in the odds of a hospital visit if the same surgery was performed at higher risk HOPD compared to a lower risk HOPD.

Table 4.3.1. Distribution of Surgery Cohort Volumes Among HOPDs

Characteristic	HOPDs
Number of facilities	3,818
Mean number of surgeries (SD)	315.45 (435.61)
Range (min – max)	1 – 5,329
25th percentile	30
50th percentile (median)	160
75th percentile	428

Note: Results based on January 1, 2022 – December 31, 2022 performance period data.
SD=standard deviation

Table 4.3.2. Distribution of Surgery Risk-Standardized Hospital Visit Ratios (RSHVRs) Among HOPDs

Characteristic	HOPDs
Number of facilities	3,818
Mean RSHVR (SD)	1.02 (0.26)
Range (min – max)	0.44 - 6.13
25th percentile	0.89
50th percentile (median)	0.99
75th percentile	1.11

Note: Results based on January 1, 2022 – December 31, 2022 performance period data.
SD=standard deviation

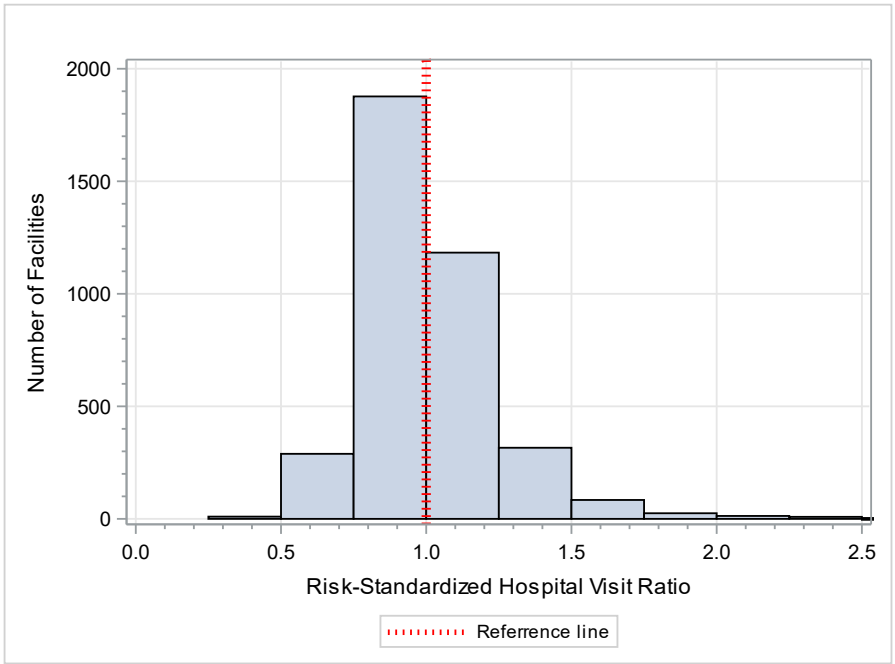
Table 4.3.3. Surgery Between-Facility Variance Among HOPDs

Characteristic	HOPDs
Between-facility variance (SE)	0.126 (0.005)
Median odds ratio	1.40

Note: Results based on January 1, 2022 – December 31, 2022 performance period data.
SE=standard error

Figure 4.3.1 shows the distribution of RSHVRs among all facilities with at least one qualifying same-day surgery after the updates. As noted above, the median facility score was 0.99, ranging from 0.44 to 6.13.

Figure 4.3.1. Distribution of Surgery Risk-Standardized Hospital Visit Ratios (RSHVR)



Note: Results based on January 1, 2022 – December 31, 2022 performance period data.

4.4. Surgery Measure Distribution of Facilities by Performance Category

Table 4.4.1 below shows the national performance for the surgery measure after updates. Of 3,818 HOPD facilities in the study cohort, 220 facilities performed "Better than Expected," 2,427 facilities performed "No Different than Expected," 230 facilities performed "Worse than Expected," and the remaining 941 facilities were classified as "Number of Cases Too Small" (fewer than 30) to reliably tell how well the hospital is performing.

Table 4.4.1. Surgery Facility Performance Category Distribution Among HOPDs

Performance Category	HOPDs	
	Number of facilities	% distribution
Better than the National Rate	220	5.76
No Different than the National Rate	2,427	63.57
Worse than the National Rate	230	6.02
Number of Cases Too Small	941	24.65

Note: Results based on specs reported in 2023 FSRs.
Performance category "Number of Cases Too Small" indicates that a facility had fewer than 30 cases, and thus its RSHVR was not reported.

5. UPDATES TO CHEMOTHERAPY MEASURE FOR 2023 REPORTING

5.1. Background and Rationale for Chemotherapy Measure Updates

Annual measure reevaluation ensures that the chemotherapy measure's specifications are continually assessed and remain valid, given possible changes in clinical care and/or coding standards. During reevaluation, our approach to identifying areas for improvement in the measure's specifications focuses on ensuring that updates improved the measure's ability to reflect quality differences related to the delivery and management of care during or after a chemotherapy treatment. Modifications to the measure are informed by review of the most recent literature, input from experts, and empirical analyses. We also relied on stakeholder feedback as a basis for identifying reevaluation topics.

Section 5.2 details the measure updates instituted during the measure reevaluation period.

5.2. Chemotherapy Measure Updates

5.2.1. Updates to Measure Code Sets

We made the following updates to the code set:

- Numerator
  - The addition of three ICD-10 codes
  - The removal of one ICD-10 code
- Denominator
  - The addition of 17 ICD-10 codes
  - The removal of two ICD-10 codes
  - The revision of 61 code descriptions
- Denominator Exclusions
  - The addition of ten ICD-10 codes
  - The removal of one ICD-10 code
  - The revision of seven code descriptions
- Risk Adjustment
  - The addition of three ICD-10 codes
- ED Observation Stay
  - The addition of the ED Observation Stay tab to the code set file

6. SUMMARY OF CHEMOTHERAPY MEASURE PERFORMANCE

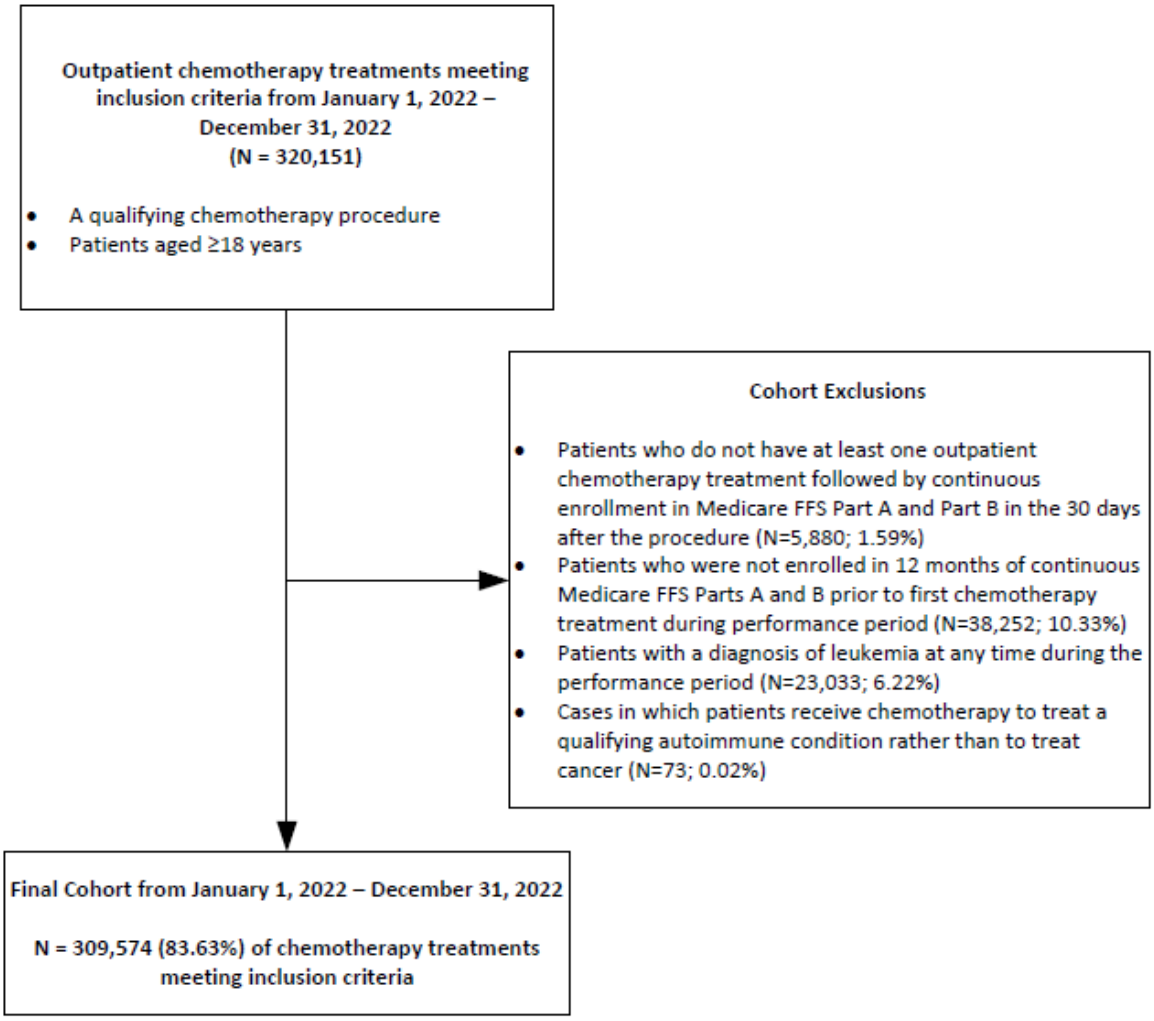
This section presents updated information on the frequency and effect of model risk factors, model performance, facility-level chemotherapy treatment count, and risk-standardized rates across HOPD facilities after incorporating the changes described in Section 5.

We computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). To test model predictive ability, we calculated observed hospital visit rates in the lowest and highest deciles based on predicted hospital visit probabilities. The c-statistic is an indicator of the model's discriminant ability or ability to correctly classify those who did and did not have an unplanned inpatient admission or ED visit within 30 days of a qualifying chemotherapy treatment. Potential values range from 0.5, meaning no better than chance, to 1.0, meaning perfect discrimination. A c-statistic of 1.0 indicates perfect prediction, implying patients' outcomes can be predicted completely by their risk factors, and physicians and facilities play no role in patients' outcomes. The frequency of model risk factors and model parameters and performance are presented in Section 6.2. In Section 6.3 we present the distributions of chemotherapy treatment volumes and risk-standardized hospital visit rates across facilities.

6.1. Final Chemotherapy Cohort

Figure 6.1.1 illustrates the final HOPD cohort using the January 1, 2022 – December 31, 2022 performance period data after applying all updates to inclusion and exclusion criteria described in Section 5.

