2020 Measure Updates and Specifications Report
Outpatient Quality Reporting Program

Risk-Standardized Hospital Visits within 7 Days After Outpatient Surgery Measure - Version 4.0

Admissions and Emergency Department Visits for Patients Receiving Outpatient Chemotherapy - Version 4.0

Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy - Version 6.0

Submitted By:

Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation (YNHHSC/CORE)

Prepared For:

Centers for Medicare & Medicaid Services (CMS)

September 2020

Table of Contents

List of Tables

List of Figures

Center for Outcomes Research and Evaluation Project Team

Danielle M. Purvis, MPH – Project Lead

Sheng Zhou, MD, MSc – Lead Analyst

Madeline L. Parisi, BA – Project Coordinator

Anna Sigler, MPH – Project Manager

Craig S. Parzynski, MS – Analytic Director

Elizabeth Triche, PhD – Reevaluation Division Oversight

Lori Geary, MPH – Director, Quality Measurement Programs

Elizabeth R. Drye, MD, SM – Director, Quality Measurement Programs

Harlan M. Krumholz, MD, SM – Principal Investigator

Measure Reevaluation Team Contributors

Alexandra Harris, MPH – Coding Content Expert

Sydnie Stackland, MPH – Coding Content Expert

Chemotherapy Measure Clinical Expert Group

Robert Daly, MD, MBA – Memorial Sloan-Kettering Cancer Center

Stephen Edge, MD – Roswell Park Memorial Institute

Scott Huntington, MD, MPH – Yale New Haven Hospital

Denise Morse, MBA – City of Hope Cancer Treatment and Research Center

Allison Snyderman, PhD – Memorial Sloan-Kettering Cancer Center

Acknowledgements

This work is a collaborative effort, and the authors gratefully acknowledge General Dynamics Information Technology; Customer Value Partners; Sharon-Lise Normand from Harvard Medical School, Department of Health Care Policy and Harvard School of Public Health, Department of Biostatistics; Jinghong Gao from CORE; Taybah for Healthcare Consulting, Inc.; and Nicole Hewitt at CMS for their contributions to this work.

1. How to Use This Report

This report describes updates that have been made in 2020 to the following measures: Risk-Standardized Hospital Visits within 7 Days After Outpatient Surgery Measure Version (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 6-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 the measure and its development, a description of each update made since September 2019, the impacts of the changes on the measure cohort and outcome, and overall measure results.

Specifically, the report includes the following sections:

- **Section 2 – Background and Overview of Measure Methodology**
    - Background
    - Overview of methodology
    - Cohort – inclusions and exclusions
    - Outcomes
    - Planned admission algorithm (PAA)
    - Variables for patient-level risk adjustment
    - Data sources
    - Measure calculation
    - Categorizing facility performance
- **Section 3 – Detailed Discussion of Surgery Measure Updates**
    - Background and rationale for measure updates
    - Inclusion/exclusion criteria updates
    - PAA updates
    - Impact of measure updates
- **Section 4 - Summary of Surgery Measure Performance After Updates**
    - Model parameters and performance
- **Section 5 – Detailed Discussion of Chemotherapy Measure Updates**
    - Background and rationale for measure updates
    - Inclusion/exclusion criteria updates
    - Planned admission algorithm updates
    - Impact of measure updates
- **Section 6 - Summary of Chemotherapy Measure Performance After Updates**
    - Model parameters and performance
- **Section 7 – Detailed Discussion of Colonoscopy Measure Updates**
    - Background and rationale for measure updates
    - Inclusion/exclusion criteria updates

    - PAA updates
    - Impact of measure updates

- **Section 8 - Summary of Colonoscopy Measure Performance After Updates**
    - Model parameters and performance
- **Section 9 – Glossary**
- The Appendices contain detailed measure information, including:
    - Statistical approach to calculating the facility-specific risk-standardized hospital visit ratio (Appendix A);
    - Summary of annual updates to the measure by year (Appendices B-D);
    - Detailed measure specifications (Appendices E-G); and
    - Detailed description of the PAA (Appendix H).

The report frequently references the measure data dictionaries for detailed coding; these dictionaries are available at: http://www.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 (CORE) developed these measures for the Centers for Medicare and Medicaid Services (CMS) under a contract supporting the development of ambulatory care outcome measures.

These measures are reevaluated annually to make improvements based on stakeholder input and to incorporate advances in science or changes in coding. The 2020 updates described in this report were made in preparation for public reporting for the calendar year 2020 performance period (surgery and chemotherapy measure), 2017-2019 performance period (colonoscopy measure), and 2022 payment determination (January 2022 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.

Surgery Measure
The surgery measure received National Quality Forum (NQF) endorsement in 2015 (NQF #2687). After the measure's endorsement by NQF, the measure was updated in 2016. In 2017, CMS held a national confidential reporting period (dry run) for the measure. CMS contracted with CORE and Mathematica Policy Research to update the measure.

Chemotherapy Measure
In 2016, CORE and Mathematica completed development of the chemotherapy measure. CMS contracted with CORE and Mathematica to update the chemotherapy measure for public reporting through measure reevaluation.

In the Calendar Year (CY) 2017 Hospital Outpatient Prospective Payment System (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 hospital outpatient departments (HOPDs) with their results on the chemotherapy measure.

The measure will be publicly reported in the OQR program in January 2021 based on the specifications detailed in the 2019 Annual Updates and Specifications report. The 2019 updates described in this report are for subsequent reporting in the January 2022 public reporting public reporting in the OQR program (for calendar year 2020 performance period and 2022 payment determination).

Colonoscopy Measure
The colonoscopy measure received NQF endorsement in 2014 (NQF #2539).

2.2. Overview of Measure Methodologies

This section provides a high-level summary of the current measure specifications, including updates from the 2020 reevaluation, which are discussed in detail in Sections 3, 5, and 7.

Surgery Measure
This measure was developed to improve the quality of care delivered to patients undergoing hospital outpatient surgeries. In brief, the surgery measure includes all 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.

Chemotherapy Measure

This measure was developed to assess the quality of care provided to cancer patients receiving outpatient chemotherapy and inform quality improvement efforts to reduce potentially preventable inpatient hospital admissions and emergency department (ED) visits for this population. The measure is calculated for all non-cancer HOPDs. Further information on the measure development process is available in the 2016 Measure Technical Reports 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. In brief, the colonoscopy measure includes all non-federal acute care HOPDs and ambulatory surgical centers (ASCs) that performed qualifying colonoscopies during the performance period. The measure will be calculated separately for each facility type and presented in two separate reports. 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.

2.2.1. Cohort

Surgery Measure Inclusion Criteria

- Surgeries and procedures that are substantial and are typically performed as same-day surgeries.
  Rationale: The target cohort 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. In addition, they do not occur in conjunction with a same-day ED visit or observation stay. 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. We further restrict Medicare's list of covered ASC procedures using the Global Surgical Package (GSP) indicator and include two types of procedures from this list:
    - 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. We want to include 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. We define substantive procedures using the Medicare Physician Fee Schedule (MPFS) global surgery indicator

(GSI) code 090.[1]

- Cystoscopy procedures with intervention.
  Rationale: All endoscopy procedures are considered non-surgical procedures based on Medicare coding (GSI code 000). However, we include cystoscopy with intervention because it is a common procedure, often performed for therapeutic intervention by surgical teams, and the outcome rate and causes of post-procedure hospital visits are similar to those for surgeries in the measure cohort.

Please refer to the data dictionary "*HOPD_Surg_Cohort*" to review the list of qualifying same-day surgeries, including cystoscopy procedures with intervention. The data dictionary *"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, we only include surgeries that are not performed concurrently with high-risk procedures. Please refer to the data dictionary "*HOPD_Surg_High_Risk_Exclusions"* tab to review the list of high-risk procedures. High-risk procedures are identified using the Hospital OPPS Addendum B.[2] 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.

- Surgeries for patients with continuous enrollment in Medicare 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.

---

[1] 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 at https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/GloballSurgery-ICN907166.pdf. More information on RVUs is available at http://www.cms.gov/apps/physician-fee-schedule/overview.aspx.

[2] https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalOutpatientPPS/Addendum-A-and-Addendum-B-Updates.html

Surgery Measure Exclusion Criteria

- Surgeries for patients without continuous enrollment in Medicare FFS Parts A and B in the 7 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 will not exclude surgeries with same-day, separate-claim ED visits if the diagnoses are indicative of a complication of care because we want to continue to capture these outcomes.
- 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: In these situations, we assume that the surgery was subsequent to the ED visit and may not represent a routine surgery. Timing of the ED visits is determined using revenue center dates from the outpatient claim.
- 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.

The measure includes patients aged 18 years or older because all adult cancer patients with a treatment plan allowing for chemotherapy treatment in a hospital outpatient setting should receive proper care management to reduce the need for acute care for the specific conditions the measure addresses. In addition, the measure includes all adult patients, rather than only those aged 65 or older, to assess a broader population and more comprehensively evaluate the quality of care provided by HOPDs.

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 "Denominator Details: Cancer Diagnosis" tab in the 2020 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 2020 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 3-day billing rule.[3] 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; 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 poorly managed 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 "Denominator Exclusion Details: Leukemia" tab in the 2020 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.
  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. The measure excludes these cases where chemotherapy is administered for non-cancer conditions because these cases are not aligned with the measure's intent. Cases are identified using ICD-10, HCPCS, and CPT® chemotherapy codes and ICD-10 diagnoses for auto-immune diseases (see "Denominator Exclusion Details: Chemotherapy Procedures for Non-Cancer" and "Denominator Exclusion Details: Autoimmune Disease

[3] 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.

Diagnoses" tabs in the 2020 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:

- Identified using HCPCS codes and CPT® codes (see 2020 Colonoscopy Data Dictionary). Qualifying colonoscopy procedures were not included in the measure if they were concurrently billed with a high-risk colonoscopy procedure code (see 2020 Colonoscopy 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.

- For patients who are 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.

- For 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 has complete data 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 7 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 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 colonoscopy data dictionary tab *"Colonos_Excl"* 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 7 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 colonoscopy data dictionary tab *"Colonos_Excl"* to review the list of codes used to identify these conditions.

- Colonoscopies followed by a subsequent outpatient colonoscopy procedure within 7 days.
  Rationale: In these situations, the 2 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, we exclude:

- 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 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.[4]
  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.

[4] 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

2.2.2. Outcome

Surgery Measure

Unplanned Hospital Visits

- Inpatient admissions directly following surgery.
  Rationale: We include admissions directly after surgery 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.[5,6,7] Please see the data dictionary *"HOPD_Surgy_ED_Obs_Stay_Def"* 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 hospital visits post-discharge are for 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 H for details about the planned admission algorithm).

Chemotherapy Measure

The chemotherapy measure evaluates two outcomes: inpatient admissions and ED visits occurring within 30 days of any chemotherapy treatment.

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 one or more inpatient admissions, including those that began with an observation stay, within 30 days of any chemotherapy treatment in an HOPD with either a:

(1) primary discharge diagnosis of any of 10 conditions – anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis; or

(2) primary discharge diagnosis of cancer and a secondary diagnosis of one of the 10 conditions on the same claim.

[5] Mattila K, Toivonen J, Janhunen L, Rosenberg PH, Hynynen M. Postdischarge symptoms after ambulatory surgery: first-week incidence, intensity, and risk factors. *Anesthesia and analgesia.* Dec 2005;101(6):1643-1650.
[6] Minatti WR, Flavio B, Pablo C, Raúl R, Guillermo P, Miguel S. Postdischarge unplanned admission in ambulatory surgery—a prospective study. *Ambulatory Surgery.* 1// 2006;12(3):107-112.
[7] Paez A, Redondo E, Linares A, Rios E, Vallejo J, Sanchez-Castilla M. Adverse events and readmissions after day-case urological surgery. *International braz j urol: official journal of the Brazilian Society of Urology.* May-Jun 2007;33(3):330-338.

These 10 conditions are potentially preventable through appropriately managed outpatient care. The 2020 Chemotherapy Measure Data Dictionary shows the qualifying diagnosis codes for each of these conditions in the "Numerator Details" 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. CMS seeks to count only unplanned admissions in the measure 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 visits outcome includes ED visits that were billed alone, with observation stays, or as stand-alone observation stays. 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 ED visit outcomes for patients who did not experience a qualifying inpatient admission.

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[8,9,10], indicating that a 30-day period is a reasonable time frame to observe the side effects of treatment.[11,12,13]

2. We observed that the highest rates of hospital visits occur within 30 days after chemotherapy treatment.[14]
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

Unplanned Hospital Visits

The measure defines the outcome as any (such as 1 or more) unplanned hospital visits within 7 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, hospital 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, hospital 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 minimize to the fullest extent all acute complications, such as syncope or abdominal pain, not just those narrowly related to procedural technique. Finally, hospital visits are costly; reducing hospital visits following colonoscopy may lead to substantial healthcare savings.

The measure defines ED visits and observation stays using billing codes or revenue center codes identified in Medicare Part B outpatient hospital claims. The 2020 Colonoscopy Data Dictionary tab "*Colonos_Outcome_ED_Obs*" provides the specific codes used to identify ED visits and observation stays.

---

[8] McKenzie H, Hayes L, White K, et al. Chemotherapy outpatients' unplanned presentations to hospital: a retrospective study. Support Care Cancer. 2011; 19:963-969.
[9] Aprile G, Pisa FE, Follador A, et al. Unplanned presentations of cancer outpatients: a retrospective cohort study. Support Care Cancer. 2013; 21(2):397-404.
[10] Foltran L, Aprile G, Pisa FE, et al. Risk of unplanned visits for colorectal cancer outpatients receiving chemotherapy: a case-crossover study. Support Care Cancer. 2014; 22(9):2527-2533.
[11] Krumholz HM, Wang Y, Mattera JA, et al. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with an acute myocardial infarction. Circulation. 2006 Apr 4; 113(13):1683-92.
[12] Krumholz HM, Lin Z, Drye EE, et al. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. Circulation: Cardiovascular Quality and Outcomes. 2011 Mar 1; 4(2):243-52.
[13] Keenan PS, Normand SL, Lin Z, et al. An administrative claims measure suitable for profiling hospital performance on the basis of 30-day all-cause readmission rates among patients with heart failure. Circulation: Cardiovascular Quality and Outcomes. 2008 Sep; 1(1):29-37.
[14] 2016 Measure Technical Report, available at https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html

7-Day Time Frame

The measure limits the outcome of hospital visits to 7 days, as existing literature suggests that the vast majority of adverse events after colonoscopy occur within the first 7 days following the procedure[15], and our empirical analyses during measure development indicated that the highest rates of hospital visits were within 7 days of colonoscopy. 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 7 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 Admission Algorithm

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

Surgery Measure

For inpatient admissions occurring after Day 1 following surgery, we only include unplanned admissions in the measure outcome. We consider admissions occurring on the day of the surgery (Day 0) and Day 1 post-surgery "unplanned" as the vast majority of these admissions are inpatient admissions directly following surgery. "Planned" admissions are those planned by providers for anticipated medical treatment or procedures that must be provided in the inpatient setting. We do not count these in the outcome because variation in planned admissions does not reflect quality differences.

To identify admissions as planned or unplanned we use 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.

Also, the measure never considers ED visits or observation stays as planned.

Colonoscopy Measure

The measure includes only unplanned admissions in the measure outcome. "Planned" admissions are those planned by providers for anticipated medical treatment or procedures that must be provided in the inpatient setting. The measure does not count these in the outcome because variation in planned admissions does not reflect differences in quality of care.

Since it is not possible to use claims to identify planned admissions directly, the measure uses an adapted version of an algorithm developed for CMS's hospital readmission measures, CMS's Planned Readmission Algorithm Version 4.0_2020. In brief, the algorithm uses the procedure codes and principal

[15] Rabeneck L, Saskin R, Paszat LF. Onset and clinical course of bleeding and perforation after outpatient colonoscopy: a population-based study. Gastrointest Endosc. Mar 2011;73(3):520-523

discharge diagnosis code on each inpatient hospital claim to identify admissions that are typically planned and may occur after a colonoscopy. 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 claim that includes a potentially planned procedure (for example, scheduled elective total hip arthroplasty) without an acute principal discharge diagnosis (for example, hip fracture).

Admissions for an acute illness or for complications of care are never considered planned. Also, the measure never considers ED visits or observation stays as planned.

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 both Part A and B inpatient, outpatient, and carrier claims 12 months prior to index procedure. 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, through a public process, a national TEP consisting of patients, surgeons, methodologists, researchers, and providers.

The risk-adjustment methodology does not include specific acute conditions if they occur only during the index procedure because they could be consequences of care (also called the complication-of-care variables); please see data dictionary "*HOPD_Surg_RF_CoC*" tab for a summary 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. Subsequent to 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-cancer HOPDs. The same set of risk-adjustment variables is used when calculating results for both PCHs and non-cancer HOPDs, but the coefficients vary by facility type. The results for PCHs results 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 *"Risk Model: Inpatient Admissions Outcome Model Definitions"* tab in the 2020 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 10 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 "Risk Model: Emergency Department Outcome Model Definitions" tab in the 2020 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 measure specifications include 15 risk-adjustment variables (age, concomitant upper GI endoscopy, polypectomy during procedure, and 12 comorbidity variables). The 2020 Colonoscopy Data Dictionary tab *"Colonos_risk factor_CCs"* presents the definition of these variables, based on CMS's hierarchical CCs. The measure does not include acute diagnoses that occur only at the time of the colonoscopy procedure toward risk adjustment because these diagnoses may represent complications of care; see the 2020 Colonoscopy 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 paid 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 Carrier (Part B Physician) claim is present and able to 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.[16] 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 0 to 3 days after the date of surgery, to capture surgical

[16] CY 2007 PFS proposed rule (71 FR 49062)

procedures billed per the CMS 3-day payment window policy.[17] The HOPD of the admitting hospital is where the case is attributed.

Chemotherapy Measure

CMS uses paid Medicare 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 NQF criteria[18] and CMS standards for claims-based models for publicly reported measures.[19]

Colonoscopy Measure

CMS uses paid 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 2019 Colonoscopy 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 0 to 3 days after the date of the colonoscopy, to capture colonoscopies billed per the CMS 3-day billing rule.

2.2.6. Measure Calculation

Surgery Measure

Measure scores are calculated by fitting the hierarchical logistic regression model to data. The measure calculates a risk-standardized hospital visit ratio (RSHVR) for each HOPD by computing the ratio of the number of predicted unplanned hospital visits to the number of expected unplanned hospital visits. The numerator is the number of unplanned hospital visits the HOPD 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. The expected rate is the number of unplanned hospital visits the HOPD is expected to have based on the nation's performance with that HOPD's case mix and surgical procedure mix. See Appendix A for more information on the statistical risk-adjustment model and the calculation of a facility risk-standardized ratio.

[17] CMS three day payment window: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Three_Day_Payment_Window.html

[18] National Quality Forum. National voluntary consensus standards for patient outcomes, first report for phases 1 and 2: a consensus report. http://www.qualityforum.org/projects/Patient_Outcome_Measures_Phases1-2.aspx. Accessed August 19, 2010.

[19] Centers for Medicare & Medicaid Services (CMS). CMS Measures Management System. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/MeasuresManagementSystemBlueprint.html. Accessed January 2016.

Chemotherapy Measure

Measure scores are calculated by fitting hierarchical logistic regression models to the data for each outcome, separately for non-cancer HOPDs. The measure's two-level hierarchical logistic regression model accounts for the clustering of patients within hospitals and variation in sample size. The measure calculates the hospital-specific risk-adjusted rate as the ratio of a hospital's "predicted" number of outcomes to "expected" number of outcomes multiplied by the national observed outcome rate. It estimates the expected number of outcomes for each hospital using the hospital's patient mix and the average hospital-specific intercept (that is, the average intercept among all hospitals in the sample). The measure estimates the predicted number of outcomes for each hospital using the same patient mix, but with an estimated hospital-specific intercept. Operationally, the measure obtains the expected number of outcomes for each hospital by summing the expected probabilities of the outcome for all patients treated at the hospital. 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 hospital-specific intercept. It calculates the predicted number of outcomes for each hospital by summing the predicted probabilities for all patients in the hospital. 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 hospital-specific intercept. See Appendix A for more information on the statistical risk-adjustment models and the calculation of facility risk-standardized rates. The data used for measure calculation contains 100% of patients receiving chemotherapy and qualifying for the measure at each facility and provides adequate sample size for a reliable measure score.

Colonoscopy Measure

Measure scores are calculated by fitting the hierarchical logistic regression model to the data. The measure calculates a score for each outpatient facility by computing the ratio of the number of predicted unplanned hospital visits to the number of expected unplanned hospital visits. The numerator is the number of unplanned hospital visits the facility is predicted to have, accounting for the facility's case mix. The expected rate is the number of unplanned hospital visits the facility is expected to have based on the nation's performance with that facility's case mix. To transform this facility-specific ratio into a rate for ease of interpretation, it is multiplied by the unplanned hospital visit rate for the entire national cohort. The regression model and national rate are calculated separately for HOPDs and ASCs; so, for example, HOPD measure scores are calculated among all HOPDs using the HOPDs national rate. This report presents results for HOPDs only; ASC results are presented in a separate report. See Appendix A for more information on the statistical risk-adjustment model and the calculation of a facility risk-standardized rate. The data used for measure calculation contains 100% of qualifying colonoscopies at each facility and provides adequate sample size for a reliable measure score.

2.2.7. Categorizing Facility Performance

Surgery Measure

The measure uses bootstrapping to empirically construct a 95% interval estimate for risk-standardized measure score calculation (Appendix A). The measure categorizes each facility's performance by comparing each facility's 95% interval estimate for its RSHVR with the expected RSHVR of 1.00. The interval estimate represents the range of probable values of the RSHVR. A 95% interval estimate indicates that there is 95% probability that the true value of the RSHVR lies between the lower limit and

the upper limit of the interval. Because an RSHVR of 1.00 indicates that an HOPD's predicted hospital visits are equal to the expected hospital visits, the measure compares the interval estimate for each HOPD to 1.00.

The measure assigns the performance categories as follows:

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

To further categorize relative performance, the measure classifies facilities into three performance categories using the approach CMS employs for reporting similarly structured hospital outcome measures on the website Hospital Compare (http://www.medicare.gov/hospitalcompare/). Specifically, it uses bootstrapping to empirically construct a 95% interval estimate for the risk-standardized admission rate (RSAR) and risk-standardized emergency department visit rate (RSEDR) (Appendix A). CMS classifies facilities into performance categories 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 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

To further categorize relative performance, the measure classifies facilities into three performance categories using the approach CMS employs for reporting similarly structured hospital outcome measures on the website Hospital Compare (http://www.medicare.gov/hospitalcompare/). Specifically, it uses bootstrapping to empirically construct a 95% interval estimate for each risk-standardized hospital visit rate (Appendix A). If the facility's entire interval estimate is below the national observed 7-day unplanned hospital visit rate, the measure classifies the facility as having better than expected performance. If the entire interval estimate is above the national rate, it classifies the facility as having worse than expected performance. If the facility's interval estimate includes the national rate, it classifies the facility as no different than expected. 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 2020 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 2020 minor refinements were made to the outpatient surgery measure specifications to improve its accuracy and to update specifications for identifying planned admissions. Section 3.3 below details the measure updates instituted during the measure reevaluation period as well as the impact of these updates on the measure cohort and outcome.

3.2. Surgery Measure Updates

We identified no coding updates for the cohort or risk factors. We did, however, update the PAA to PAA v4.0_2020. This change is detailed below.

3.2.1. Updated 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 2 to 7 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 *"PAA PA1 Always Plnnd Px"* and *"PAA PA2 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 "*PAA P3 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 "*PAA P4 Acute Dx*").

We consider admissions occurring on the day of the surgery (Day 0) and Day 1 post-surgery "unplanned" as the vast majority 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 2021 payment determination, the surgery measure will adopt version 4.0_2020 of the planned readmission algorithm, which updates the v4.0_2019 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_2020. Appendix H provides more detailed information on the algorithm.

Update to V4.0_2020. For this update, we studied the 2019 versions of the AHRQ CCS map for diagnoses and procedures, respectively, to determine how newly implemented FY 2019 ICD-10 codes were categorized, and to examine any code shifts that may have occurred from the previous version of the AHRQ CCS map to the most recent AHRQ CCS map. Review of these versions of the AHRQ CCS map was extensive and included:

- Examination of approximately 280 new ICD-10-CM codes and 390 new ICD-10-PCS codes added by AHRQ into 34 AHRQ CCS diagnosis categories and 21 AHRQ CCS procedure categories, respectively, to determine how the newly implemented ICD-10 codes should be incorporated into the planned admission algorithm specifications; and,
- Examination of two ICD-10-CM codes and approximately 50 ICD-10-PCS codes that AHRQ shifted during the update into two different CCS diagnosis categories and nine different CCS procedure categories, respectively, to investigate where shifts may affect the planned admission algorithm.

We then solicited input from clinical and measure experts to confirm the clinical appropriateness of the AHRQ CCS categorization of the newly implemented ICD-10 codes and any changes warranted due to the code shifts that occurred. The experts also reviewed the newly implemented ICD-10 codes in the FY 2019 version of the ICD-10-CM/PCS codes to determine which, if any, should be added to the singular ICD-10 code lists that are also used in the algorithm (conditions that are not captured by AHRQ CCS categories). The intent was to maintain the clinical integrity of the algorithm. These processes led to the following changes to the algorithm:

- Potentially planned procedures:
    - The addition of AHRQ CCS procedure category 162 ('Other OR therapeutic procedures on joints');
    - The removal of AHRQ CCS procedure category 202 ('Electrocardiogram');
    - The removal of AHRQ CCS procedure category 112 ('Other OR therapeutic procedures of urinary tract') as a whole category, and a subset of ICD-10-PCS codes that fell under this category in the singular ICD-10-PCS code list was retained as potentially planned procedures;
    - The addition of three AHRQ CCS procedure categories as whole categories (AHRQ CCS 96, 118, and 163), and the previous subsets of ICD-10-PCS codes that fell under these categories in the singular ICD-10-PCS code list were removed; and,
    - The removal of the ICD-10-PCS codes associated with AHRQ CCS procedure categories 95 and 174 that were previously in the singular ICD-10-PCS code list.
- Acute diagnoses:
    - The addition of AHRQ CCS diagnosis category 100 ('Acute myocardial infarction') as a whole category, and the previous subset of ICD-10-CM codes that fell under this category in the singular ICD-10-CM code list was removed; and,
    - The addition of ICD-10-CM codes (associated with AHRQ CCS diagnosis categories 97, 101, 106, 108, 115, and 133) to the singular ICD-10-CM code list. The singular ICD-10-CM code list previously had ICD-10-CM codes associated with AHRQ CCS diagnosis categories 97, 106, 108, 115, and 133 in the list; new codes were added. The addition of ICD-10-CM codes associated with AHRQ CCS diagnosis category 101 ('Coronary atherosclerosis and other heart disease') is new to the singular ICD-10-CM code list.