Figure 6.1.1. HOPD Chemotherapy Cohort



6.2. Chemotherapy Model Parameters and Performance

Table 6.2.1 summarizes the chemotherapy model risk factor frequencies in 2023. Table 6.2.2 presents the corresponding odds ratios (ORs) and 95% confidence intervals (CIs). Most variables are statistically significant.

Table 6.2.1. Frequency of Chemotherapy Model Risk Factors Among HOPDs

Risk Factor (CC)	Mean (SD), Median (IQR), or %
Total N	309,574
Mean age (SD)	73.3 (8.4)
Male	54.1

Risk Factor (CC)	Mean (SD), Median (IQR), or %
Number of Outpatient Chemotherapy Treatments, Median (IQR)	4 (2-10)
Respiratory Disorder (CC 110 – 113)	28.1
Renal Disease (CC 132, 134 – 140)	26.3
Diabetes (CC 17 – 20)	29.8
Other Injuries (CC 174)	22.1
Metabolic Disorders (CC 21 – 26)	83.8
GI Disorders (CC 27 – 32, 34, 36 – 38)	69.2
Psychiatric Disorders (CC 50 – 69)	42.5
Neurological Conditions (CC 70 – 81)	27.3
Cardiovascular Disease (CC 82 – 109)	86.5
Breast Cancer	15.5
Digestive Cancer	17.1
Respiratory Cancer	17.7
Lymphoma	16.2
Other Cancer	26.0
Prostate Cancer	21.7
Anal Cancer	1.0
Bladder Cancer	10.6
Ovarian Cancer	4.3
Pancreatic Cancer	4.5
Secondary Cancer of Lymph Nodes	20.8
Secondary Cancer of Solid Tumors	47.2
Concurrent Radiotherapy	5.2

Notes: Results based on January 1, 2022 – December 31, 2022 performance period. CC-related risk factors are defined by v24 of CC map.

Table 6.2.2. Adjusted ORs and 95% CIs for the Chemotherapy Logistic Regression Model Among HOPDs

Variable	Inpatient Admissions Odds Ratio (95% CI)	ED Visits Odds Ratio (95% CI)
Age	1.00 (0.99-1.00)	0.99 (0.99-0.99)
Male	1.05 (1.02-1.08)	0.83 (0.80-0.86)
Number of Outpatient Chemotherapy Treatments	1.02 (1.02-1.02)	1.04 (1.04-1.04)
Respiratory Disorder (CC 110 – 113)	1.25 (1.22-1.29)	1.13 (1.09-1.17)
Renal Disease (CC 132, 134 – 140)	1.34 (1.30-1.37)	–
Diabetes (CC 17 – 20)	1.16 (1.13-1.19)	–
Other Injuries (CC 174)	1.10 (1.07-1.13)	1.19 (1.14-1.23)

Variable	Inpatient Admissions Odds Ratio (95% CI)	ED Visits Odds Ratio (95% CI)
Metabolic Disorders (CC 21 – 26)	1.20 (1.15-1.25)	–
GI Disorders (CC 27 – 32, 34, 36– 38)	1.28 (1.24-1.32)	1.35 (1.29-1.40)
Psychiatric Disorders (CC 50 – 69)	1.13 (1.10-1.16)	1.21 (1.17-1.25)
Neurological Conditions (CC 70 – 81)	1.06 (1.04-1.09)	1.08 (1.04-1.11)
Cardiovascular Disease (CC 82 – 109)	1.29 (1.23-1.35)	1.17 (1.11-1.23)
Breast Cancer	0.99 (0.95-1.04)	1.04 (0.99-1.09)
Digestive Cancer	1.48 (1.43-1.53)	1.23 (1.18-1.28)
Respiratory Cancer	1.65 (1.60-1.70)	1.17 (1.12-1.22)
Lymphoma	1.88 (1.81-1.95)	–
Other Cancer	1.31 (1.27-1.34)	1.16 (1.12-1.21)
Prostate Cancer	0.60 (0.58-0.63)	–
Anal Cancer	1.30 (1.17-1.45)	1.13 (0.99-1.31)
Bladder Cancer	0.99 (0.95-1.04)	0.91 (0.85-0.97)
Ovarian Cancer	1.29 (1.22-1.36)	1.15 (1.07-1.24)
Pancreatic Cancer	2.30 (2.20-2.41)	1.42 (1.33-1.52)
Secondary Cancer of Lymph Nodes	1.28 (1.25-1.32)	1.16 (1.12-1.20)
Secondary Cancer of Solid Tumors	2.06 (2.00-2.11)	1.29 (1.24-1.33)
Concurrent Radiotherapy	1.37 (1.30-1.43)	1.14 (1.06-1.22)

Note: Results based on January 1, 2022 – December 31, 2022 performance period.
See 2022 Chemotherapy Measure Data Dictionary for risk factor definitions.

Table 6.2.3. Chemotherapy Logistic Regression Model Performance Among HOPDs

Characteristic	Inpatient Admissions	ED Visits
Predictive ability, % (lowest decile – highest decile)	2.12 – 26.88	2.05 – 12.21
c-statistic	0.717	0.665

Note: Results based on January 1, 2022 – December 31, 2022 performance period.

6.3. Distribution of Chemotherapy Measure Facility-Level Measure Scores

Table 6.3.1 presents the distribution of index chemotherapy treatments among all qualifying patients for each facility type. There were 3,347 HOPDs with at least one patient with a qualifying index chemotherapy treatment during the July 2022 – December 2022 performance period. The median number of qualifying treatments was 19 (IQR: 4 – 84).

Table 6.3.2 shows the median RSAR. The median RSAR was 10.23 inpatient admissions per 100 chemotherapy treatments (IQR: 9.94 – 10.58).

Table 6.3.3 shows the mean and median RSEDR. The median RSEDR was 5.35 ED visits per 100 chemotherapy treatments (IQR: 5.19 – 5.59).

Finally, Table 6.3.4 presents the median odds ratio for the RSAR and RSEDR. The median odds ratio represents the median increase in odds of an inpatient admission or ED visit, respectively, if a patient received outpatient chemotherapy at a higher risk hospital compared to a lower risk hospital. For the RSAR, the value of 1.26 among HOPDs indicates that a patient had a 26% increase in the odds of an inpatient admission if the outpatient chemotherapy was received at a higher risk HOPD compared to a lower risk HOPD. For the RSDER, the value of 1.32 among HOPDs indicates that a patient had a 32% increase in the odds of an ED visit if the outpatient chemotherapy was received at a higher risk HOPD compared to a lower risk HOPD.

Figures 6.3.1 and 6.3.2 show the overall distribution of RSARs and RSEDRs for HOPDs.

Table 6.3.1. Distribution of Chemotherapy Treatments Volumes Among HOPDs

Characteristic	HOPDs
Number of facilities	3,347
Mean number of patients (SD)	92.49 (207.40)
Range (min – max)	1 – 2,598
25th percentile	4
50th percentile (median)	19
75th percentile	84

Note: Results based on January 1, 2022 – December 31, 2022 performance period.

Table 6.3.2. Distribution of Chemotherapy Risk-Standardized Admission Rates (RSAR) Among HOPDs

Characteristic	HOPDs
Number of facilities	3,347
Mean RSAR (SD)	10.35 (0.96)
Range (min – max)	6.26 – 17.20
25th percentile	9.94
50th percentile (median)	10.23
75th percentile	10.58

Note: Results based on January 1, 2022 – December 31, 2022 performance period.

Table 6.3.3. Distribution of Chemotherapy Risk-Standardized Emergency Department Visit Rates (RSEDR) Among HOPDs

Characteristic	HOPDs
Number of facilities	3,347
Mean RSEDR (SD)	5.42 (0.61)
Range (min – max)	3.03 – 9.08
25th percentile	5.19
50th percentile (median)	5.35
75th percentile	5.59

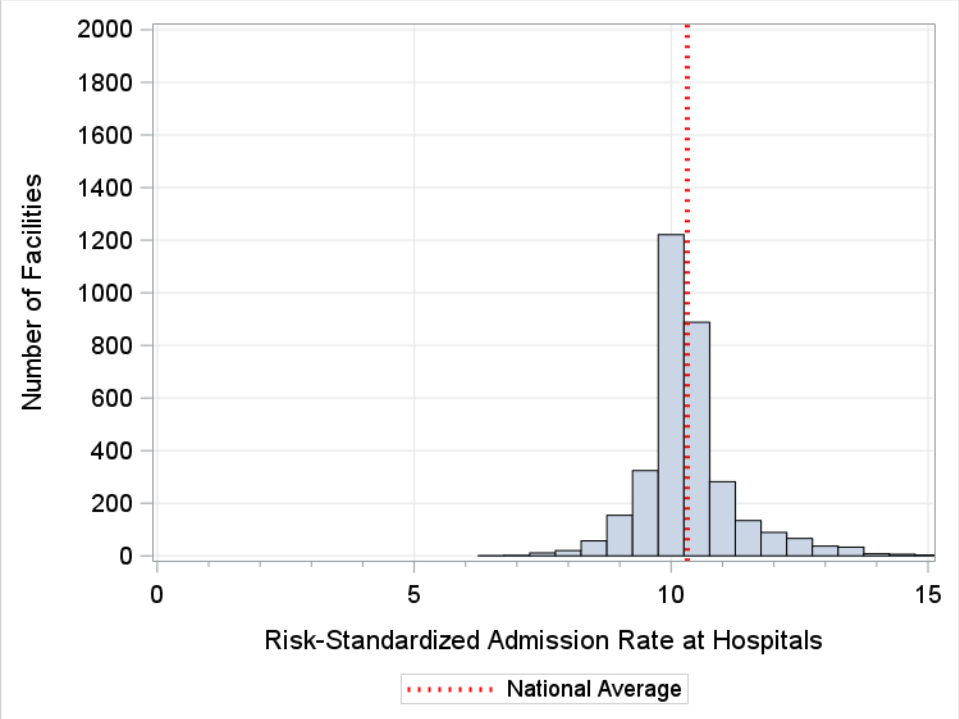
Note: Results based on January 1, 2022 – December 31, 2022 performance period.