The complete set of codes reflected in the v4.0_2020 planned readmission algorithm adopted as the PAA for the surgery measure are available in the data dictionary tabs *"PAA PA1 Always Plnnd Px,"* "*PAA PA2 Always Plnnd Dx,"* "*PAA PA3 Pot Plnnd Px,"* and *"PAA PA4 Acute Dx.*"

3.3. Impact of Surgery Measure Updates

3.3.1. Assessment of Surgery Measure Updates

We conducted reevaluation analyses with updated specifications to reflect the changes described in Section 3.2 using the March 2020 CDR claims data (January 1, 2019 – November 30, 2019).

We compared the overall observed unplanned and planned hospital visit rates between the original and the updated version 4.0_2020 of the PAA (based on the revised cohort). The impact of these changes is presented in Section 3.3.2.

3.3.2. Planned Admission Algorithm Updates

Table 3.3.2.1 summarizes the impact of changes to the PAA on the rate of unplanned hospital visits. Updating the PAA to align with v4.0_2020 of the planned readmission algorithm from the v4.0_2019 planned readmission algorithm[20] increased the number of hospitals visits that are considered unplanned by 49. The overall unplanned hospital visit rate of 7.14% changed minimally from 7.13%.

Table 3.3.2.1. Impact of Changes to the Surgery PAA

	Prior to Changes to PAA	After PAA Changes are Implemented	Net Change
Number of hospital visits (unplanned and planned)	77,804	77,804	0
Number of unplanned hospital visits	74,896	74,945	-49
Unplanned hospital visit rate	7.13%	7.14%	-0.00%
Number of planned hospital visits	2,908	2,859	49
Planned hospital visit rate	0.28%	0.27%	0.00%

Notes: Results based on January 1, 2019-November 30, 2019 claims detail report data; due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data. This table reflects changes in total hospital visits associated with the cohort before updates (n=1,050,083), in "Surgery measure prior to changes to PAA" column, and the cohort after updates (n=1,050,083), in "Surgery measure after PAA changes are implemented" column.

3.3.3. Outcome Rates Before and After Updates

As the results in Table 3.3.3.1 show, the updates to the measure exclusions increased the unadjusted number of ED visits or observational stays by 77 cases, decreased the number of unadjusted unplanned admissions by four cases, and increased the number of unadjusted hospital visits among the measure cohort by 73 cases. Changes to the measure exclusions resulted in a nominal decrease in outcome rates (<0.01%) among each of the three types of outcomes (ED visits or observational stays, unplanned admissions, and total hospital visits).

[20] As noted in Section 3.2.4, this report describes the impact of moving to from v4.0_2019 to v4.0_2020 of Planned Readmission Algorithm. However, future implementation for CY2021 payment determination will use the most up-to-date version available. Updates are described in Table 3, and Appendix H presents details on the algorithm.

As the results in Table 3.3.3.2 show, the updates to the PAA did not change the unadjusted number of ED visits or observational stays, increased the number of unadjusted unplanned admissions by 49 cases, and increased the number of unadjusted hospital visits among the measure cohort by 49 cases. Changes to the PAA resulted in nominal changes in outcome rates (7.13-7.14%) among each of the three types of visits (ED visits, observational stays, unplanned admissions).

Table 3.3.3.1. Impact of Changes to Surgery Measure Outcome Rate after Changing Coding to Minimum ED Revenue Center Date

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	36,874	3.51%	36,951	3.52%	-77 (-0.01%)
Unplanned admissions	38,071	3.63%	38,067	3.63%	4 (0.00%)
Total hospital visits	74,945	7.14%	75,018	7.14%	-73 (-0.01%)

Notes: Results based on January 1, 2019 -November 30, 2019, claims detail report data; due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data.

Table 3.3.3.2. Impact of Changes to Surgery Measure Outcome and Rate after Changes to PAA

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	36,874	3.51%	36,874	3.51%	0 (0.00%)
Unplanned admissions	38,022	3.62%	38,071	3.63%	-49 (-0.00%)
Total hospital visits	74,896	7.13%	74,945	7.14%	-49 (-0.00%)

Notes: Results based on January 1, 2019-November 30, 2019 claims detail report data; due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data.

As noted in Section 3.2, this report describes the impact of moving to from v4.0_2019 to v4.0_2020 of Planned Readmission Algorithm. However, future implementation for CY2021 payment determination will use the most up-to-date version available. Updates are described in Table 3.3.2.1, and Appendix H presents details on the algorithm.

4. Summary of Surgery Measure Performance after Updates

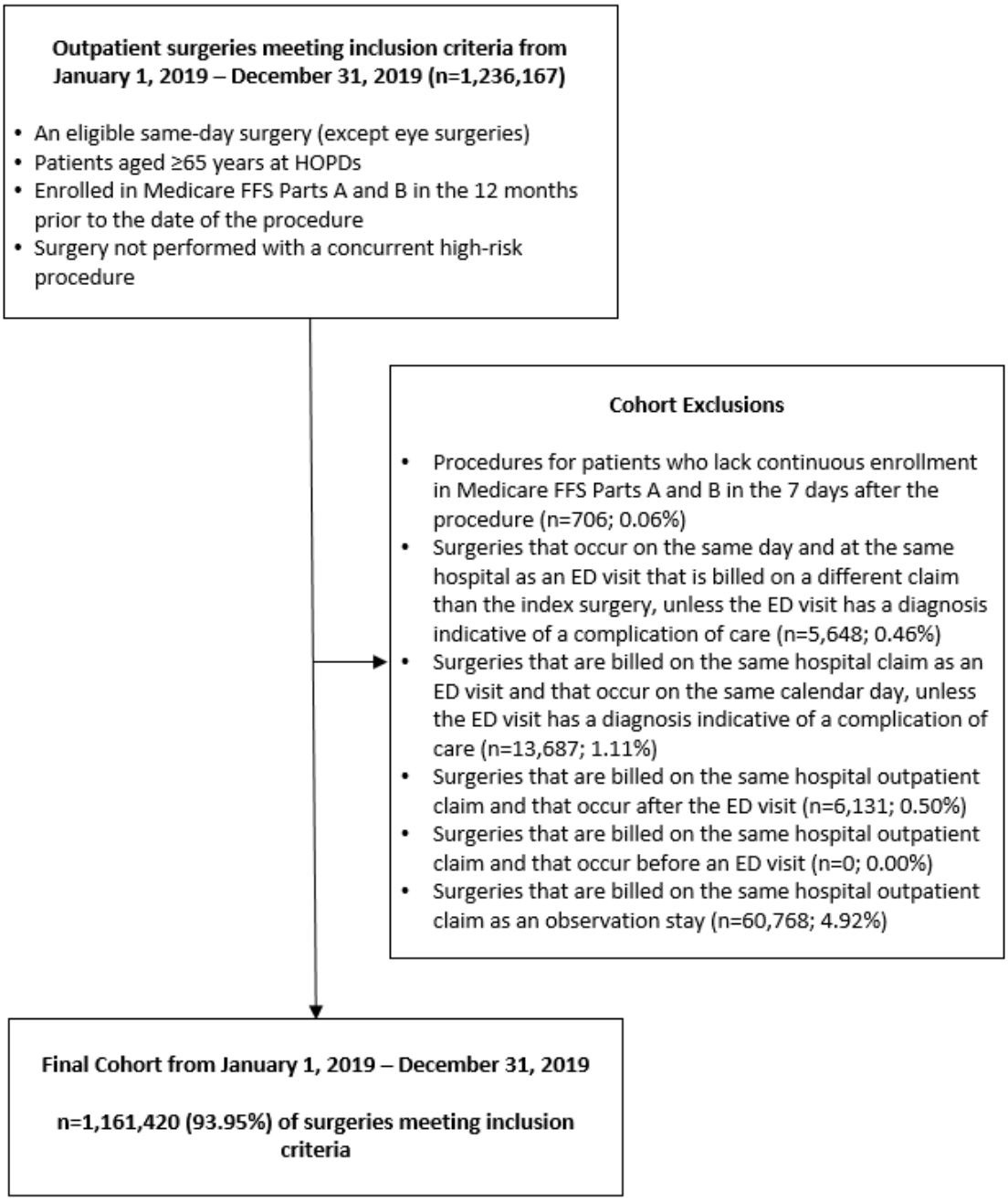
This section presents updated information on the frequency and effect of model risk factors, model performance, facility-level surgery volume, and risk-standardized rates across facilities after incorporating the changes described in Section 3.

We evaluated the updated measure specifications in the dataset used in the surgery measure dry run, discussed in Section 2.1. The dataset included Medicare FFS claims for surgeries performed from January 1, 2019-December 31, 2019. 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, 2019-December 31, 2019 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 7 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 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 coefficients and corresponding 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	1,161,420
Age minus 65 (years above 65)	9.65 (6.70)
Cancer (CC 8-14)	35.04
Diabetes and DM Complications (CC 17-19, 122, 123)	33.18
Disorders of Fluid/Electrolyte/Acid-Base (CC 24)	16.98
Intestinal Obstruction/Perforation (CC 33)	2.38
Inflammatory Bowel Disease (CC 35)	1.28
Bone/Joint/Muscle Infections/Necrosis (CC 39)	2.29
Hematological Disorders Including Coagulation Defects and Iron Deficiency (CC 46, 48, 49)	30.21
Dementia or Senility (CC 51-53)	7.10
Psychiatric Disorders (CC 57-63)	22.40
Hemiplegia, Paraplegia, Paralysis, Functional Disability (CC 70, 71, 73, 74, 103-105, 189, 190)	3.95
Other Significant CNS Disease (CC 77-80)	4.66
Cardiorespiratory Arrest, Failure and Respiratory Dependence (CC 82-84)	6.72
Congestive Heart Failure (CC 85)	17.22
Ischemic Heart Disease (CC 86-89)	30.69
Hypertension and Hypertensive Disorders (CC 94, 95)	71.81
Arrhythmias (CC 96, 97)	34.01
Vascular Disease (CC 106-109)	29.67
Chronic Lung Disease (CC 111-113)	21.66
UTI and Other Urinary Tract Disorders (CC 144, 145)	37.85
Pelvic Inflammatory Disease and Other Specified Female Genital Disorders (CC 147)	4.00
Chronic Ulcers (CC 157-161)	5.25
Cellulitis, Local Skin Infection (CC 164)	9.41
Prior Significant Fracture (CC 169-171)	5.75
Morbid Obesity (CC 22)	5.25

Risk Factor (CC)	Mean (SD) or %
Work Relative Value Units – Mean (SD)	9.17
Surgical Body System:	
Cardiovascular	10.90
Digestive	13.45
Ear	0.66
Endocrine	1.41
Female Genitalia	1.76
Hemic-Lymphatic	0.48
Skin & Breast	12.17
Male Genitalia	4.59
Musculoskeletal	24.98
Nervous	8.64
Nose-Throat-Pharynx	1.41
Respiratory	0.09
Urinary	19.45
Miscellaneous Procedures	0.02

Notes: Results based on January 1, 2019-December 31, 2019 performance period. CC-related risk factors are defined by v22 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)
Comorbidities:	
Cancer (CC 8-14)	1.02 (1.00-1.03)
Diabetes and DM Complications (CC 17-19, 122, 123)	1.13 (1.11-1.14)
Disorders of Fluid/Electrolyte/Acid-Base (CC 24)	1.14 (1.12-1.16)
Intestinal Obstruction/Perforation (CC 33)	1.17 (1.13-1.22)
Inflammatory Bowel Disease (CC 35)	1.02 (0.96-1.08)
Bone/Joint/Muscle Infections/Necrosis (CC 39)	1.44 (1.38-1.50)
Hematological Disorders Including Coagulation Defects and Iron Deficiency (CC 46, 48, 49)	1.10 (1.09-1.12)
Dementia or Senility (CC 51-53)	1.19 (1.16-1.22)

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)	1.17 (1.13-1.20)
Other Significant CNS Disease (CC 77-80)	1.21 (1.17-1.24)
Cardiorespiratory Arrest, Failure and Respiratory Dependence (CC 82-84)	1.07 (1.04-1.10)
Congestive Heart Failure (CC 85)	1.11 (1.08-1.13)
Ischemic Heart Disease (CC 86-89)	1.15 (1.13-1.17)
Hypertension and Hypertensive Disorders (CC 94, 95)	1.1 (1.08-1.12)
Arrhythmias (CC 96, 97)	1.16 (1.14-1.18)
Vascular Disease (CC 106-109)	1.12 (1.10-1.14)
Chronic Lung Disease (CC 111-113)	1.13 (1.11-1.15)
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)	0.92 (0.88-0.96)
Chronic Ulcers (CC 157-161)	1.11 (1.07-1.14)
Cellulitis, Local Skin Infection (CC 164)	1.17 (1.14-1.20)
Prior Significant Fracture (CC 169-171)	1.43 (1.39-1.47)
Morbid Obesity (CC 22)	1.10 (1.07-1.14)
Work Relative Value Units	1.12 (1.11-1.12)
Surgical Body System:	
Cardiovascular	1.06 (0.95-1.17)
Digestive	1.7 (1.53-1.88)
Ear	Reference
Endocrine	0.90 (0.80-1.01)

Parameter	Odds Ratio (95% CI)
Female Genitalia	1.34 (1.19-1.51)
Hemic-Lymphatic	1.09 (0.94-1.28)
Skin & Breast	0.70 (0.63-0.78)
Male Genitalia	1.88 (1.69-2.09)
Miscellaneous Procedures	0.20 (0.06-0.73)
Musculoskeletal	1.19 (1.08-1.32)
Nervous	1.47 (1.32-1.63)
Nose-Throat-Pharynx	1.28 (1.14-1.44)
Respiratory	0.76 (0.58-1.00)
Urinary	2.01 (1.81-2.23)

Notes: Results based on January 1, 2019-December 31, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

Table 4.2.3. Surgery Logistic Regression Model Performance Among HOPDs

Characteristic	HOPDs
Predictive ability, % (lowest decile – highest decile)	2.21-18.24
c-statistic	0.687

Note: Results based on January 1, 2019 -December 31, 2019 performance period data.
SD=standard deviation

4.3. Distribution of Surgery Measure Facility-Level Measure Score

Table 4.3.1 presents the distribution of index surgeries for HOPDs in the cohort. There were 3,900 HOPDs after the updates with at least one qualifying index surgery. The mean number of qualifying procedures was 297.80. The number of qualifying procedures varied widely across facilities, ranging from 1 to 4,019, with a median value of 156 surgeries (interquartile range [IQR] = 33 - 406).

Table 4.3.2 shows the median risk-standardized hospital visit ratio (RSHVR) was 1.01, which ranged from 0.49 to 2.33. The wide variation in performance across HOPDs highlight continuing opportunities for quality improvement.

Finally, Table 4.3.3 presents the between-facility variance of 0.069 (SE:0.003). 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. That is, a value of 1.29 indicates that a patient has a 29% 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	3,900
Mean number of surgeries (SD)	297.80 (398.55)
Range (min – max)	1 – 4,019
25th percentile	33
50th percentile (median)	156
75th percentile	406

Note: Results based on January 1, 2019 -December 31, 2019 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	3,900
Mean RSHVR (SD)	1.01 (0.16)
Range (min – max)	0.49 - 2.33
25th percentile	0.93
50th percentile (median)	0.99
75th percentile	1.07

Note: Results based on January 1, 2019 -December 31, 2019 performance period data.
SD=standard deviation

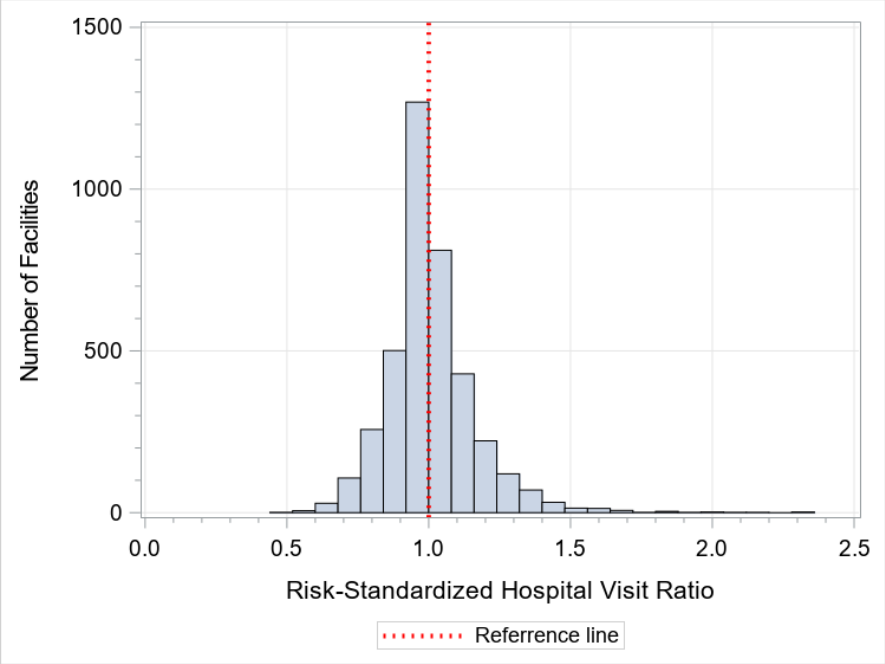
Table 4.3.3. Surgery Between-Facility Variance Among HOPDs

Characteristic	HOPDs
Between-facility variance (SE)	0.069 (0.003)
Median odds ratio	1.29

Note: Results based on January 1, 2019 -December 31, 2019 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 0.93 to 1.07.

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



Note: Results based on January 1, 2019 -December 31, 2019, 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 3,900 HOPD facilities in the study cohort, 154 facilities (3.95%) performed "Better than Expected," 2,658 facilities (68.15%) performed "No Different than Expected," 158 facilities (4.05%) performed "Worse than Expected," and the remaining 930 facilities (23.85%) 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	154	3.95%
No Different than the National Rate	2,658	68.15%
Worse than the National Rate	158	4.05%
Number of Cases Too Small	930	23.85%

Note: 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 2020 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 relied on two sources of stakeholder feedback as a basis for identifying reevaluation topics: (1) recommendations from the measure's 2020 Clinical Expert Group that were not addressed in 2019 reevaluation, and (2) stakeholder feedback received during implementation of the measure into the OQR program.

We reviewed these sources of stakeholder feedback and identified opportunities for measure refinement**.** We then conducted empirical analyses, using 1-year of performance data from January 1, 2019-November 30, 2019, to assess impacts of proposed changes on the measure results. We also solicited feedback from the 2020 Clinical Expert Group to assess clinical appropriateness of each potential change. Section 5.2 below details the measure updates we implemented as a result of our reevaluation process and the impact of these updates on the measure cohort, outcome, and measure scores.

5.2. Chemotherapy Measure Updates

5.2.1. Update to Level of Coding

While conducting these annual measure updates, we identified that the measure counts the number of chemotherapy administrations at the claim-level. Counting at the claim-level is problematic because facilities don't necessarily bill every day; they often bill monthly, or longer. Because of this, each claim could include multiple chemotherapy administrations. Therefore, we made the update to count the chemotherapy administrations at the procedure-level, to ensure we're adjusting for all the individual chemotherapy administrations included on the claim. We reviewed the impact of this update on outcome rates (Table 5.3.3.1 below) and frequency of model risk factors (Table 5.3.5.2 below).

5.2.2. Removal of Chemotherapy Administered on the Same Date or After the Date of Inpatient Admission

We received feedback from the Alliance of Dedicated Cancer Centers (ADCC) in October 2019 regarding the chemotherapy measure specifications. One recommendation the ADCC provided was to exclude cases where the date of chemotherapy administration is equal to or after the admission attributed to the hospital. The ADCC generated this feedback after reviewing their facility-specific reports (FSRs) and indicating that hospitals found several instances in which the outpatient chemotherapy administration associated with an admission to their hospital was administered while the patient was an inpatient.

In response to this feedback, we reviewed the impact on outcome rates (Table 5.3.4.1 below) and frequency of cases that fell into these categories (Table 5.3.4.2 below) with the Clinical Expert Group.

After discussion with the Clinical Expert Group, we determined to exclude the cases that fell into these categories because it is unlikely patients will have outpatient chemotherapy administered and be admitted to the ER or hospital on the same day.

5.5.3. Update to Number of Chemotherapy Administration Counts

While conducting these annual measure updates, we identified that the exposure variable (number of chemotherapy treatments) we use in the model includes all chemotherapies, not just those that are included in the measure. The number of included chemotherapy treatments better reflects the probability of experience in outcome in the 30 days following the event, so we made the update for the number of chemotherapy treatment counts to reflect only those chemotherapy treatments that meet inclusion criteria. We reviewed the impact of this update on the frequency of the number of chemotherapy treatment counts model risk factor (Table 5.3.5.3 below).

5.5.4. Update to Measure Code Sets

Each year, as part of reevaluation of the chemotherapy measure, we review the measure's code set as well as annual updates to ICD-10-CM, CPT®, and HCPCS coding guidelines to ensure that the measure's code set is up to date and clinically appropriate. We also obtain input from our Clinical Expert Group to refine of existing code sets. During this year's review, we did not identify any needed refinements to the existing code set and, therefore, our updates focused exclusively on incorporating relevant annual updates to ICD-10-CM, CPT®, and HCPCS in the measure's code set. We made the following updates to the measure specifications:

- Removed 18 non-billable codes from 'Concurrent Radiotherapy' risk variable
- Removed malignant neoplasm codes from 'Other Cancer' and 'Digestive Cancer' Risk Variables
- Added 4 new ICD-defined variables to the measure risk model, which include removed codes from 'Other Cancer' and 'Digestive Cancer' Risk Variables:
    - Anal Cancer
    - Bladder Cancer
    - Ovarian Cancer
    - Pancreatic Cancer

5.3. Impact of Chemotherapy Measure Updates

5.3.1. Assessment of Chemotherapy Updates

We conducted reevaluation analyses with updated specifications to reflect the changes above using January 1, 2019 - November 30, 2019 claims data. The analyses examined the impact of each change, individually, on facility performance and model performance. Note that the additions of new FY2020 codes are not captured in our analyses based on the time period of our data. These results are presented in Table 5.3.2.1.

Overall, the updates to the measure specifications had no impact on cohort size. The updates also had a minimal impact on the national inpatient admission rate, which increased from 11.42% to 11.49% among non-cancer HOPDs, and the national ED visit rate, which increased from 5.79% to 5.98% among non-cancer HOPDs.

5.3.2. Chemotherapy Cohort Updates

Table 5.3.2.1. Impact of Updates to Chemotherapy Measure Specification Exclusion Criteria

Exclusion Criteria	2019 Measure Specifications	Revised 2020 Measure Specifications	Net Change
Number of included patients meeting inclusion criteria	359,019	359,020	-1
Number of excluded patients (total) n, %	62,301 (17.35%)	62,213 (17.33%)	88
Patients excluded because they did not have at least one chemotherapy treatment followed by 30 days of continuous enrollment in Medicare FFS Parts A and B	4,606 (7.39%)	4500 (7.23%)	106
Patients excluded because they did not have at least one chemotherapy treatment preceded by 12 months of continuous enrollment in Medicare FFS Parts A and B	40,361 (64.78%)	40361 (64.88%)	0
Patients excluded because they had a diagnosis of leukemia at any point during the performance period	23,227 (37.28%)	23,227 (37.33%)	0
Patients who only had cases in which chemotherapy was provided to treat a qualifying auto-immune condition rather than cancer (number)	231 (0.37%)	199 (0.32%)	32
Final Cohort n, %	296,718 (82.65%)	296,807 (82.67%)	-89

Note: Results based on January 1, 2019-November 30, 2019 performance period.

5.3.3. Impact of Updates to Outcome Rates after Changes to Procedure-Level Coding Among Non-Cancer HOPDs

As the results in Table 5.3.3.1 show, the updates to the measure exclusions decreased the unadjusted number of ED visits or observational stays by 560 cases and decreased the number of unadjusted unplanned admissions by 215 cases. Updates to the coding resulted in nominal changes in outcome rates for ED visits or observation stays and unplanned admissions (0.19% and 0.07%, respectively).

Table 5.3.3.1. Impact of Updates to Outcome Rates after Changes to Procedure-Level Coding Among Non-Cancer HOPDs

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	17,193	5.79%	17,753	5.98%	-560 (-0.19%)
Unplanned admissions	33,893	11.42%	34,108	11.49%	-215 (-0.07%)

Notes: Results based on January 1, 2019-November 30, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

5.3.4. Impact of Updates to Chemotherapy Administered on the Same Date or After the Date of Inpatient Admission

As the results in Table 5.3.4.1 show, the updates to the measure exclusions decreased the unadjusted number of ED visits or observational stays by 339 cases and decreased the number of unadjusted unplanned admissions by 1,290 cases. Updates to the measure exclusions resulted in nominal changes in ED visit or observational stay outcome rates (5.98%-5.87%), and unplanned admission outcome rates (11.49%-11.06%).

Table 5.3.4.2 summarizes the procedure-level frequencies for the scenarios examined by the ADCC. Group 1 is cases where admissions occurred on the same date as the chemotherapy administration (1,248 procedures, 0.05% of total cases). Group 2 is cases where chemotherapy was administered during the inpatient stay (1,667 procedures, 0.07% of total cases). Group 3 is cases that were not in group 1 nor group 2, which was 0 procedures.

Table 5.3.4.1. Impact of Updates to Outcome Rates after Excluding Admissions Occurring the Same Day or before Chemotherapy Among Non-Cancer HOPDs

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	17,753	5.98%	17,414	5.87%	339 (0.11%)
Unplanned admissions	34,108	11.49%	32,818	11.06%	1,290 (0.43%)

Notes: Results based on January 1, 2019-November 30, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

Table 5.3.4.2. Procedure-Level Frequencies for Chemotherapy Measure

Group 1 Date of admission of the inpatient claim = Date of chemotherapy ≤ Date of discharge of the inpatient claim	Group 2 Date of admission of the inpatient claim < Date of chemotherapy < Date of discharge of the inpatient claim	Group 3 Not in 1 and 2 (no overlap)
1,248 (0.04%)	1,667 (0.06%)	0 (0.00%)

5.3.5. Impact of Updates to the Risk Models

Table 5.3.5.1 summarizes the impact of coding updates for the frequency of chemotherapy risk models in 2019 coded at the claim-level, and in 2020 coded at the procedure-level.

Table 5.3.5.2 summarizes the impact of updates to only the number of outpatient chemotherapy treatments risk factor in 2019 counting all chemotherapy administrations (6.9), and in 2020 counting only chemotherapy administrations that met measure inclusion criteria (6.7).