Table 6.3.4. Chemotherapy Between-Facility Variance Among HOPDs

Characteristic	HOPDs
RSAR median odds ratio	1.26
RSEDR median odds ratio	1.32

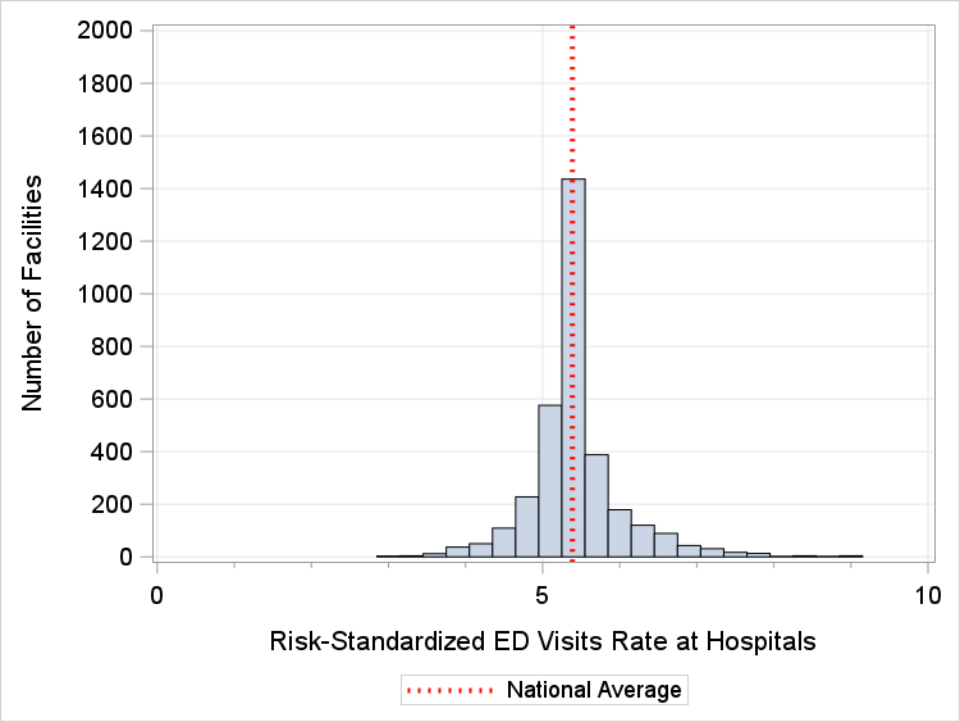
Note: Results based on January 1, 2022 – December 31, 2022 performance period.

Figure 6.3.1. Distribution of Facility RSARs at HOPDs



Note: Results based on January 1, 2022 – December 31, 2022 performance period.

Figure 6.3.2. Distribution of Facility RSEDR Performance at HOPDs



Note: Results based on January 1, 2022 – December 31, 2022 performance period.

6.4. Chemotherapy Measure Distribution of Facilities by Performance Category

Facility performance was assessed for 3,347 HOPDs with a qualifying chemotherapy treatment during the performance period using the updated measure specifications. Among the 3,347 HOPDs, 14 performed "Better than the national rate," 1,449 performed "No different than the national Rate," and 59 performed "Worse than the national rate" for the 30-day Qualifying Inpatient Admission outcome. 1,825 were classified as "Number of cases too small" (fewer than 25) to reliably tell how well the hospital is performing.

For the 30-day ED visit outcome, among the 3,347 HOPDs, 27 performed "Better than the national rate," 1,470 performed "No different than the national rate," and 25 performed "Worse than the national rate." 1,825 were classified as "Number of cases too small" (fewer than 25) to reliably tell how well the hospital is performing.

Table 6.4.1 displays performance category assignments at HOPDs during the January 1, 2022 – December 31, 2022 performance period.

Table 6.4.1. Chemotherapy Facility Performance Category Distribution Among HOPDs

Facility Performance Category	Inpatient Admission Outcome	ED Visit Outcome
Total Number of Facilities in the Nation	3,347	3,347
Number of Facilities in the Nation that Performed Better than National Rate	14	27
Number of Facilities in the Nation that Performed No Different than National Rate	1,449	1,470
Number of Facilities in the Nation that Performed Worse than National Rate	59	25
Number of Facilities in the Nation that had Too Few Cases	1,825	1,825

7. UPDATES TO COLONOSCOPY MEASURE FOR 2023 REPORTING

7.1. Background and Rationale for Colonoscopy Measure Updates

The measure aims to improve the quality of care delivered to patients undergoing outpatient colonoscopy procedures. The measure is reevaluated annually.

Importantly, the measurement period for 2022 public reporting was reduced to approximately 29 months (from the typical 36 months) in response to the COVID-19 public health emergency and CMS's decision to exclude claims data for January 1, 2020 – June 30, 2020 (Q1 and Q2 of 2020). This also impacts the 12-month look-back period for risk adjustment as this data. CMS's decision to exclude this data under its Extraordinary Circumstances Exceptions (ECE) policy was done to assist healthcare providers who were directing their resources toward caring for patients and ensuring the health and safety of staff. For more information on the exclusion of claims data for Q1 and Q2 2020, please refer to the following CMS communications:

- https://www.cms.gov/newsroom/press-releases/cms-announces-relief-clinicians-providers-hospitals-and-facilities-participating-quality-reporting
- https://www.cms.gov/files/document/guidance-memo-exceptions-and-extensions-quality-reporting-and-value-based-purchasing-programs.pdf
- https://qualitynet.cms.gov/files/5f0707a3b8112700239dca19?filename=2020-62-IP.pdf
- https://qualitynet.cms.gov/files/5f6d198d4ac8370021c54179?filename=HQR_FAQs_092420.pdf

Consistent with this policy, the final performance period for the results in this report included procedures between 7/1/2020 – 12/31/2022, and the data period used for risk adjustment included claims from 1/1/2019 – 12/31/2019 and 7/1/2020 – 12/31/2022.

Section 7.2 details the measure updates instituted during the measure reevaluation period.

7.2. Colonoscopy Measure Updates

7.2.1. Update to Measure Code Sets

There were no ICD-10 coding updates identified for the cohort or risk factors. The PAA v4.0_2022 was updated to PAA v4.0_2023. This change is detailed in Section 7.2.2.

7.2.2. Updated Planned Admission Algorithm

The colonoscopy measure outcome does not include planned inpatient admissions because they are not a signal of poor-quality care. The PAA excludes inpatient admissions if:

- The inpatient claim contains a procedure code or diagnosis that maps to the AHRQ CCS procedure or diagnosis category that is considered "always planned" (data dictionary tabs *"Colon PAA1 Always Plnnd Px"* and *"Colon PAA2 Always Plnnd Dx");* or
- The inpatient claim contains a procedure code that maps to an AHRQ CCS procedure category that is considered "potentially planned" (data dictionary tab "*Colon PAA3 Pot Plnnd Px*"), and the principal diagnosis on the claim is not in an AHRQ CCS diagnosis group or an individual ICD-10 code that is considered acute (data dictionary tab "*Colon PAA4 Acute Dx*").

We consider admissions occurring on the day of the colonoscopy (Day 0) and Day 1 post-colonoscopy as "unplanned" since most of these admissions directly follow the procedure. ED visits and observation stays are never considered planned.

The colonoscopy measure PAA uses the same coding as the planned readmission algorithm developed for CMS's hospital readmission measures. The planned readmission algorithm v4.0 is updated annually to reflect coding updates and clinical expert review, and the PAA for the colonoscopy measure is updated to align with the planned readmission algorithm.

For CY 2025 payment determination, the colonoscopy measure will adopt version 4.0_2023 of the planned readmission algorithm, which updates the v4.0_2022 version used in this report (identified in the data dictionary tables for potentially planned procedures and acute diagnoses). This section describes updates to v4.0_2023. Appendix E provides more detailed information on the algorithm.

Update to V4.0_2023:
In September 2019 and December 2020, the AHRQ HCUP released new versions of the CCS for ICD-10-CM and ICD-10-PCS codes, respectively, called the CCS-Refined (CCS-R). The magnitude of changes from the CCS beta versions to the CCS-R is extensive. Until comprehensive testing can be completed on the CCS-R, we will continue utilizing the existing beta version v2019.1 of the CCS for ICD-10-CM/PCS as the basis for the planned readmission algorithm specifications, updating it as appropriate with clinical expert input.

For current public reporting, we first reviewed the new ICD-10-CM and ICD-10-PCS codes in the FY 2022 code set to determine the most appropriate

categorizations for the newly implemented ICD-10 codes, using the existing v2019.1 beta version of the CCS for ICD-10-CM/PCS.

We confirmed the clinical appropriateness of the CCS categorizations of the newly implemented ICD-10 codes in relation to the planned readmission algorithm, and whether any changes were warranted. This led to the following changes in the algorithm:

- Potentially planned procedures:
  - The addition of new ICD-10-PCS codes (associated with AHRQ CCS procedure categories 48 and 49) to the singular ICD-10-PCS code list.

- Acute diagnoses:
  - The removal of ICD-10-CM codes (associated with AHRQ CCS diagnosis 237 and 661) from the singular ICD-10-CM code list;
  - The addition of whole 237 and 661, and the addition of ICD-10-CM codes (associated with AHRQ CCS diagnosis categories 155, 233, 238, 253, and 662).
  - The revision of 13 ICD-10-CM code descriptions.

Analyses of the changes to the planned readmission algorithm specifications suggest minimal impact to readmission measure rates.

The complete set of codes reflected in the v4.0_2023 planned readmission algorithm adopted as the PAA for the colonoscopy measure are available in the data dictionary tabs *"Colon PAA1 Always Plnnd Px,"* "*Colon PAA2 Always Plnnd Dx,*" "*Colon PAA3 Pot Plnnd Px,"* and *"Colon PAA4 Acute Dx.*"