Table 5.3.5.1. Impact of Coding Updates on Frequency of Chemotherapy Model Risk Factors Among Non-Cancer HOPDs

Risk Factor (CC)	Mean (SD) or %		
	2019 (claim-level)	2020 (procedure-level)	Net Change
Total N	296,718	296,807	89
Mean age (SD)	72.6 (8.7)	72.6 (8.7)	0.00
Male	53.28	53.28	0.00
Number of Outpatient Chemotherapy Treatments	5.7 (6.0)	6.7 (7.1)	1.00
Respiratory Disorder (CC 110 – 113)	31.41	31.42	0.01
Renal Disease (CC 132, 134 – 140)	25.15	25.15	0.00
Diabetes (CC 17 – 20)	29.8	29.8	0.00
Other Injuries (CC 174)	23.18	23.19	0.01
Metabolic Disorders (CC 21 – 26)	82.8	82.8	0.00
GI Disorders (CC 27 – 32; 34; 36-38)	70.05	70.05	0.00
Psychiatric Disorders (CC 50-69)	44.35	44.35	0.00
Neurological Conditions (CC 70 – 81)	26.87	26.87	0.00
Cardiovascular Disease (CC 82 – 109)	86.97	86.97	0.00
Breast Cancer	16.04	16.04	0.00
Digestive Cancer	17.22	17.22	0.00
Respiratory Cancer	19.75	19.75	0.00
Lymphoma	16.57	16.57	0.00

Risk Factor (CC)	Mean (SD) or %		
	2019 (claim-level)	2020 (procedure-level)	Net Change
Other Cancer	25.4	25.4	0.00
Prostate Cancer	20.55	20.54	-0.01
Anal Cancer	1.11	1.11	0.00
Bladder Cancer	9.46	9.45	-0.01
Ovarian Cancer	4.42	4.42	0.00
Pancreatic Cancer	4.45	4.45	0.00
Secondary Cancer of Lymph Nodes	20.03	20.03	0.00
Secondary Cancer of Solid Tumors	46.9	46.9	0.00
Concurrent Radiotherapy	2.98	2.95	-0.03

Notes: Results based on January 1, 2019-November 30, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

Table 5.3.5.2. Impact of Updates to Number of Chemotherapy Treatment Counts Among Non-Cancer HOPDs

Risk Factor (CC)	2019 (all chemotherapy)	2020 (met inclusion criteria)
Number of Outpatient Chemotherapy Treatments, Mean (SD)	6.9 (7.2)	6.7 (7.1)

Notes: Results based on January 1, 2019-November 30, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

6. Summary of Chemotherapy Measure Performance after Updates

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. Table 6.1 summarizes the chemotherapy model risk factor frequencies in 2020.

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 on the basis of 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.

Table 6.1. Frequency of Chemotherapy Model Risk Factors Among Non-Cancer HOPDs

Risk Factor (CC)	Mean (SD) or %
Total N	314,534
Mean age (SD)	72.6 (8.7)
Male	53.2
Number of Outpatient Chemotherapy Treatments (Median)	7.1 (7.5)
Respiratory Disorder (CC 110 – 113)	31.5
Renal Disease (CC 132, 134 – 140)	25.2
Diabetes (CC 17 – 20)	29.9
Other Injuries (CC 174)	23.2
Metabolic Disorders (CC 21 – 26)	82.9
GI Disorders (CC 27 – 32; 34; 36-38)	70.1
Psychiatric Disorders (CC 50-69)	44.4
Neurological Conditions (CC 70 – 81)	26.8
Cardiovascular Disease (CC 82 – 109)	87.0
Breast Cancer	16.1
Digestive Cancer	17.6
Respiratory Cancer	20.0
Lymphoma	16.5
Other Cancer	26.2
Prostate Cancer	20.5
Anal Cancer	1.2

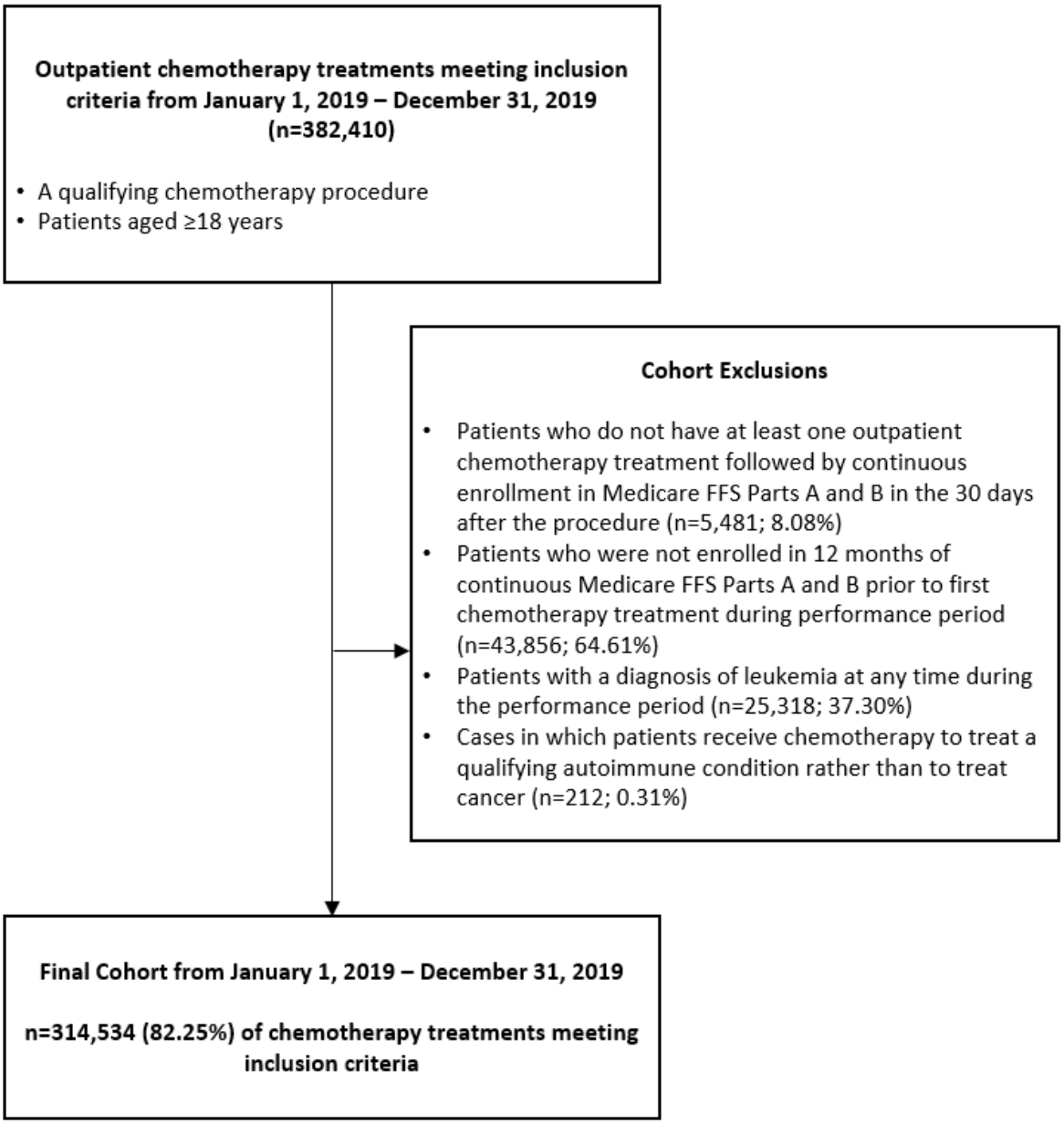
Risk Factor (CC)	Mean (SD) or %
Bladder Cancer	9.7
Ovarian Cancer	4.4
Pancreatic Cancer	4.5
Secondary Cancer of Lymph Nodes	20.6
Secondary Cancer of Solid Tumors	47.4
Concurrent Radiotherapy	6.1

Notes: Results based on January 1, 2019-December 31, 2019 performance period. CC-related risk factors are defined by v22 of CC map.

6.1. Final Chemotherapy Cohort

Figure 6.1.1 illustrates the final HOPD cohort using the January 1, 2019-December 31, 2019 performance period data after applying all updates to inclusion and exclusion criteria described in Section 5.

Figure 6.1.1. Non-Cancer HOPD Chemotherapy Cohort



6.2. Chemotherapy Model Parameters and Performance

Table 6.2.1 presents the corresponding odds ratios (ORs) and 95% confidence intervals (CIs). The majority of variables are statistically significant.

Table 6.2.1. Adjusted ORs and 95% CIs for the Chemotherapy Logistic Regression Model Among Non-Cancer HOPDs

Variable	Inpatient Admissions Odds Ratio (95% CI)	ED Visits Odds Ratio (95% CI)
Age	0.99 (0.99-1.00)	0.99 (0.99-0.99)
Male	1.01 (0.99-1.04)	0.86 (0.82-0.89)
Number of Outpatient Chemotherapy Treatments	1.02 (1.02-1.02)	1.04 (1.03-1.04)
Respiratory Disorder (CC 110 – 113)	1.25 (1.22-1.28)	1.16 (1.12-1.2)
Renal Disease (CC 132, 134 – 140)	1.41 (1.37-1.44)	1.07 (1.03-1.10)
Diabetes (CC 17 – 20)	1.11 (1.08-1.13)	1.08 (1.04-1.11)
Other Injuries (CC 174)	1.10 (1.08-1.13)	1.19 (1.15-1.23)
Metabolic Disorders (CC 21 – 26)	1.21 (1.16-1.25)	1.04 (0.99-1.08)
GI Disorders (CC 27 – 32; 34; 36-38)	1.27 (1.23-1.31)	1.32 (1.27-1.37)
Psychiatric Disorders (CC 50-69)	1.16 (1.13-1.19)	1.21 (1.17-1.25)
Neurological Conditions (CC 70 – 81)	1.06 (1.04-1.09)	1.06 (1.03-1.10)
Cardiovascular Disease (CC 82 – 109)	1.31 (1.26-1.37)	1.15 (1.09-1.21)
Breast Cancer	0.96 (0.92-0.99)	1.01 (0.96-1.06)
Digestive Cancer	1.37 (1.33-1.41)	1.19 (1.14-1.24)
Respiratory Cancer	1.67 (1.62-1.72)	1.11 (1.07-1.16)
Lymphoma	1.98 (1.92-2.05)	1.15 (1.10-1.21)
Other Cancer	1.25 (1.22-1.28)	1.14 (1.10-1.18)
Prostate Cancer	0.62 (0.59-0.64)	0.89 (0.85-0.94)
Anal Cancer	1.29 (1.17-1.42)	0.97 (0.84-1.10)

Variable	Inpatient Admissions Odds Ratio (95% CI)	ED Visits Odds Ratio (95% CI)
Bladder Cancer	0.98 (0.94-1.03)	0.89 (0.84-0.95)
Ovarian Cancer	1.24 (1.18-1.31)	1.11 (1.04-1.19)
Pancreatic Cancer	2.09 (1.99-2.18)	1.43 (1.35-1.52)
Secondary Cancer of Lymph Nodes	1.31 (1.27-1.34)	1.13 (1.09-1.17)
Secondary Cancer of Solid Tumors	2.07 (2.01-2.12)	1.31 (1.26-1.35)
Concurrent Radiotherapy	1.39 (1.34-1.45)	1.11 (1.05-1.18)

Note: Results based on January 1, 2019-December 31, 2019 performance period.
See 2020 Chemotherapy Data Dictionary for risk factor definitions.

Table 6.2.2. Chemotherapy Logistic Regression Model Performance Among Non-Cancer HOPDs

Characteristic	Inpatient Admissions Non-cancer HOPDs	ED Visits Non-cancer HOPDs
Predictive ability, % (lowest decile – highest decile)	2.45 – 30.88	2.28 – 13.66
c-statistic	0.719	0.662

Note: Results based on January 1, 2019-December 31, 2019 performance period.

6.3. Distribution of Chemotherapy Measure Facility-Level Measure Score

Table 6.3.1 presents the distribution of index chemotherapy treatments among all qualifying patients for each facility type. There were 3,484 non-cancer HOPDs with at least one patient with a qualifying index chemotherapy treatment during the January 2019-December 2019 performance period. The median number of qualifying treatments was 18 (interquartile range [IQR]: 4 – 84).

Table 6.3.2 shows the median RSAR. The median non-cancer RSAR was 12.01 inpatient admissions per 100 chemotherapy treatments (IQR: 11.70 – 12.38).

Table 6.3.3 shows the mean and median RSEDR. The median RSEDR was 6.14 ED visits per 100 chemotherapy treatments (IQR: 5.95 – 6.42).

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 1.24 among non-cancer HOPDs indicates that a patient has a 24% increase in the odds of an inpatient admission if the outpatient chemotherapy was received at higher risk HOPD compared to a lower risk HOPD. For the RSDER, the value of 1.31 among non-cancer HOPDs indicates

that a patient has a 31% increase in the odds of an ED visit if the outpatient chemotherapy was received at 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 non-cancer HOPDs.

Table 6.3.1. Distribution of Chemotherapy Procedure Volumes Among Non-Cancer HOPDs

Characteristic	Non-cancer HOPDs
Number of facilities	3,484
Mean number of patients (SD)	90.3 (197.5)
Range (min – max)	1 – 2,415
25th percentile	4
50th percentile (median)	18
75th percentile	84

Note: Results based on January 1, 2019-December 31, 2019 performance period.

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

Characteristic	Non-cancer HOPDs
Number of facilities	3,484
Mean RSAR (SD)	12.12 (1.00)
Range (min – max)	8.65 – 18.67
25th percentile	11.70
50th percentile (median)	12.01
75th percentile	12.38

Note: Results based on January 1, 2019-December 31, 2019 performance period.

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

Characteristic	Non-cancer HOPDs
Number of facilities	3,484
Mean RSEDR (SD)	6.22 (0.70)
Range (min – max)	3.43 – 11.25
25th percentile	5.95
50th percentile (median)	6.14
75th percentile	6.42

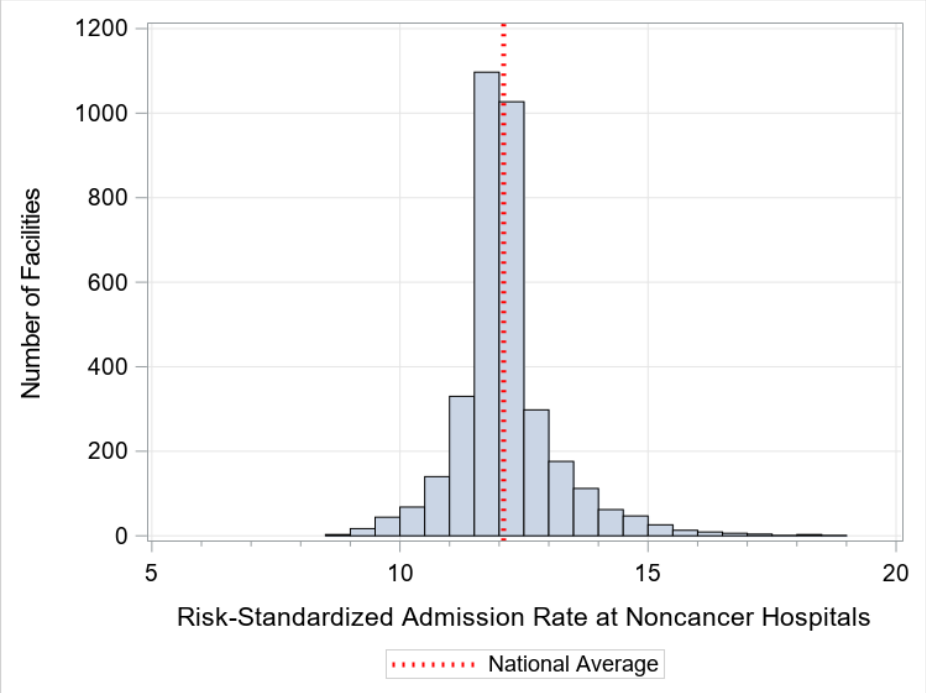
Note: Results based on January 1, 2019-December 31, 2019 performance period.

Table 6.3.4. Chemotherapy Between-Facility Variance Among Non-Cancer HOPDs

Characteristic	Non-cancer HOPDs
RSAR Median odds ratio	1.24
RSEDR Median odds ratio	1.31

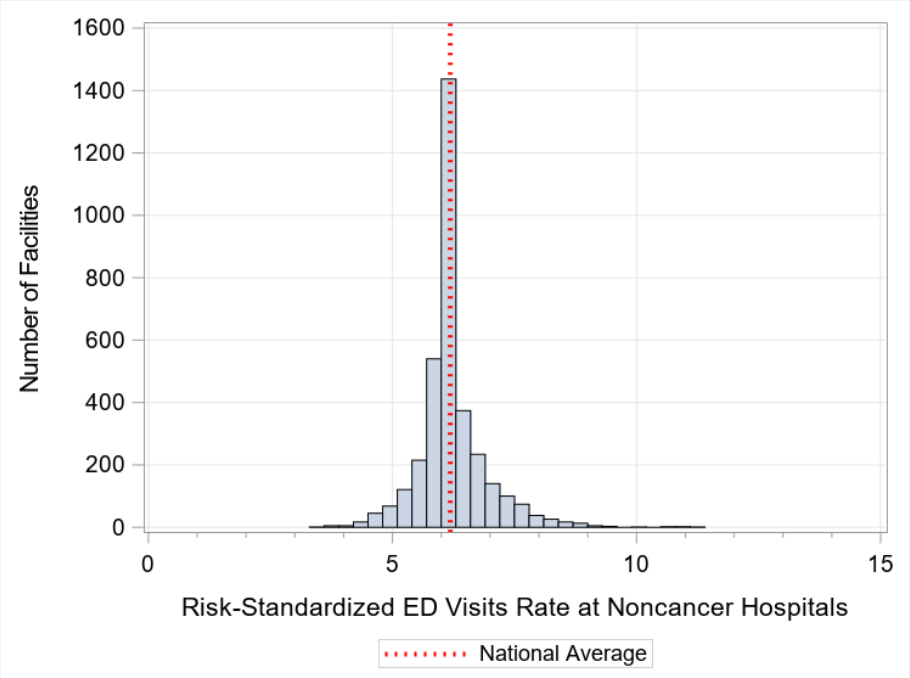
Note: Results based on January 1, 2019-December 31, 2019 performance period.

Figure 6.3.1. Distribution of Facility RSARs at Non-cancer HOPDs



Note: Results based on January 1, 2019-December 31, 2019 performance period.

Figure 6.3.2. Distribution of Facility RSEDR Performance at Non-cancer HOPDs



Note: Results based on January 1, 2019-December 31, 2019 performance period.

6.4. Chemotherapy Measure Distribution of Facilities by Performance Category

Facility performance was assessed for the 3,484 non-cancer HOPDs with a qualifying chemotherapy treatment during the performance period using the updated measure specifications. Among the 3,484 non-cancer HOPDs, 17 performed "Better than the national rate," 1,505 performed "No different than the national Rate," and 64 performed "Worse than the national rate" for the 30-day Qualifying Inpatient Admission outcome. 1,898 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 3,484 non-cancer HOPDs, 34 performed "Better than the national rate," 1,524 performed "No different than the national rate," and 28 performed "Worse than the national rate." 1,898 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 non-cancer HOPDs during the January 2019-December 2019 performance period.

Table 6.4.1. Chemotherapy Facility Performance Category Distribution Among Non-Cancer HOPDs

Facility Performance Category	Inpatient Admission Outcome	ED Visit Outcome
Total Number of Facilities in the Nation	3,484	3,484
Number of Facilities in the Nation that Performed Better than National Rate	17	34
Number of Facilities in the Nation that Performed No Different than National Rate	1,505	1,524
Number of Facilities in the Nation that Performed Worse than National Rate	64	28
Number of Facilities in the Nation that had Too Few Cases	1,898	1,898

7. Updates to Colonoscopy Measure for 2020 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.

Section 7.2 and Section 7.3 below detail the measure updates instituted during the measure reevaluation period and the impact of these updates on the measure cohort and outcome.

7.2. Colonoscopy Measure Updates

7.2.1. Updates to the Measure Specifications

We reviewed the fiscal year (FY) 2019 ICD-10-PCS, FY 2019 ICD-10-CM, and 2019 CPT® coding systems to update the colonoscopy codes that define the cohort and cohort exclusions for total colectomies, high-risk colonoscopies, upper GI procedures, IBD, and diverticulitis. We reviewed the 2019 CPT® coding system for updates to two risk factors: endoscopy during procedure and polypectomy during procedure. We made the following updates to the measure specifications:

- The addition of 1 new code to the 'polypectomy during procedure' risk variable
- The addition of 12 new codes to the 'endoscopy during procedure' risk variable
- The removal of 18 non-billable ICD codes from the cohort exclusions

In addition, the colonoscopy measure adopted the PAA v4.0_2020. Coding updates are described in Section 7.3.2; for more detailed information about the PAA, see Appendix H.

7.3. Impact of Colonoscopy Measure Updates

7.3.1. Assessment of Colonoscopy Measure Updates

We conducted reevaluation analyses with updated specifications to reflect the changes above using January 1, 2017 – November 30, 2019 claims data from the March 2020 Claims Detail Report (CDR) release.

Due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data in order to accommodate CMS's reporting timelines. The results of these analyses are presented in Section 7.3.3. We also compared the overall observed unplanned and planned hospital visit rates between the original and the updated versions of the PAA (based on the revised cohort). The impact of these changes is presented in Section 7.3.2.

7.3.2. Planned Admission Algorithm Updates

Table 7.3.2.1 summarizes the impact of changes to the PAA on the rate of unplanned hospital visits for HOPDs. Updating the PAA to align with v4.0_2020 of the Planned Readmission Algorithm identified 97 additional unplanned hospital visits.

Table 7.3.2.1. Impact of Changes to Colonoscopy PAA

	Prior to Changes to PAA	After PAA Changes are Implemented	Net Change
Number of hospital visits (unplanned and planned)	42,108	42,109	-1
Number of unplanned hospital visits	35,951	36,048	-97
Unplanned hospital visit rate (%)	1.63%	1.64%	-0.00%
Number of planned hospital visits	6,157	6,061	96
Planned hospital visit rate (%)	0.28%	0.27%	0.00%

Notes: Results based on January 1, 2017-November 30, 2019 performance period data; due to the timing of availability of performance data, impact analyses were conducted with March 2020 CDR data. In rare instances, changes to the PAA (v4.0_2020) will impact which cases are excluded from measure cohort. This is because exclusions for diverticulitis and IBD use post-procedure admissions along with procedural and history information to identify if a case should be flagged.

7.3.3. Outcome Rates Before and After Updates

As the results in Table 7.3.3.1 show, the updates to the measure coding decreased the unadjusted number of ED visits or observational stays by 25 cases, did not change the number of unadjusted unplanned admissions, and decreased the number of unadjusted hospital visits among the measure cohort by 25 cases. Changes to the measure coding resulted in no change in outcome rates among each of the three types of outcomes (ED visits or observational stays, unplanned admissions, and total hospital visits).

As the results in Table 7.3.3.1 show, the updates to the PAA did not impact the unadjusted number of ED visits or observational stays, increased the number of unadjusted unplanned admissions by 97 cases, and increased the number of unadjusted hospital visits among the measure cohort by 97 cases. Changes to the PAA resulted in no changes in outcome rate among each of the three types of outcomes (ED visits or observational stays, unplanned admissions, and total hospital visits).

Table 7.3.3.1. Impact of Changes to Colonoscopy Measure Outcome Rate after Changing Coding to Minimum ED Revenue Center Date

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	24,786	1.12%	24,761	1.12%	25 (0.00%)
Unplanned admissions	11,262	0.51%	11,262	0.51%	0 (0.00%)

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
Total hospital visits	36,048	1.64%	36,023	1.63%	25 (0.00%)

Notes: Results based on January 1, 2017 -November 30, 2019, claims detail report data; due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data.

Table 7.3.3.2. Impact of Changes to Colonoscopy Measure Outcome Rate after Changes to PAA

Type of Outcome	2019 Measure Specifications: Frequency (n)	2019 Measure Specifications: Outcome Rate (%)	Revised 2020 Measure Specifications: Frequency (n)	Revised 2020 Measure Specifications: Outcome Rate (%)	Change in Outcome n (%)
ED visits or observational stays	24,786	1.12%	24,786	1.12%	0 (0.00%)
Unplanned admissions	11,165	0.51%	11,262	0.51%	-97 (-0.00%)
Total hospital visits	35,951	1.63%	36,048	1.64%	-97 (-0.00%)

Notes: Results based on January 1, 2017 -November 30, 2019, claims detail report data; due to the timing of availability of performance data, impact analyses were conducted in March 2020 CDR data.

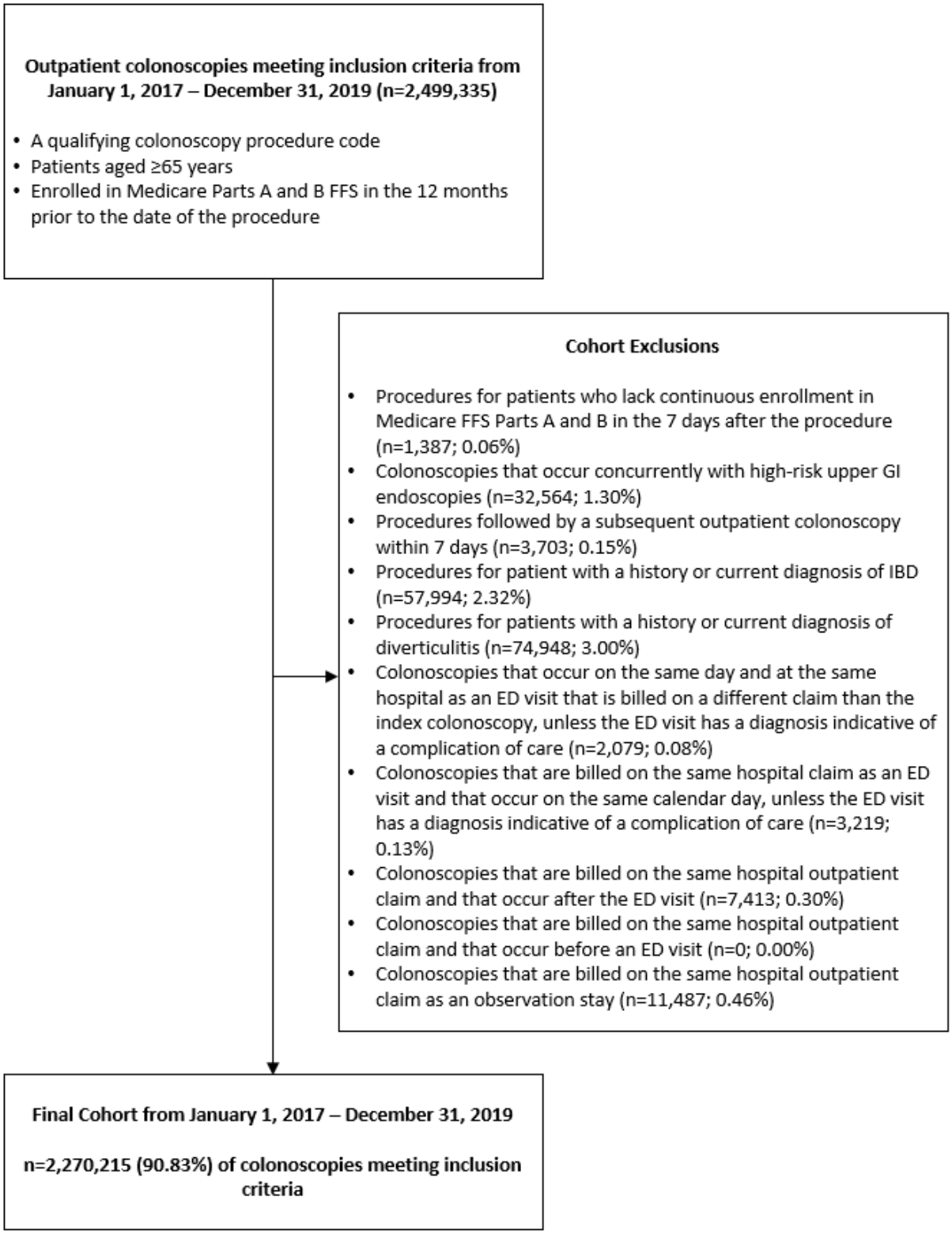
8. Summary of Colonoscopy Measure Performance after Updates

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. All analyses were performed in data from the January 1, 2017 – December 31, 2019 performance year period.