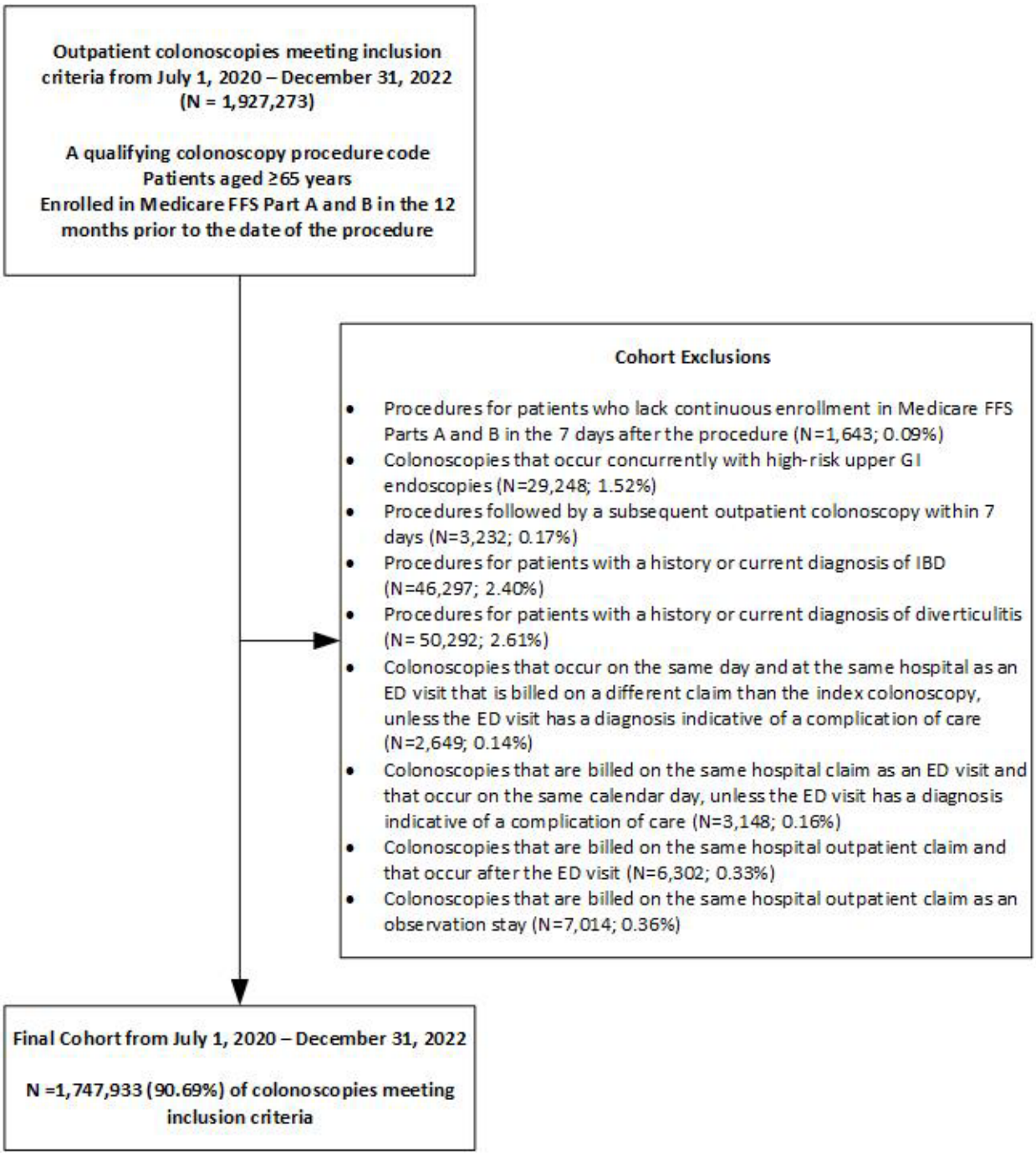
8. SUMMARY OF COLONOSCOPY MEASURE PERFORMANCE

This section presents updated information on the frequency and effect of model risk factors, model performance, facility-level colonoscopy volume, and risk-standardized rates across facilities after incorporating the changes described in Section 7.

8.1. Final Colonoscopy Cohort

Figure 8.1.1 illustrates the final cohort using the July 1, 2020 – December 31, 2022 performance data after applying all updates to inclusion and exclusion criteria described in Section 7.

Figure 8.1.1. HOPD Colonoscopy Cohort



8.2. Colonoscopy Model Parameters and Performance

We computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). To test model predictive ability, we calculated observed hospital visit rates in the lowest

and highest deciles based on predicted hospital visit probabilities. The c-statistic is an indicator of the model's discriminant ability to correctly classify those who did and did not have an unplanned hospital visit within seven days of the colonoscopy. Potential values range from 0.5, meaning no better than chance, to 1.0, meaning perfect discrimination. A c-statistic of 1.0 indicates perfect prediction, implying patients' outcomes can be predicted completely by their risk factors, and physicians and facilities play no role in patients' outcomes. The frequency of model risk factors and model parameters and performance are presented in this section, Section 8.2. In Section 8.3, we present the distributions of colonoscopy procedure volumes and risk-standardized hospital visit rates across facilities.

Table 8.2.1 shows the frequency of risk factors used in the risk-adjustment model. Table 8.2.2 presents the corresponding odds ratios (ORs) and 95% confidence intervals (CIs) from the hierarchical logistic regression model. Table 8.2.3 presents the colonoscopy model performance values.

Please note that, due to seasonal fluctuations, a truncated look-back period for risk adjustment in response to CMS's ECE policy, and other factors, the statistics from the second and shorter time period (July 1, 2020 – December 31, 2020) that are presented in the tables within this section are not directly comparable to the other two time periods.

Table 8.2.1. Frequency of Colonoscopy Model Risk Factors Among HOPDs over Different Time Periods

Risk Factor (% unless otherwise indicated)	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Total N	337,455	701,069	709,409	1,747,933
Age 65-69	32.16	31.63	30.70	31.35
Age 70-74	35.68	36.58	36.36	36.32
Age 75-79	21.01	20.91	22.26	21.48
Age 80-84	8.42	8.23	8.19	8.25
Age 85+	2.72	2.65	2.49	2.60
Endoscopy during Procedure	22.17	21.98	21.40	21.78
Polypectomy during Procedure	43.86	44.60	46.03	45.04
Congestive Heart Failure (CC 85)	7.39	9.66	10.45	9.55
Ischemic Heart Disease (CC 86-89)	15.61	20.20	22.30	20.16
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	5.20	7.48	8.36	7.40
Chronic Lung Disease (CC 111-113)	12.86	16.04	17.31	15.94
Metastatic Cancer (CC 8-11)	8.39	9.25	9.96	9.37
Liver Disease (CC 27-32)	6.30	8.71	9.38	8.52
Iron Deficiency Anemia (CC 49)	18.76	22.62	24.03	22.45

Risk Factor (% unless otherwise indicated)	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	6.51	9.48	10.43	9.29
Pneumonia (CC 114-116)	2.50	3.61	3.82	3.48
Psychiatric Disorders (CC 57-59, 61-63)	14.17	18.36	20.22	18.31
Substance Abuse (CC 54-56, 202-203)	5.11	6.90	7.43	6.77
Arrhythmia (CC 96-97)	15.73	20.06	22.34	20.15

Notes: Results based on July 1, 2020–December 31, 2022 performance period. CC-related risk factors are defined by v24 of CC map.

Table 8.2.2. Adjusted ORs and 95% CIs for the Colonoscopy Logistic Regression Model Among HOPDs over Different Time Periods

Variable (CC)	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Endoscopy during Procedure	1.28 (1.20-1.37)	1.29 (1.23-1.35)	1.25 (1.20-1.31)	1.28 (1.24-1.32)
Polypectomy during Procedure	1.17 (1.11-1.24)	1.17 (1.12-1.22)	1.23 (1.18-1.28)	1.19 (1.16-1.22)
Congestive Heart Failure (CC 85)	1.32 (1.21-1.45)	1.35 (1.27-1.43)	1.39 (1.31-1.47)	1.36 (1.31-1.41)
Ischemic Heart Disease (CC 86-89)	1.25 (1.16-1.35)	1.21 (1.15-1.27)	1.21 (1.15-1.27)	1.21 (1.17-1.25)
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	1.23 (1.11-1.36)	1.27 (1.20-1.36)	1.14 (1.07-1.21)	1.20 (1.15-1.25)
Chronic Lung Disease (CC 111-113)	1.27 (1.18-1.37)	1.27 (1.21-1.34)	1.25 (1.19-1.32)	1.26 (1.22-1.30)
Metastatic Cancer (CC 8-11)	1.21 (1.11-1.32)	1.20 (1.13-1.27)	1.20 (1.14-1.28)	1.20 (1.16-1.25)
Liver Disease (CC 27-32)	1.33 (1.21-1.47)	1.30 (1.23-1.39)	1.14 (1.07-1.21)	1.23 (1.18-1.28)
Iron Deficiency Anemia (CC 49)	1.43 (1.34-1.54)	1.33 (1.27-1.40)	1.33 (1.27-1.40)	1.35 (1.30-1.39)
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	1.49 (1.37-1.63)	1.43 (1.35-1.51)	1.46 (1.38-1.54)	1.44 (1.39-1.50)
Pneumonia (CC 114-116)	1.28 (1.13-1.46)	1.22 (1.12-1.32)	1.28 (1.19-1.38)	1.25 (1.19-1.32)
Psychiatric Disorders (CC 57-59, 61-63)	1.34 (1.24-1.44)	1.33 (1.27-1.40)	1.33 (1.27-1.40)	1.32 (1.28-1.36)

Variable (CC)	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Substance Abuse (CC 54-56, 202-203)	1.24 (1.11-1.38)	1.23 (1.15-1.32)	1.20 (1.12-1.28)	1.22 (1.16-1.27)
Arrhythmia (CC 96-97)	1.38 (1.19-1.60)	1.36 (1.24-1.50)	1.43 (1.30-1.57)	1.38 (1.30-1.47)
With Arrhythmia: Age 70-74 v. Age 65-69	1.07 (0.90-1.26)	1.11 (1.00-1.23)	1.07 (0.97-1.18)	1.08 (1.01-1.16)
With Arrhythmia: Age 75-79 v. Age 65-69	1.24 (1.05-1.46)	1.18 (1.06-1.32)	1.22 (1.10-1.35)	1.20 (1.13-1.29)
With Arrhythmia: Age 80-84 v. Age 65-69	1.55 (1.29-1.86)	1.49 (1.32-1.67)	1.40 (1.25-1.57)	1.46 (1.36-1.57)
With Arrhythmia: Age 85+ v. Age 65-69	1.71 (1.36-2.14)	1.97 (1.72-2.27)	1.63 (1.41-1.89)	1.79 (1.63-1.96)
Without Arrhythmia: Age 70-74 v. Age 65-69	1.02 (0.93-1.11)	1.04 (0.98-1.11)	1.03 (0.97-1.11)	1.03 (0.99-1.07)
Without Arrhythmia: Age 75-79 v. Age 65-69	1.18 (1.07-1.31)	1.19 (1.10-1.28)	1.18 (1.10-1.28)	1.18 (1.13-1.24)
Without Arrhythmia: Age 80-84 v. Age 65-69	1.64 (1.46-1.86)	1.50 (1.37-1.65)	1.62 (1.47-1.78)	1.58 (1.49-1.68)
Without Arrhythmia: Age 85+ v. Age 65-69	2.21 (1.86-2.62)	2.17 (1.90-2.48)	2.23 (1.94-2.57)	2.21 (2.04-2.41)

Notes: Results based on July 1, 2020 – December 31, 2022 performance period data.
CC-related risk factors are defined by v24 of CC map.
OR=Odds ratio; CI=Confidence interval

Table 8.2.3. Colonoscopy Logistic Regression Model Performance Among HOPDs over Different Time Periods

Characteristic	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Predictive ability, % (lowest decile – highest decile)	0.66-3.84	0.61-3.83	0.56-3.70	0.60-3.75
c-statistic	0.676	0.682	0.682	0.679

Note: Results based on July 1, 2020–December 31, 2022 performance period data.

8.3. Distribution of Facility-Level Measure Score

Table 8.3.1 presents the number of index colonoscopies. There were 3,614 HOPDs with at least one qualifying index colonoscopy in the 2023 data. The median number of qualifying procedures was 95 (interquartile range [IQR]: 33 – 242) for HOPDs.

Table 8.3.2 shows the mean and median risk-standardized hospital visit (RSHV) rates. The median HOPD RSHV rate was 13.13 hospital visits per 1,000 colonoscopies (IQR: 12.74 – 13.61). Figure 8.3.1 shows the overall distribution of RSHV rates for HOPDs.