8.1. Final Colonoscopy Cohort

Figure 8.1.1 illustrates the final cohort using the January 1, 2017 – December 31, 2019 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 on the basis of 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 7 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 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.

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

Risk Factor (% unless otherwise indicated)	01/2017-12/2017	01/2018-12/2018	01/2019-12/2019	01/2017-12/2019
Total N	753,876	753,305	763,034	2,270,215
Age 65-69	34.33	33.63	33.01	33.65
Age 70-74	33.85	34.43	34.95	34.41
Age 75-79	20.35	20.75	20.91	20.67
Age 80-84	8.4	8.27	8.37	8.35
Age 85+	3.07	2.91	2.77	2.92
Concomitant Endoscopy	19.06	19.54	20.02	19.54
Polypectomy during Procedure	39.07	40.58	42.57	40.74
Congestive Heart Failure (CC 85)	9.86	10.15	10.47	10.16
Ischemic Heart Disease (CC 86-89)	22.46	22.63	22.97	22.69
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	8.93	8.92	9.02	8.96
Chronic Lung Disease (CC 111-113)	18.81	18.98	19.16	18.99
Metastatic Cancer (CC 8-11)	9.83	9.82	9.99	9.88
Liver Disease (CC 27-32)	8.18	8.49	8.8	8.49
Iron Deficiency Anemia (CC 49)	24.23	24.34	24.51	24.36
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	10.69	10.94	11.12	10.92
Pneumonia (CC 114-116)	5.22	5.32	5.13	5.23
Psychiatric Disorders (CC 57-59, 61-63)	18.58	19.47	20.33	19.46
Drug and Alcohol Abuse/Dependence (CC 54-56)	7.38	7.92	8.17	7.83
Arrhythmia (CC 96-97)	20.37	20.94	21.64	20.98

Notes: Results based on January 1, 2017-December 31, 2019 performance period. CC-related risk factors are

defined by v22 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)	01/2017-12/2017	01/2018-12/2018	01/2019-12/2019	01/2017-12/2019
Concomitant Endoscopy	1.32 (1.27-1.38)	1.29 (1.24-1.35)	1.30 (1.24-1.35)	1.30 (1.27-1.33)
Polypectomy during Procedure	1.27 (1.22-1.32)	1.23 (1.19-1.28)	1.21 (1.17-1.25)	1.24 (1.21-1.26)
Congestive Heart Failure (CC 85)	1.31 (1.24-1.38)	1.33 (1.26-1.4)	1.41 (1.34-1.48)	1.35 (1.31-1.39)
Ischemic Heart Disease (CC 86-89)	1.3 (1.24-1.35)	1.27 (1.22-1.33)	1.29 (1.24-1.35)	1.29 (1.26-1.32)
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	1.14 (1.08-1.20)	1.19 (1.13-1.25)	1.16 (1.1-1.22)	1.16 (1.13-1.20)
Chronic Lung Disease (CC 111-113)	1.29 (1.24-1.35)	1.25 (1.20-1.30)	1.19 (1.14-1.24)	1.24 (1.21-1.27)
Metastatic Cancer (CC 8-11)	1.07 (1.01-1.13)	1.1 (1.05-1.16)	1.10 (1.05-1.16)	1.09 (1.06-1.13)
Liver Disease (CC 27-32)	1.26 (1.19-1.33)	1.24 (1.17-1.3)	1.20 (1.14-1.27)	1.23 (1.19-1.27)
Iron Deficiency Anemia (CC 49)	1.29 (1.24-1.34)	1.29 (1.24-1.34)	1.31 (1.25-1.36)	1.29 (1.26-1.33)
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	1.46 (1.39-1.53)	1.42 (1.35-1.49)	1.46 (1.39-1.53)	1.44 (1.4-1.48)
Pneumonia (CC 114-116)	1.15 (1.08-1.22)	1.23 (1.16-1.31)	1.24 (1.16-1.31)	1.21 (1.17-1.25)
Psychiatric Disorders (CC 57-59, 61-63)	1.35 (1.3-1.41)	1.35 (1.3-1.41)	1.33 (1.28-1.39)	1.35 (1.31-1.38)
Drug and Alcohol Abuse/Dependence (CC 54-56)	1.21 (1.14-1.28)	1.18 (1.12-1.25)	1.19 (1.12-1.26)	1.19 (1.15-1.23)
Age by Arrhythmia Interaction	-	-	-	-
Among those without Arrhythmia (CC 96-97)	-	-	-	-
Age 70-74 v. Age 65-69	1.08 (1.02-1.14)	1.06 (1-1.12)	1.10 (1.04-1.17)	1.08 (1.05-1.12)
Age 75-79 v. Age 65-69	1.27 (1.2-1.36)	1.23 (1.16-1.31)	1.24 (1.17-1.33)	1.25 (1.2-1.3)
Age 80-84 v. Age 65-69	1.45 (1.34-1.58)	1.63 (1.5-1.76)	1.54 (1.42-1.67)	1.54 (1.47-1.61)
Age 85+ v. Age 65-69	2.21 (1.98-2.47)	2.16 (1.93-2.42)	2.20 (1.96-2.47)	2.19 (2.05-2.34)
Among those with Arrhythmia (CC 96-97)	-	-	-	-

Variable (CC)	01/2017-12/2017	01/2018-12/2018	01/2019-12/2019	01/2017-12/2019
Age 70-74 v. Age 65-69	0.98 (0.9-1.07)	0.95 (0.87-1.03)	1.00 (0.92-1.08)	0.98 (0.93-1.02)
Age 75-79 v. Age 65-69	1.11 (1.01-1.21)	1.06 (0.98-1.16)	1.10 (1.01-1.20)	1.09 (1.04-1.15)
Age 80-84 v. Age 65-69	1.28 (1.16-1.42)	1.23 (1.12-1.36)	1.32 (1.20-1.46)	1.28 (1.21-1.35)
Age 85+ v. Age 65-69	1.80 (1.60-2.01)	1.43 (1.27-1.61)	1.72 (1.53-1.94)	1.65 (1.54-1.76)
Arrhythmia (CC 96-97)	1.55 (1.43-1.67)	1.66 (1.54-1.8)	1.51 (1.39-1.63)	1.57 (1.5-1.64)

Notes: Results based on January 1, 2017-December 31, 2019 performance period data. CC-related risk factors are defined by v22 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	01/2017-12/2017	01/2018-12/2018	01/2019-12/2019	01/2017-12/2019
Predictive ability, % (lowest decile – highest decile)	0.69-4.78	0.69-4.78	0.72-4.74	0.69-4.76
c-statistic	0.686	0.685	0.682	0.684

Note: Results based on January 1, 2017 -December 31, 2019 performance period data.

8.3. Distribution of Facility-Level Measure Score

Table 8.3.1 presents the number of index colonoscopies. There were 3,749 HOPDs with at least one qualifying index colonoscopy in the 2020 data. The median number of qualifying procedures was 102 (interquartile range [IQR]: 37 – 255) for HOPDs.

Table 8.3.2 shows the mean and median risk-standardized hospital visit (RSHV) rates. The median HOPD RSHV rate was 16.38 hospital visits per 1,000 colonoscopies (IQR: 15.76 – 17.06). 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 OR. Between-facility variance for HOPDs was 0.035 (SE = 0.003). If there were no systematic differences between facilities, the between-facility variances would be 0. The median OR 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. The estimated median ORs suggest a meaningful increase in the risk of a hospital visit if a procedure was performed at a higher risk facility compared to a lower risk facility. For HOPDs, a value of 1.19 indicates that a patient has a 19% increase in the odds of a hospital visit if the same procedure was performed at 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	01/2017-12/2017	01/2018-12/2018	01/2019-12/2019	01/2017-12/2019
Number of facilities	3,873	3,814	3,749	3,994
Mean number of colonoscopies (SD)	194.65 (278.76)	197.51 (287.05)	203.53 (297.62)	568.41 (845.30)
Range (min – max)	1 – 4,270	1 – 4,559	1 – 4,495	1 – 13,324
25th percentile	35	35	37	92
50th percentile (median)	99	100	102	276
75th percentile	248	248	255	713

Note: Results based on January 1, 2017 -December 31, 2019 performance period data.

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

Characteristic	01/2017-12/2019
Number of facilities	3,994
Mean RSHV rate (SD)	16.46 (1.32)
Range (min – max)	11.31 – 24.90
25th percentile	15.76
50th percentile (median)	16.38
75th percentile	17.06

Note: Results based on January 1, 2017 -December 31, 2019 performance period data.

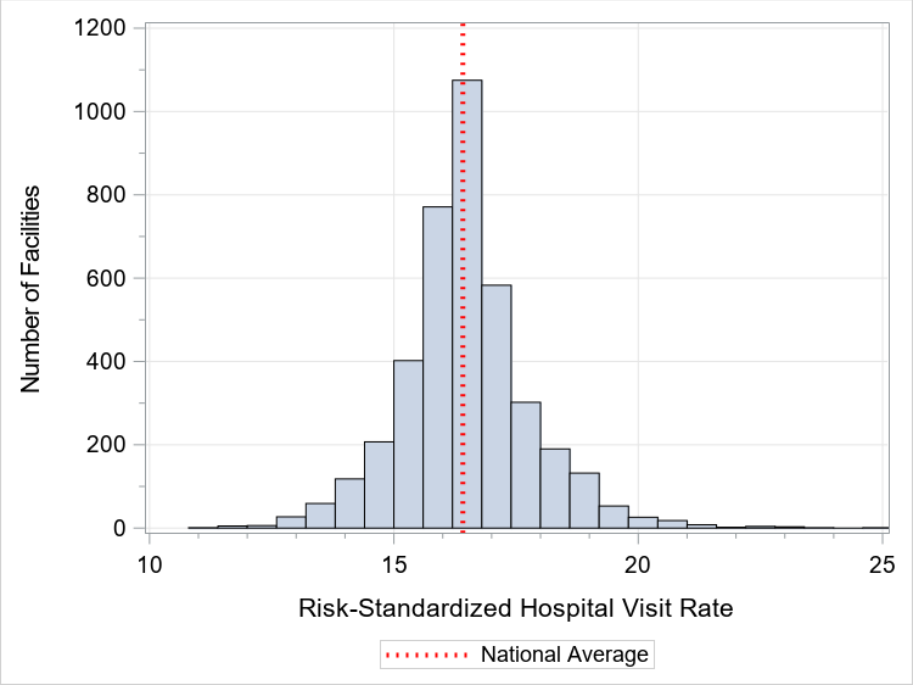
SD=standard deviation

Table 8.3.3. Colonoscopy Between-Facility Variance Among HOPDs

Characteristic	01/2017-12/2019
Between-facility variance (SE)	0.035 (0.003)
Median OR	1.19

Note: Results based on January 1, 2017 -December 31, 2019 performance period data.
SE=standard error

Figure 8.3.1. Distribution of Colonoscopy RSHV Rates



Note: Results based on January 1, 2017 -December 31, 2019 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 3,994 HOPD facilities in the study cohort, 23 facilities (0.58%) performed "Better than the National Rate," 3,496 facilities (87.53%) performed "No Different than the National Rate," 14 facilities (0.35%) performed "Worse than the National Rate," and 461 facilities (11.54%) 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	23	0.58%
No Different than the National Rate	3,496	87.53%
Worse than the National Rate	14	0.35%
Number of Cases Too Small	461	11.54%

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 particular 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 as a consequence 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 7 days of the procedure the facility is expected to have given the HOPD's case mix (for the surgery measure this also includes the and surgical procedure mix) and the average of all facility-specific effects in the nation. The denominator is the RSHVR.