Finally, Table 8.3.3 presents the between-facility variance and median odds ratio. Between-facility variance for HOPDs was 0.034 (SE= 0.004). If there were no systematic differences between facilities, the between-facility variances would be 0. The median odds ratio represents the median increase in odds of a hospital visit if a procedure on a single patient was performed at a higher risk facility compared to a lower risk facility. For HOPDs, the median value was 1.19, indicating that a patient had a 19% increase in the odds of a hospital visit if the same procedure was performed at a higher risk HOPD compared to a lower risk HOPD.

Table 8.3.1. Distribution of Colonoscopy Cohort Volumes Among HOPDs over Different Time Periods

Characteristic	7/1/2020-12/31/2020	1/1/2021-12/31/2021	1/1/2022-12/31/2022	7/1/2020-12/31/2022
Number of facilities	3,563	3,653	3,614	3,775
Mean number of colonoscopies (SD)	94.71 (140.78)	191.92 (291.77)	196.29 (295.56)	463.03 (713.71)
Range (min – max)	1 – 2,190	1 – 4,645	1 – 4,760	1 – 11,595
25th percentile	16	32	33	71
50th percentile (median)	46	92	95	217
75th percentile	118	239	242	570

Note: Results based on July 1, 2020 – December 31, 2022 performance period data.

Table 8.3.2. Distribution of Colonoscopy Risk-Standardized Hospital Visit (RSHV) Rates Among HOPDs

Characteristic	7/1/2020-12/31/2022
Number of facilities	3,775
Mean RSHV rate (SD)	13.18 (0.91)
Range (min – max)	9.13 – 18.14
25th percentile	12.74
50th percentile (median)	13.13
75th percentile	13.61

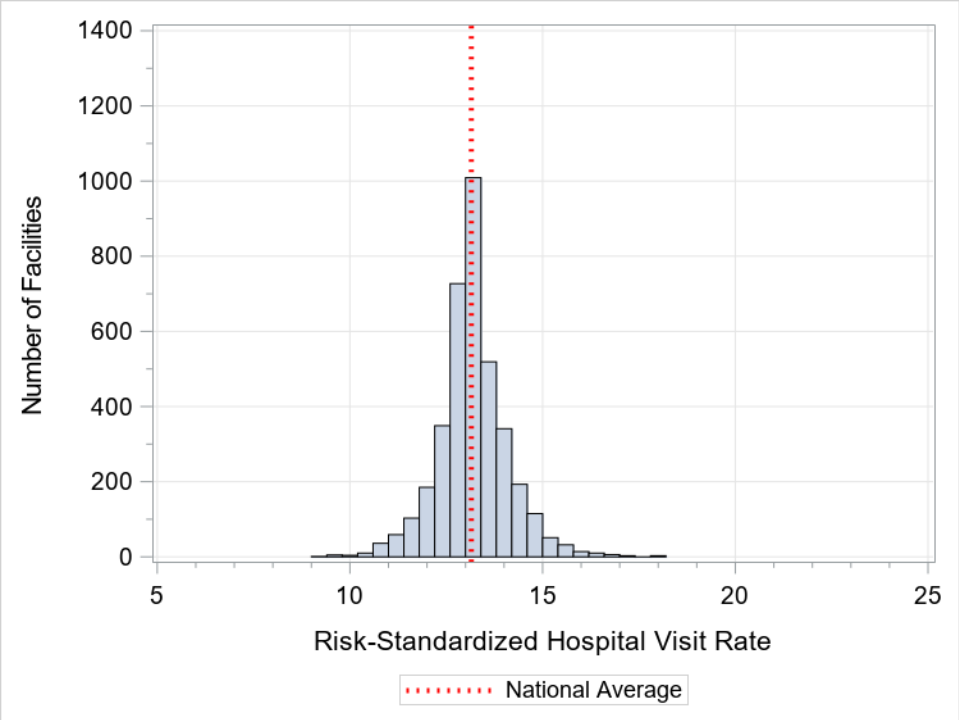
Note: Results based on July 1, 2020 – December 31, 2022 performance period data.
SD=standard deviation

Table 8.3.3. Colonoscopy Between-Facility Variance Among HOPDs

Characteristic	7/1/2020-12/31/2022
Between-facility variance (SE)	0.034 (0.004)
Median odds ratio	1.19

Note: Results based on July 1, 2020 – December 31, 2022 performance period data.
SE=standard error

Figure 8.3.1. Distribution of Colonoscopy RSHV Rates



Note: Results based on July 1, 2020 – December 31, 2022 performance period data.

8.4. Distribution of Facilities by Performance Category

Table 8.4.1 below shows the national performance for the colonoscopy measure after updates. Of 3,775 HOPD facilities in the study cohort, 11 facilities performed "Better than the National Rate," 3,254 facilities performed "No Different than the National Rate," 5 facilities performed "Worse than the National Rate," and 505 facilities were classified as "Number of Cases Too Small" (fewer than 30) to reliably tell how well the hospital is performing.

Table 8.4.1. Colonoscopy Facility Performance Category Distribution Among HOPDs

Performance Category	HOPDs	
	Number of facilities	% distribution
Better than the National Rate	11	0.29
No Different than the National Rate	3,254	86.20
Worse than the National Rate	5	0.13
Number of Cases Too Small	505	13.38

9. GLOSSARY

Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) (chemotherapy measure): A diagnosis and procedure categorization that groups thousands of individual procedure and diagnosis codes into clinically coherent, mutually exclusive procedure CCS categories and mutually exclusive diagnosis CCS categories, respectively.

Case mix: The comorbidity profile and age characteristics of patients with index procedures at a given facility (for chemotherapy measure, the particular mix of comorbidities, cancer types, gender and age groups of eligible patients at a given facility).

Cohort: The index procedures used to calculate the measure after inclusion and exclusion criteria have been applied (for chemotherapy measure, the patients with at least one index chemotherapy treatment used to calculate the measure after inclusion and exclusion criteria have been applied).

Complications (surgery and colonoscopy measure): Medical conditions that likely occurred because of care rendered during the index procedure.

Comorbidities: Medical conditions that the patient had in addition to his/her primary reason for receiving a procedure (for chemotherapy measure, medical conditions the patient had during the 12-month period prior to the chemotherapy treatment).

Condition Categories (CCs): Groupings of diagnosis codes in clinically relevant categories, from the Hierarchical Condition Categories (HCCs) system. The measures use the grouping but not the hierarchical logic of the system to create risk factor variables. Description of the CCs can be found at http://www.cms.hhs.gov/Reports/downloads/pope_2000_2.pdf.

Discharge diagnosis (chemotherapy measure): ICD-10-CM code indicating the primary or secondary reason for a hospital visit.

Expected hospital visits (surgery and colonoscopy measure): The number of hospital visits within seven days of the procedure the facility is expected to have given the HOPD's case mix (for the surgery measure this also includes the surgical procedure mix) and the average of all facility-specific effects in the nation.

Expected outcomes (chemotherapy measure): The number of eligible patients expected to experience an admission or ED visit within 30 days of the chemotherapy treatment predicted by the hierarchical model among that facility's patient population, accounting for patients' risk factors and the average of all facility-specific effects in the nation.

Facility-specific effect (chemotherapy measure): An estimate of the additional impact a facility has on the log odds of a hospital visit within 30 days of the chemotherapy treatment after accounting for patient-level risk factors.

Facility-specific intercept: A measure of the facility quality of care calculated based on the facility's actual hospital visit rate relative to facilities with similar patients, considering how many patients it served, its patients' risk factors, and how many experienced a subsequent unplanned hospital visit. The facility-specific effect will be negative for a better-than-average facility, positive for a worse-than-average facility, and close to zero for an average facility. The facility-specific effect is used in the numerator to calculate "predicted" hospital visits.

Hierarchical logistic regression model (all measures): A class of generalized linear models for clustered data. The model not only considers patient risk factors, but also estimates a facility-specific quality effect, an estimate of the additional impact a facility has on the log odds of having a hospital visit.

Hierarchical model (chemotherapy measure): A class of generalized linear models for clustered data. The model not only considers patient risk factors, but also estimates a facility-specific quality effect, an estimate of the additional impact a facility has on the log odds of having an admission or ED visit.

Hospital visit (surgery measure): Inpatient admission directly after surgery or ED visit, observation stay, or unplanned inpatient admission occurring after discharge from the HOPD within 7 days of an index surgical procedure.

Index chemotherapy: The chemotherapy treatment for a given patient included in the measure calculation as the treatment to which the outcome is attributed.

Index colonoscopy: Any colonoscopy included in the measure calculation as the procedure to which the outcome is attributed.

Index surgical procedure: Any eligible surgery assessed in the measure for the outcome (hospital visit within 7 days).

Interval estimate: Similar to a confidence interval. The interval estimate is a range of probable values for the estimate that characterizes the amount of uncertainty associated with the estimate. For example, a 95% interval estimate for a hospital visit rate indicates that CMS is 95% confident that the true value of the rate lies between the lower limit and the upper limit of the interval.

Medicare fee-for-service (FFS): Original Medicare plan in which providers receive a fee or payment for each individual service provided directly from Medicare. All services rendered are unbundled and paid for separately. Only beneficiaries in Medicare FFS, not in managed care (Medicare Advantage), are included in the measure.

National observed admission rate (chemotherapy measure): The number of eligible patients that experience one or more qualifying inpatient admissions within 30 days of the chemotherapy treatment divided by the number of eligible patients. The observed rate has not

been risk adjusted to account for patient differences, nor have adjustments been made to account for differences in sample sizes or facility-specific effect.

National observed ED visit rate (chemotherapy measure): The number of eligible patients that experience one or more qualifying ED visits within 30 days of the chemotherapy treatment divided by the number of eligible patients. The observed rate has not been risk adjusted to account for patient differences, nor have adjustments been made to account for differences in sample sizes or facility-specific effect.

National observed 7-day unplanned hospital visit rate (colonoscopy measure): All included colonoscopies with the outcome divided by all included colonoscopies.

Observed rate (chemotherapy measure): The number of eligible patients that experience one or more qualifying inpatient admissions or one or more qualifying stand-alone ED visits within 30 days of the chemotherapy treatment divided by the number of eligible patients. The observed rate has not been risk adjusted to account for patient differences, nor have adjustments been made to account for differences in sample sizes or facility-specific effect.

Observed unplanned hospital visit rate (surgery measure): The number of eligible surgeries that experience a hospital visit within seven days of the index surgical procedure divided by the number of eligible index surgeries. The observed unplanned hospital visit rate has not been risk-adjusted to account for patient and procedure differences, nor have adjustments been made to account for differences in sample size, the clustering of patients within facilities, and a facility-specific effect.

Outcome (surgery and colonoscopy measure): The result of a broad set of healthcare activities that affect patients' well-being. For these measures, the outcome includes any ED visit, observation stay, or unplanned inpatient admission, FFS hospitalization (ED, OBS, or readmission), or acute care hospitalization (including all CAHs) within seven days of the index procedure.

Planned hospital visits (surgery and colonoscopy measure): A hospital visit within seven days of the index procedure that is a scheduled part of the patient's plan of care. Planned hospital visits are not counted as outcomes in these measures.

Predicted hospital visits (surgery and colonoscopy measure): The number of unplanned hospital visits within seven days of the surgery the facility is predicted to have, accounting for the observed unplanned hospital visit rate, the number of surgeries performed at the HOPD, and the HOPD's case mix and that facility's facility-specific effect.

Predicted outcomes (chemotherapy measure): The number of eligible patients that are predicted to experience one or more qualifying inpatient admissions or qualifying stand-alone ED visits within 30 days by the hierarchical model among a facility's patients, given the patients' risk factors and that facility's facility-specific effect.

Procedure category (surgery and colonoscopy measures): A group of related procedure codes, as grouped by the Agency for Healthcare Research and Quality (AHRQ) CCS.

Risk-adjustment variables: Patient demographics and comorbidities used to standardize rates for differences in case mix across facilities.

Risk-standardized admission rate (RSAR) (chemotherapy measure): An admission rate that has been adjusted for differences in case mix across facilities and a facility-specific effect. The rate is calculated by producing a ratio of the number of "predicted outcomes" to the number of "expected outcomes" for each facility and then multiplying the ratio by the national observed outcome rate. Separate models are used for the inpatient admission and ED visit outcomes.

Risk-standardized emergency department visit rate (RSEDR) (chemotherapy measure): An ED visit rate that has been adjusted for differences in case mix across facilities and a facility-specific effect. The rate is calculated by producing a ratio of the number of "predicted outcomes" to the number of "expected outcomes" for each facility and then multiplying the ratio by the national observed outcome rate. Separate models are used for the inpatient admission and ED visit outcomes.

Unplanned hospital visits (surgery and colonoscopy measure): Acute clinical events are patient experiences that require urgent hospital visits. Any ED visit, observation stay, ~~or~~ unplanned inpatient admission, FFS hospitalization (ED, OBS or readmission), or acute care hospitalization (including all CAHs) occurring after discharge from the HOPD.

Work relative value unit (RVU) (surgery measure): Approximate the procedure complexity by incorporating elements of physician time and efforts. Surgeries with increasing complexity are assigned a higher work RVU.

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11. APPENDICES

Appendix A: Measure Score Calculation and Reporting

We fit a hierarchical generalized linear model (HGLM), which accounts for the clustering of observations within HOPDs. We assume the outcome is a known exponential family distribution and relates linearly to the covariates via a known link function, h. For our model, we assumed a binomial distribution and a logit link function. Further, we accounted for the clustering within HOPDs by estimating a facility-specific effect, α_i, which we assume follows a normal distribution with mean μ and variance τ^2, the between-facility variance component. The following equations define the HGLM:

$$(1)\quad h\left(\Pr(Y_{ij}=1|\boldsymbol{Z}_{ij,}\omega_i)\right)=\log\left(\frac{\Pr(Y_{ij}=1|\boldsymbol{Z}_{ij,}\omega_i)}{1-\Pr(Y_{ij}=1|\boldsymbol{Z}_{ij,}\omega_i)}\right)=\alpha_i+\boldsymbol{\beta Z}_{ij}$$

$$\text{where } \alpha_i=\mu+\omega_i;\ \omega_i\sim N(0\tau^2)$$

$$i=1\ldots I;\ j=1\ldots n_i$$

Where Y_{ij} denotes the outcome (equal to 1 if patient has one or more qualifying hospital visits within 7 days, 0 otherwise) for the *j-th* patient who had a surgical procedure at the *i-th* HOPD; $\boldsymbol{Z}_{ij}$ = ($Z_{1ij}, Z_{2ij}, \ldots Z_{pij}$) is a set of *p* patient-specific covariates derived from the data; and *I* denotes the total number of HOPDs; and n_i the number of surgeries performed at HOPD *i*. The facility-specific intercept of the *i-th* HOPD, α_i, defined above, comprises μ, the adjusted average intercept over all HOPDs in the sample, and ω_i, the facility specific intercept deviation from μ. A point estimate of ω_i, greater or less than 0, determines whether HOPD performance is worse or better compared to the adjusted average outcome.

We estimate the HGLM using the SAS software system (GLIMMIX procedure).

Risk-Standardized Measure Score Calculation

Using the HGLM defined by Equation (1), we obtain the parameters $\hat{\mu}$, $\left(\hat{a}_1,\hat{a}_{2,}\ldots,\hat{a}_1\right)$, $\hat{\beta}$, and $\hat{\tau}^2$. We calculate a risk-standardized ratio s, for each HOPD by computing the ratio of the number of predicted hospital visits to the number of expected hospital visits. Specifically, we calculate:

(1) Predicted Value: $\hat{Y}_{ij} = h^{-1}\left(\hat{\alpha}_i + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right) = \frac{\boldsymbol{exp}\left(\hat{\alpha}_i + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right)}{\boldsymbol{exp}\left(\hat{\alpha}_i + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right) + \mathbf{1}}$

(2) Expected Value: $\hat{e}_{ij} = h^{-1}\left(\hat{\mu} + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right) = \frac{\boldsymbol{exp}\left(\hat{\mu} + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right)}{\boldsymbol{exp}\left(\hat{\mu} + \widehat{\boldsymbol{\beta}}\boldsymbol{Z}_{ij}\right) + \mathbf{1}}$

(3) $\hat{s}_i = \frac{\sum_{j=1}^{n_i} \hat{Y}_{ij}}{\sum_{j=1}^{n_i} \hat{e}_{ij}}$

If the "predicted" number of hospital visits is higher (lower) than the "expected" number of hospital visits, then that HOPDs $\hat{s}_i$ will be higher (lower) than 1.

Outlier Evaluation

Because the measure score is a complex function of parameter estimates, we use re-sampling and simulation techniques to derive an interval estimate to determine if a HOPD is performing better than, worse than, or no different than expected. A HOPD is considered as better than expected if their entire confidence interval falls below 1 and considered worse if the entire confidence interval falls above 1. They are considered no different if the confidence interval overlaps 1.

More specifically, we use a bootstrapping procedure to compute confidence intervals. Because the theoretical-based standard errors are not easily derived, and to avoid making unnecessary assumptions, we use the bootstrap to empirically construct the sampling distribution for each facility-level risk-standardized ratio. The bootstrapping algorithm is described below.

Bootstrapping Algorithm

Let *I* denote the total number of facilities in the sample. We repeat steps 1 – 4 below for b = 1,2,…B times:

1. Sample *I* facilities with replacement.
2. Fit the hierarchical logistic regression model using all patients within each sampled facility. We use as starting values the parameter estimates obtained by fitting the model to all facilities. If some facilities are selected more than once in a bootstrapped sample, we treat them as distinct so that we have *I* random effects to estimate the variance components. At the conclusion of Step 2, we have:
   a. $\widehat{\boldsymbol{\beta}}^{(b)}$(the estimated regression coefficients of the risk factors).
   b. The parameters governing the random effects, facility adjusted outcomes, distribution $\hat{\mu}^{(b)}$ and $\hat{\tau}^{2(b)}$.

c. The set of facility-specific intercepts and corresponding variances, $\left\{\hat{\alpha}_i^{(b)}, \hat{var}\left(\alpha_i^{(b)}\right); i = 1,2,\ldots,I\right\}$

3. We generate a facility random effect by sampling from the distribution of the facility-specific distribution obtained in Step 2c. We approximate the distribution for each random effect by a normal distribution. Thus, we draw $\alpha_i^{(b*)} \sim N(\hat{\alpha}_i^{(b)}, \hat{var}\left(\alpha_i^{(b)}\right))$ for the unique set of facilities sampled in Step 1.

4. Within each unique facility *i* sampled in Step 1, and for each case *j* in that facility, we calculate $\hat{y}_{ij}^{(b)}$, $\hat{e}_{ij}^{(b)}$, and $\hat{s}_i^{(b)}$ where $\widehat{\boldsymbol{\beta}}^{(b)}$ and $\hat{\mu}^{(b)}$ are obtained from Step 2 and $\alpha_i^{(b*)}$ is obtained from Step 3.

Ninety-five percent interval estimates (or alternative interval estimates) for the facility-standardized outcome can be computed by identifying the 2.5th and 97.5th percentiles of randomly half of the B estimates (or the percentiles corresponding to the alternative desired intervals).

Appendix B: Annual Updates to Surgery Measure Since Measure Development

Annual updates of the measure can be found in the annual updates and specifications reports available on *QualityNet*. For convenience, we have listed key measure updates here by calendar year and corresponding report.

2023

2023 Measure Updates and Specifications Report

- Updated the ICD-10 code-based specifications used in the measure.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2022

2022 Measure Updates and Specifications Report

- Addition of 172 codes to the cohort inclusion, removal of 11 codes from the cohort inclusion, addition of 51 codes to the cohort exclusions, and removal of 11 codes from the cohort exclusions.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2021

2021 Measure Updates and Specifications Report

- Shortening of the measurement period for 2021 public reporting to approximately 6 months (from the typical 12-month measurement period).
  Rationale: The measurement period reduction is in response to the COVID-19 public health emergency and CMS's decision to exclude claims data for January 1, 2020 - June 30, 2020 (Q1 and Q2 of 2020) under its ECE policy.
- Addition of 4 codes to the cohort inclusion, removal of 1 code from the cohort eye exclusions, and the addition of 33 codes to the cohort high-risk exclusions.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2020

2020 Measure Updates and Specifications Report

- Update to coding for emergency department (ED) visits by shifting from the previously used 'claim from date' on the claim, to the 'minimum ED revenue center date' on the claim.
  Rationale: Aligns with changes we made last year to exclude cases based on this date.

2019

2019 Measure Updates and Specifications Report

- Update to exclusion for surgeries that are billed on the same hospital claim as an ED visit and that occur on the same calendar day, unless the ED visit has a diagnosis indicative of a complication of care.
  Rationale: In these situations, it is not possible to use claims data to determine whether the surgery was the cause of, subsequent to, or during the ED visit. However, if the ED visit is coded with a diagnosis for a complication, the assumption is that it occurred after the surgery.
- Update to exclusion for surgeries that are billed on the same hospital outpatient claim and that occur after the ED visit.
  Rationale: In these situations, we assume that the surgery was subsequent to the ED visit and may not represent routine surgery. The timing of the ED visits is determined using revenue center dates from the outpatient claim.
- Update to the surgery measure's planned readmission algorithm by adopting changes made when going from v4.0_2019 to v4.0_2020[**] of the planned readmission algorithm (see Section 3.2.2 for a discussion of updates to the planned readmission algorithm).
  Rationale: These changes improve the accuracy of the algorithm by updating the algorithm for coding changes and decreasing the number of hospital visits that the algorithm mistakenly designated as unplanned or planned.