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 (surgery and colonoscopy measure): A class of generalized linear

models for clustered data. The model not only takes into account patient risk factors, but also estimates a facility-specific 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 takes into account patient risk factors, but also estimates a facility-specific 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 (chemotherapy measure): 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 readmission 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 7 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 is hospital visit (ED visit, observation stay, or inpatient admission) within 7 days of the index procedure.

Planned hospital visits (surgery and colonoscopy measure): A hospital visit within 7 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 7 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. The numerator in the RSHVR.

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) Clinical Classification Software (CCS).

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.

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 ED 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. Unplanned hospital visits are counted as outcomes in the measure.

10. 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:

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

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

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

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).

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

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

(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.

A.2. 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.

A.3. 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,$\left\{\hat{\alpha}_i^{(b)}, \hat{var}\left(\alpha_i^{(b)}\right); i = 1,2, \dots, I\right\}$
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 all prior updates here under the calendar year and corresponding report.

B.1. 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.

B.2. 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 a routine surgery. Timing of the ED visits is determined using revenue center dates from the outpatient claim.
- Update the surgery measure's planned readmission algorithm by adopting changes made when going from v4.0_2019 to v4.0_2020[21] of the planned readmission algorithm (see Section 3.2.1 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.

B.3. 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

[21] In this 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.

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 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 the surgery measure's planned admission algorithm (PAA) by adopting changes made when going from v4.0_2017 to v4.0_2019[10] of the planned readmission algorithm (see Section 3.2.1 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.

B.4. 2017

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

B.5. 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 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.

C.1. 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 ER.
- 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.

C.2. 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.

C.3. 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. CMS seeks to count only 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.

C.4. 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 dies 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.

C.5. 2016

2016 Measure Technical Report (Original Measure Specifications)

Inclusion Criteria

- All adult Medicare FFS patients with a diagnosis of cancer aged 18 years or older at the start of the performance period.
  Rationale: The measure includes patients aged 18 years or older because all adult cancer patients with a treatment plan allowing for chemotherapy treatment in a hospital outpatient setting should receive proper care management to reduce the need for acute care for the specific conditions the measure addresses.

- The measure includes chemotherapy treatment at HOPDs identified using CPT/ HCPCS procedure and medication procedure codes, ICD-9-CM chemotherapy encounter diagnosis codes, or revenue center codes for chemotherapy administration.
  Rationale: Using claims data allows for consistent identification of chemotherapy administration in HOPDs and aligns with the NQF criteria and CMS standards for claims-based models for publicly reported measures.

Exclusion Criteria

- Patients with a diagnosis of leukemia at any time during the performance period.
  Rationale: The measure excludes patients with leukemia because, given the high toxicity of treatment and recurrence of disease, admissions among this population do not reflect poorly managed 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.

- Patients who were not enrolled in Medicare FFS Parts A and B in the year before their first 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.
  Rationale: The measure excludes these patients to ensure that full data will be available for outcome assessment.

Outcome

The measure assesses two outcomes for each patient in the cohort. The first outcome is one or more inpatient admissions within 30 days of any chemotherapy treatment in an HOPD during the performance period with either: (1) a primary discharge diagnosis of anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis; or (2) a primary discharge diagnosis of cancer and a secondary diagnosis of one of those 10 diagnoses on the same claim.

The second outcome is any ED visit over the same time period with the same qualifying diagnoses listed above. The measure assesses the ED visit outcome only for patients who did not experience a qualifying inpatient admission. In addition, 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.

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.

D.1 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.

D.2. 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.[22]
  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 a routine surgery. Timing of the ED visits is determined using revenue center dates from the outpatient claim.

D.3. 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.

[22] In this 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.

- 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.

D.4. 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.

D.5. 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.
- Exclude 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.
- Updated 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.

D.6. 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) Exclude 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: Because the outcome time frame is 7 days, the requirement for continuous enrollment was shortened to exclude as few index procedures as necessary.

Appendix E: Surgery Measure Specifications

The measure specifications are described in more detail in Section 3.

E.1. Surgery Cohort

The measure includes outpatient surgeries:

- That are substantial and performed as same-day surgery at HOPDs (except eye surgeries), identified by Medicare Physician Fee Schedule GSI code 090. Medicare developed a list for ASCs to identify surgeries that can be safely performed as same-day surgeries and do not typically require an overnight stay.
- That are cystoscopy procedures with intervention (regardless of GSI value).
- For patients who are age 65 or older at the time of the procedure.
- That are not performed concurrently with a high-risk procedure.
- For patients with continuous enrollment in Medicare FFS Parts A and B in the 12 months prior to the procedure.

The measure excludes outpatient surgeries:

- For patients who lack continuous enrollment in Medicare FFS Parts A and B for at least 7 days after the procedure.
- 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.
- 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.
- That are billed on the same hospital outpatient claim and that occur after the ED visit.
- That are billed on the same outpatient claim as an observation stay.

E.2. List of Included CPT® Procedure Codes in the Surgery Cohort

Data dictionary tab *"HOPD_Surg_Cohort"* includes procedure codes used to define the measure cohort, including cystoscopy with intervention.

Note:

- This list does not include diagnostic cystoscopy procedures (cystoscopy alone or cystoscopy plus biopsy).
- Medicare identifies all procedure codes listed below as safe to perform as a same-day procedure without typically requiring an overnight stay.

E.3. List of Excluded Eye Surgeries

Data dictionary tab "*HOPD_Surg_Eye_Exclusions"* lists eye surgeries not included in the measure cohort.

E.4. Surgery Risk Adjustment

Data dictionary tab "*HOPD_Surg_Risk_Factor_CCs*" lists the risk-adjustment variables included in the surgery measure risk model, as specified in Hierarchical Condition Category (HCC) Version 22.

Data dictionary tab "*HOPD_Surg_RF_CoC*" lists complication of care variables not used in risk adjustment if occurring only during procedure.

E.5. Surgery Outcome

The measure outcome is any of the following hospital visits:

1. Inpatient admission directly after surgery
2. An unplanned hospital visit (inpatient admission, observation stay, or ED visit) occurring after discharge and within 7 days of the surgery

Data dictionary tab *"HOPD_Surgy_ED_Obs_Stay_Def"* provides the codes used to identify ED visits and observation stays.

The outcome includes only unplanned inpatient admissions, since planned admissions are not a signal of quality of care. All ED visits and observation stays are considered unplanned. See Section 3.2.1 and Appendix H for more detail on the definition of unplanned versus planned hospital admissions.

Appendix F: Chemotherapy Measure Specifications

The measure specifications are described in more detail in Section 5.

F.1. Chemotherapy Cohort

The measure includes:

- Medicare FFS patients age 18 and older with a diagnosis of cancer receiving chemotherapy treatment in a hospital outpatient setting.
    - Outpatient chemotherapy procedures are identified using CPT®/HCPCS procedure and medication procedure codes, ICD-10 chemotherapy encounter diagnosis codes, ICD-10-CM and ICD-10-PCS codes, or revenue center codes for chemotherapy administration.
    - Cancer diagnoses are identified using International Classification of Disease Tenth Revision (ICD-10-CM) diagnosis codes from inpatient, outpatient, or Part B claims during the performance period.

The measure excludes:

- Patients with a diagnosis of leukemia at any time during the performance period.
    - Leukemia diagnoses are identified using ICD-10-CM diagnosis codes from inpatient, outpatient, or Part B claims during the performance period.
- Patients who were not enrolled in 12 months of continuous in Medicare FFS Parts A and B prior to at least one chemotherapy treatment during performance period.
- 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.
- Patients who only had cases in which chemotherapy was provided to treat a qualifying autoimmune condition, rather than to treat cancer.
    - Cases where chemotherapy is administered a qualifying autoimmune condition are by the presence of at least one of 20 qualifying ICD-10, HCPCS, and CPT® chemotherapy codes and ICD-10 diagnoses for select autoimmune diseases.

F.2. Chemotherapy Risk Adjustment

The risk-adjustment model for inpatient admissions has 25 patient-level risk-adjustment variables (age, sex, exposure to chemotherapy, exposure to concurrent radiotherapy, 9 comorbidity variables, and 12 cancer diagnosis categories). Refer to the "Risk Model: Inpatient Admissions Outcome Model Definitions" tab in the 2020 Chemotherapy Measure Data Dictionary for the list of variables.

The risk-adjustment model for ED visits has 20 patient-level risk-adjustment variables (age, sex, exposure to chemotherapy, exposure to concurrent radiotherapy, 6 comorbidity variables, and 10 cancer diagnosis categories). Refer to the "Risk Model: ED Visit Outcome Model Definitions" tab in the 2020 Chemotherapy Measure Data Dictionary for the list of variables.

F.3. Chemotherapy Outcome

The chemotherapy measure has two outcomes:

The first outcome is one or more inpatient admissions within 30 days of any chemotherapy treatment in an HOPD during the performance period with either: (1) a primary discharge diagnosis of any of 10

conditions -- anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis; or (2) a primary discharge diagnosis of cancer and a secondary diagnosis of one of those 10 conditions on the same claim.

Inpatient admissions that are considered "always planned" do not qualify 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. CMS seeks to count only unplanned admissions in the measure outcome because variation in planned admissions does not reflect quality differences. See Appendix H for more detail on the definition of unplanned versus planned hospital admissions for the chemotherapy measure.

The second outcome is any ED visit (or stand-alone observation stay) within 30 days of any chemotherapy treatment with the same ten qualifying diagnoses listed above for the inpatient admissions outcome - anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis; either in the principal position or as a secondary diagnosis with cancer as principal diagnosis. The measure only assesses the ED visit outcome for patients who did not experience a qualifying 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.

The measure only assesses the ED visit outcome for patients who did not experience a qualifying inpatient admission.

The 2020 Chemotherapy Measure Data Dictionary shows the qualifying diagnosis codes for each of the conditions considered in the two outcomes in the "Numerator Details" tabs, and the AHRQ CCS used to identify always planned admissions are listed on the "Always Planned Procedure Definition" and "Always Planned Diagnosis Definition" tabs.

Appendix G: Colonoscopy Measure Specifications

The measure specifications are described in more detail in Section 7.

G.1. Colonoscopy Cohort

The measure includes:

- Outpatient colonoscopy procedures identified using HCPCS codes and CPT® codes. Qualifying colonoscopy procedures were not included in the measure if they were concurrently billed with a high-risk colonoscopy procedure code.
- Colonoscopies for patients who are aged 65 or over at the time of the procedure.
- Patients with continuous enrollment in Medicare FFS Parts A and B in the 12 months prior to the procedure.

The measure excludes:

- Procedures for patients who lack continuous enrollment in Medicare FFS Parts A and B in the 7 days after the procedure.
- Colonoscopies that occur concurrently with high-risk upper GI endoscopies.
- 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 7 days of the colonoscopy.
- Colonoscopies followed by a subsequent outpatient colonoscopy procedure within 7 days.
- 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.
- 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.
- Colonoscopies that are billed on the same hospital outpatient claim and that occur after the ED visit.
- Colonoscopies that are billed on the same hospital outpatient claim as an observation stay.

G.2. List of Included CPT® Procedure Codes in the Colonoscopy Cohort

Data dictionary tab *"Colonos_Cohort"* includes procedure codes used to define the measure cohort.

G.3. Colonoscopy Risk Adjustment

Data dictionary tab "*Colonos_risk_factor_CCs*" lists the risk-adjustment variables included in the colonoscopy measure risk model, as specified in Hierarchical Condition Category (HCC) Version 22 and "*Colonos_risk_factor_CPT"* lists the risk-adjustment variables included in the colonoscopy measure risk model, as defined by individual CPT® codes.

Data dictionary tab "*Colonosc_CoC_CCs*" lists complication of care variables not used in risk adjustment if occurring only during procedure.

G.4. Colonoscopy Outcome

The measure outcome is any (such as one or more) unplanned hospital visit within 7 days of an outpatient colonoscopy; a hospital visit includes any ED visit, observation stay, or unplanned inpatient admission.

Data dictionary tab *"Colonos_Outcome_ED_Obs"* provides the codes used to identify ED visits and observation stays. The outcome includes all-cause hospital visits because from a patient perspective, an unplanned visit for any cause is an adverse event.

The outcome includes only unplanned inpatient admissions, since planned admissions are not a signal of quality of care. All ED visits and observation stays are considered unplanned. See Section 7.3.2 and Appendix H for more detail on the definition of unplanned versus planned hospital admissions.

Appendix H: Planned Admission Algorithm, Adapted From CMS Planned Readmission Algorithm Version 4.0

H.1. Planned Admission Algorithm Overview

The planned admission algorithm is adapted from the CMS Planned Readmission Algorithm Version 4.0_2020. The algorithm is a set of criteria for classifying admissions within 7 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 7 provides 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.

The algorithm classifies admissions as planned or unplanned using a flow chart (Figure H.1) and four tables of procedures and conditions, included in the data dictionary, tabs *"PAA PA1 Always Plnnd Px,"* "*PAA PA2 Always Plnnd Dx,*" "*PAA PA3 Pot Plnnd Px,"* and *"PAA PA4 Acute Dx."*

- "*PAA PA1 Always Plnnd Px*" tab identifies procedures that, if present in an admission, classify the admission as planned.
- "*PAA PA2 Always Plnnd Dx*" tab identifies principal discharge diagnoses that classify admissions as planned.
- *"PAA PA3 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.
- "*PAA PA4 Acute Dx*" lists the acute (unplanned) principal discharge diagnoses that disqualify admissions with a potentially planned procedure in *"PAA PA3 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 H.1. Planned Admission Algorithm Flow Chart