2018

2018 Measure Updates and Specifications Report

- Update to the approach for identifying concurrent high-risk procedure to (1) not require specific GSI values for procedures on CMS's Hospital Outpatient Prospective Payment System "inpatient only" procedures list, (2) exclude cases with a high-risk procedure identified on the outpatient or inpatient facility claim that are matched to a professional services claim having an eligible same-day surgery.
  Rationale: This improves the measure's ability to exclude all cases with concurrent high-risk surgery.
- Expansion of definition of complication of care for same-day, separate-claim ED visit exclusion. Additional CCS complication codes added following dry run:
  - CCS 2616: Adverse effects of medical care
  - CCS 2617: Adverse effects of medical drugs
    Rationale: This improves accuracy of capturing the outcome by including "same-day" ED visits that are indicative of a complication of care.
  - Update to the exclusion for surgeries billed on the same claim as an ED visit, where the measure continues to exclude surgeries billed on the same hospital outpatient claim as an ED visit *unless* the primary diagnosis on the facility claim is indicative of a

[**] In the 2019 measure reevaluation report, the measure adapted planned readmission algorithm Version 4.0_2020, but for future implementation, the measure will use the most up-to-date version available.

complication of care.
Rationale: This improves accuracy of capturing the outcome by including "same-day" "same-claim" ED visits indicative of a complication of care.

- Update to the surgery measure's planned admission algorithm (PAA) by adopting changes made when going from v4.0_2017 to v4.0_2019[††] of the planned readmission algorithm (see Section 3.2.2 for a discussion of updates to the planned readmission algorithm).
  Rationale: These changes improve the accuracy of the algorithm by updating the algorithm for coding changes and decreasing the number of hospital visits that the algorithm mistakenly designated as unplanned or planned.

2017

(No changes were made in 2017 during the dry run year)

2016

2016 Measure Updates and Specifications Report

- Update to the exclusion criterion for Medicare FFS Enrollment.
  Rationale: The measure excludes surgeries for patients who are not continuously enrolled in Medicare FFS Parts A and B for at least 7 days after the surgery (rather than at least 30 days, as specified in the original measure). The measure will continue to exclude patients with fewer than 7 days post-surgery enrollment to ensure all patients have full data available for outcome assessment. This minor adjustment shortens the requirement for continuous enrollment to exclude index procedures only when necessary.
- Addition of an exclusion criterion to exclude surgeries that are billed on the same day but on a separate claim as an ED visit, unless the ED visit has a diagnosis indicative of a complication of care.
  Rationale: It is unclear whether a same-day ED visit occurred before or after an eligible same-day surgery. However, the measure excludes surgeries with same-day, separate-claim ED visits when the diagnosis for the ED visit is indicative of a post-surgery complication. The measure classifies these diagnoses using AHQR CCS groups. The measure considers ED visits with the following diagnoses as outcomes:
  - AHRQ CCS 237 – Complication of device; implant or graft
  - AHRQ CCS 238 – Complications of surgical procedures or medical care
  - AHRQ CCS 257 – Other aftercare
  - ICD-9-CM code 338.18 – Acute pain

In these scenarios, the procedure is counted in the index cohort and the ED visit is counted as an outcome.

- Update to how the measure handles multiple qualifying procedures within 7 days.
  Rationale: The timeframe for outcome assessment was 7 days after each procedure that

[††] In the 2018 measure reevaluation report, the measure adapted planned readmission algorithm Version 4.0_2019.

occurred within a 7-day period. With the updated specifications, the outcome is attributed to the surgery nearest to (and preceding) the hospital visit.

- Adoption of the changes from the updated planned readmission algorithm Version 4.0_2017 from Version 3.0, which are based on findings from a validation study and the review of those findings by clinical experts, to the surgery measure's PAA.
  Rationale: These changes improve the accuracy of the algorithm by decreasing the number of hospital visits that the algorithm mistakenly designated as unplanned or planned.
- Specification of the risk variables and complication-of-care variables mapped to the Hierarchical Condition Categories (HCC) Version 22 to accommodate ICD-10 codes.
  Rationale: This update accommodates the use of ICD-10 codes for risk variable definitions using version 22 of CMS's HCCs.

Appendix C: Annual Updates to Chemotherapy Measure Since Measure Development

Annual updates of the measure can be found in the annual updates and specifications reports available on *QualityNet*. For convenience, we have listed all prior updates here under the calendar year and corresponding report.

2023

2023 Measure Updates and Specifications Report

- Updated the ICD-10 code-based specifications used in the measure.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2022

2022 Measure Updates and Specifications Report

- Addition of 10 codes to the numerator, addition of 5 codes to the denominator, addition of 17 codes to the denominator exclusions, and the addition of 68 codes to the risk adjustment variables.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2021

2021 Measure Updates and Specifications Report

- Shortening of the measurement period for 2021 public reporting to approximately 6 months (from the typical 12-month measurement period).
  Rationale: The measurement period reduction is in response to the COVID-19 public health emergency and CMS's decision to exclude claims data for January 1, 2020 - June 30, 2020 (Q1 and Q2 of 2020) under its ECE policy.
- Removal of 11 codes from the denominator (cohort), addition of 1 code to the numerator (outcome), the addition of 19 codes to the denominator (cohort), and the addition of 81 codes to the Concurrent Radiotherapy risk variable.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2020

2020 Measure Updates and Specifications Report

- Update to coding to code the measure at the procedure-level, not the claim-level.
  Rationale: Facilities do not necessarily bill every day, they bill monthly, or longer. This update ensures all individual chemotherapy treatments that are billed on the claim are adjusted for.
- Update to exclusion criteria to exclude all cases where chemotherapy was administered on the same date as hospital admission and during inpatient stays.

Rationale: It would be uncommon for a patient to receive outpatient chemotherapy and then be admitted to the ED or hospital.

- Update to coding of number of chemotherapy treatments risk variable to include only chemotherapy treatments that meet inclusion criteria.
  Rationale: This better reflects the probability of experience in outcome in the 30 days following the event.

2019

2019 Measure Updates and Specifications Report

- Addition of stand-alone observation stays to the ED-visit measure outcome.
  Rationale: It has become increasingly common for observation stays to be used in place of hospital admissions or ED visits. This rate already captured observation stays billed with an ED visit, so this update adds in a small portion billed separately. This update improved the measure's ability to capture all hospital visits that may indicate gaps in quality of care.
- Addition of four new four new cancer risk variables (anal cancer, bladder cancer, ovarian cancer, and pancreatic cancer) from existing, broader risk factor categories in both risk models.
  Rationale: Adding more specificity to cancer type in the risk models will account for patients with cancer types that may be more likely to experience an outcome and ensure that both models more accurately discriminate and predict facility performance.

2018

2018 Measure Updates and Specifications Report

- Addition of a new case-level exclusion in which patients receiving chemotherapy to treat a qualifying autoimmune condition rather than cancer are excluded from the measure.
  Rationale: This improves the measure's ability to ensure that only chemotherapy treatments for cancer are included in the measure cohort.
- Exclusion of patients with leukemia in remission.
  Rationale: Patients with leukemia in remission are still at elevated risk for adverse events after chemotherapy treatment and thus admissions among this population do not reflect poorly managed outpatient care.
- Addition of concurrent radiotherapy to the measure's risk adjustment model.
  Rationale: Patients receiving chemotherapy and radiotherapy concurrently are at higher risk for an outcome due to increased exposure to toxins. Adding this as a risk adjustment variable will ensure that facilities treating a higher proportion of patients undergoing concurrent radiotherapy are not penalized.
- Removal of planned admissions from the measure outcome.
  Rationale: Planned admissions are defined as those planned by providers for anticipated medical treatment or procedures that must be provided in the inpatient setting. The measure only counts unplanned admissions in the measure outcome because variation in planned admissions does not reflect quality differences.
- Removal of 17 codes from the numerator (outcome) and addition of 1 code to the numerator (outcome) and 8 codes to the denominator (cohort).
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's

existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2017

2017 Measure Refinements Memorandum

- Update of code sets used to identify measure denominator (cohort) and numerator (outcome) by reviewing codes included in related code sets and conducting a forwards and backwards mapping of ICD-9 and ICD-10 codes utilizing CMS's General Equivalency Mapping (GEMS) files.
  Rationale: The chemotherapy measure code sets were updated to better refine the denominator (cohort) population of measured patients receiving chemotherapy, as well as the group of potentially preventable diagnoses qualifying as outcomes. The diagnosis codes used to identify the measure population and qualifying diagnoses, known as the code sets, are the foundation of the measure. It is critical that these codes accurately capture the concept intended and are regularly updated to reflect changes in the coding systems.
- Inclusion of patients who die following chemotherapy and would have been excluded only because they lacked a full month of Medicare FFS enrollment data.
  Rationale: Retaining these patients in the cohort better reflects the quality of chemotherapy care among included HOPDs, as the measure now includes all patients receiving chemotherapy, even those who were admitted to the hospital or visited the ED for a potentially preventable condition or symptom that was associated with the patient's death within 30 days of chemotherapy.

Appendix D: Annual Updates to Colonoscopy Measure Since Measure Development

Annual updates of the measure can be found in the annual updates and specifications reports available on *QualityNet*. For convenience, we have listed all prior updates here under the calendar year and corresponding report.

2023

2023 Measure Updates and Specifications Report

- Updated the ICD-10 code-based specifications used in the measure.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2022

2022 Measure Updates and Specifications Report

- Addition of 44 codes to the emergency department exclusions and the removal of 1 code from the emergency department exclusions.
  Rationale: Each year, as part of reevaluation of the measure, CMS reviews the measure's existing code set as well as updates to ICD-10, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date.

2021

2021 Measure Updates and Specifications Report

- Shortened the measurement period for 2021 public reporting to approximately 29 months (from the typical 36-month measurement period).
  Rationale: The measurement period reduction is in response to the COVID-19 public health emergency and CMS's decision to exclude claims data for January 1, 2020 - June 30, 2020 (Q1 and Q2 of 2020) under its ECE policy.

2020

2020 Measure Updates and Specifications Report

- Update to coding for ED visits by shifting from the previously used 'claim from date' on the claim, to the 'minimum ED revenue center date' on the claim.
  Rationale: Aligns with changes we made last year to exclude cases based on this date.

2019

2019 Measure Updates and Specifications Report

- Modification of the PAA to align with changes made to CMS's Planned Readmission Algorithm version 4.0 2020.[‡‡]

[‡‡] In the 2019 measure reevaluation report, the measure adapted Planned Readmission Algorithm Version 4.0_2020, but for future implementation, the measure will use the most up-to-date version available.

Rationale: These changes align with the specifications of similar measures and improve the accuracy of the algorithm.

- Update to exclusion for surgeries that are billed on the same hospital claim as an ED visit and that occur on the same calendar day, unless the ED visit has a diagnosis indicative of a complication of care.
  Rationale: In these situations, it is not possible to use claims data to determine whether the surgery was the cause of, subsequent to, or during the ED visit. However, if the ED visit is coded with a diagnosis for a complication, the assumption is that it occurred after the surgery.
- Update to exclusion for surgeries that are billed on the same hospital outpatient claim and that occur after the ED visit.
  Rationale: In these situations, we assume that the surgery was subsequent to the ED visit and may not represent routine surgery. The timing of the ED visits is determined using revenue center dates from the outpatient claim.

2018

2018 Measure Updates and Specifications Report

- Modification of the PAA to align with changes made to CMS's Planned Readmission Algorithm version 4.0_2019.
  Rationale: These changes align with the specifications of similar measures and improve the accuracy of the algorithm.
- Modification of the list of AHRQ CCS categories used to define complications of care for ED visit exclusions.
  Rationale: The list of AHRQ CCS categories used to identify complications of care in the same claim/same-day ED visit exclusions was modified and expanded to include one ICD-10 diagnosis code for post-procedural pain. The changes were made to improve the accuracy of the measure and ensure that it captures complications of care following low-risk colonoscopies.

2017

2017 Measure Updates and Specifications Report

- Expansion of same outpatient claim ED visit exclusion to include colonoscopies matched to inpatient claims with ED visits.
  Rationale: In these situations, much like colonoscopies on the same outpatient claim as an ED visit, it is not possible to use claims data to determine whether the colonoscopy was the cause of, subsequent to, or during the ED visit.
- Adjustment of ED-related exclusions to only exclude colonoscopies on the same claim or on the same day and at the same facility as an ED visit if the facility claim does not have a diagnosis that is a complication of care as defined by four AHRQ CCS categories.
  Rationale: While we cannot determine the order of events in these cases, we are keeping cases with facility diagnoses that indicate clear complications of care in order to ensure that the measure captures its intended outcome.
- Modification of the PAA to align with appropriate changes signaled during ICD-10 code testing and review.

Rationale: First, the algorithm was aligned with version 4 (ICD-10) of the Planned Readmission Algorithm used in the inpatient readmission measures and the 2017 ACO admission measures. Next, CMS removed or added additional ICD-10-PCS (from PA3) and ICD-10-CM (from PA4) codes, as appropriate to the colonoscopy measure, following review of new FY2017 codes and GEM mappings.

2016

2016 Measure Updates and Specifications Report

- Addition of three high-risk colonoscopy procedure codes to the list of excluded procedures.
  Rationale: Because the measure is intended to assess quality of care during and following low-risk colonoscopy procedures, these three codes are not appropriate for inclusion in the measure cohort.
- Addition of new (added in 2015 or later) procedure codes for index low-risk colonoscopies, high-risk colonoscopies, and upper GI endoscopy exclusions.
  Rationale: These new codes are consistent with the intent of the measure to include only low-risk procedures and reflect current code sets.
- Expansion of the exclusions for IBD and diverticulitis to include current diagnoses of IBD and diverticulitis as well as a history of either condition.
  Rationale: IBD and diverticulitis are serious conditions that, if diagnosed during the colonoscopy, would likely result in an admission that does not reflect the quality or safety of the colonoscopy.
- Addition of an exclusion for colonoscopies that are billed on the same hospital outpatient claim as an observation stay.
  Rationale: In these situations, it is not possible to use claims data to determine whether the colonoscopy was the cause of, subsequent to, or during the observation stay.
- Exclusion of colonoscopies on the same day, but on a separate-claim, as an ED visit occurring at the same facility.
  Rationale: It is unclear whether a same-day ED visit occurred before or after a colonoscopy. However, it is unlikely that a patient would experience an ED visit for an acute diagnosis at one facility and then travel to another facility for a routine colonoscopy on the same day; therefore, ED visits at different facilities are not excluded because they likely represent complications of care.
- Updating of the PAA with measure-specific changes and to align with CMS's Planned Readmission Algorithm version 4.0.
  Rationale: These changes improve the accuracy of the algorithm by decreasing the number of hospital visits that the algorithm mistakenly designated as unplanned or planned.

2015

2015 Measure Updates and Specifications Report

- Addition of the exclusion for same-claim ED visits.
  Rationale: In these situations, it is not possible to use claims data to determine whether the colonoscopy was the cause of, subsequent to, or during the ED visit.

- Addition of exclusion for colonoscopies followed by a subsequent procedure within 7 days.
  Rationale: In these situations, the two colonoscopies are considered part of a single episode of care, for which the subsequent colonoscopy is considered the index procedure.
- (Revision to an original exclusion) Exclusion of colonoscopies for patients who are not continuously enrolled in Medicare FFS Parts A and B for at least 7 days instead of 30 after the qualifying colonoscopy.
  Rationale: Since the outcome time frame is seven days, the requirement for continuous enrollment was shortened to exclude as few index procedures as necessary.

Appendix E: Planned Admission Algorithm, adapted from CMS Planned Readmission Algorithm Version 4.0

Planned Admission Algorithm Overview

The planned admission algorithm is adapted from the CMS Planned Readmission Algorithm Version 4.0_2021. The algorithm is a set of criteria for classifying admissions within seven days of an outpatient surgery or visit as planned or unplanned using Medicare claims. We count only unplanned admissions in the measure outcome because variation in planned admissions does not reflect quality differences. Section 3.2.2 and Section 7.2.2 provide detail on the changes made to the algorithm based on reevaluation.

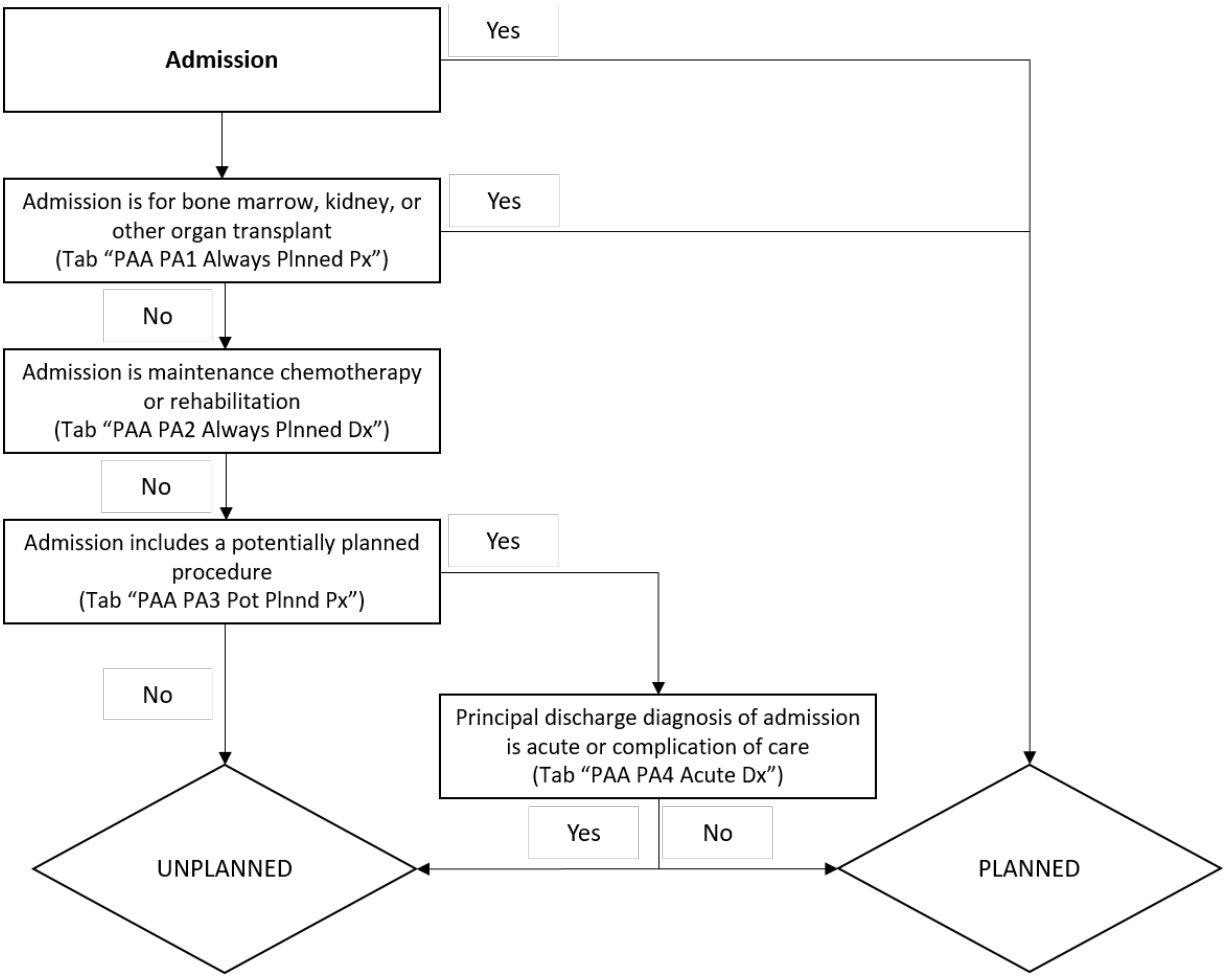
The surgery, colonoscopy, and chemotherapy measures use the always planned procedures (CCS 64, 105, and 176) and always planned diagnoses (CCS 45 and 254) lists from the planned admission algorithm. The surgery and colonoscopy measures also use the potentially planned procedures and acute diagnoses lists; the surgery measure aligns with the Planned Readmission Algorithm v4.0, whereas the colonoscopy measure has some measure-specific differences. Specifically, the colonoscopy measure includes an additional 14 CCS categories, including CCS 70, 72, 73, 75, 76, 77, 90, 92, 93, 95, 96, 97, 98, and 194.

For the surgery and colonoscopy measures, the algorithm classifies admissions as planned or unplanned using a flow chart (Figure E.1) and four tables of procedures and conditions, included in the data dictionary, tabs *"PAA1 Always Plnnd Px,"* "*PAA2 Always Plnnd Dx,*" "*PAA3 Pot Plnnd Px,"* and *"PAA4 Acute Dx."*

- "*PAA1 Always Plnnd Px*" tab identifies procedures that, if present in an admission, classify the admission as planned.
- "*PAA2 Always Plnnd Dx*" tab identifies principal discharge diagnoses that classify admissions as planned.
- *"PAA3 Pot Plnnd Px"* identifies procedures that, if present, classify an admission as planned as long as that admission does not have an acute (unplanned) principal discharge diagnosis.
- "*PAA4 Acute Dx*" lists the acute (unplanned) principal discharge diagnoses that disqualify admissions with a potentially planned procedure in *"PAA3 Pot Plnnd Px"* tab as planned.

The algorithm uses AHRQ's CCS (http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp) codes to group thousands of individual procedure and diagnosis ICD-10-CM codes into clinically coherent, mutually exclusive procedure CCS categories and mutually exclusive diagnosis CCS categories, respectively.

Figure E.1. Planned Admission Algorithm Flow Chart



Note: This flowchart is used for the surgery and colonoscopy measures.