

Hospital Visits after Urology Ambulatory Surgical Center Procedures

Technical Report: Public Comment Draft

Submitted by:

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Table of Contents

Table of Contents.....	2
List of Tables	4
List of Figures	5
Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation (CORE) Project Team.....	6
Acknowledgements.....	7
1. Executive Summary.....	9
1.1 Rationale for Assessing Hospital Visits after Ambulatory Surgery	9
1.2 Measure Development	10
1.3 Measure Specifications	10
1.4 Summary	11
2. Introduction and Call for Public Comment	12
2.1 Background	12
2.2 Definition of an Ambulatory Surgical Center (ASC)	12
2.3 Importance of Assessing Unplanned Hospital Visits after ASC Procedures	13
2.4 Related Measures Under Development	14
3. Measure Development Methods.....	15
3.1 Overview of Measure Development Process	15
3.2 Data Sources	15
3.3 Cohort Definition	16
3.3.1 Inclusion Criteria	16
3.3.2 Exclusion Criteria.....	18
3.4 Outcome	18
3.4.1 Definition of Outcome	18
3.4.2 Outcome Timeframe	19
3.4.3 Multiple Qualifying Procedures within a 7-Day Period	19
3.4.4 All-Cause Hospital Visits.....	19
3.4.5 Removal of Planned Admissions from the Outcome.....	20
3.5 Model Development	21
3.5.1 Overview	21
3.5.2 Candidate Risk Factors for Patient-Level Risk Adjustment.....	21
3.5.3 Final Risk-Adjustment Variable Selection	23
3.5.4 Statistical Software	23

4.	Results	24
4.1	Overall Summary.....	24
4.2	Patient-Level Risk-Adjustment Model	24
4.2.1	Candidate and Final Model Variables	24
4.3	Additional Testing to be Performed	25
5.	Summary and Discussion	27
6.	References	28
7.	Tables	31
8.	Figures	37
9.	Appendices.....	39
	Appendix A: List of Included Current Procedural Terminology (CPT®) Codes Defining Urology Procedures	39
	Appendix B: Emergency Department Visits and Observation Stays Definition.....	48
	Appendix C: Planned Admission Algorithm	48
	Appendix D: Measure Score Calculation and Reporting.....	65
	Appendix E: Risk-Adjustment Model Development	67

List of Tables

Table 1. Top 20 procedures in the urology cohort (data source: Medicare 20% FFS Sample, 2013)	31
Table 2. Number and frequency of emergency department visits, observation stays, and unplanned inpatient admissions (data source: Medicare 20% FFS Sample, 2013).....	31
Table 3. Top hospital visit diagnoses for any hospital visit within 7 days of urology procedures (data source: Medicare 20% FFS Sample, 2013).....	32
Table A1. List of included Current Procedural Terminology (CPT®) codes defining urology procedures	39
Table PA1. Procedure categories that are always planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0).....	51
Table PA2. Diagnosis categories that are always planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0).....	51
Table PA3. Procedure categories that are potentially planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0).....	51
Table PA4. Diagnosis categories that are acute (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0)	56
Table E1. Candidate variables considered for the risk-adjustment model	67
Table E2. Condition Categories (CCs) that are not risk adjusted for if they occur only at the time of the procedure	69

List of Figures

Figure 1. Timing of hospital visits within 30 days of urology ASC procedures (Event Rate per day post discharge for 0- through 30-day period) (data source: Medicare 20% FFS Sample, 2013)	37
Figure 2. Distribution of unadjusted hospital visit rates following urology ASC procedures (data source: Medicare 20% FFS Sample, facilities with > 30 cases, 2013)	38
Figure PA1. Planned admission algorithm flowchart.....	50

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1. Executive Summary

This report presents for public comment a quality measure of ambulatory surgical center (ASC) urology procedures. The measure assesses the quality of urology ASC procedures using the outcome of hospital visits – including emergency department (ED) visits, observation stays, and unplanned inpatient admissions – within 7 days after the surgery. Yale New Haven Health Services Corporation—Center for Outcomes Research and Evaluation (CORE) is developing the measure for the Centers for Medicare & Medicaid Services (CMS). This ASC-level measure will inform patient choice and help providers and ASCs improve the quality of care.

This report presents the measure specifications for public comment. We present the rationale for the measure and the specific proposed technical approach to the measure. As part of CMS's standard development process, CMS invites public comment on all aspects of the measure.

Instructions on how to submit comments are available at the following webpage:

<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/CallforPublicComment.html>. During the public comment period, we especially invite comments on the following:

1. Adjusting for surgical procedural complexity. As detailed in [Section 3.5.2](#), work relative value units (RVUs) are used to adjust for procedural complexity, an approach that is well-established in the literature and is used in the American College of Surgeons (ACS) National Surgical Quality Improvement Project (NSQIP). Comments on additional approaches to risk adjusting for procedural complexity using Medicare claims data are welcomed.
2. Identifying treatments that routinely start at an ASC and are followed within 7 days by planned inpatient care. As detailed in [Section 3.4.5](#), the measure intends to exclude “planned” hospital admissions from the outcome because variation in planned admissions may not reflect quality differences. Such admissions are identified using a “planned admission” algorithm presented in [Appendix C](#). Thus, identifying any additional planned procedures not captured by the algorithm that would routinely be followed by an admission within 7 days of a urology ASC procedure as part of the care plan is important for the measure.

1.1 Rationale for Assessing Hospital Visits after Ambulatory Surgery

Ambulatory surgery is increasingly common in the United States (US). Nearly 70% of all surgeries in the US are performed in an outpatient setting, with an expanding number and variety of procedures being performed at stand-alone ASCs.¹ While ambulatory surgery is considered low-risk for complications, there are well-described and potentially preventable

adverse events that can occur after ambulatory surgery leading to unplanned care in a hospital. These events include urinary retention, uncontrolled pain, infection, bleeding, and venous thromboembolism.

Hospital visits following same-day surgery are an important and accepted patient-centered outcome reported in the literature.²⁻⁹ National estimates of hospital visit rates following surgery vary from 0.5-9.0% based on the type of surgery, outcome measured (admissions alone or admissions and ED visits), and timeframe for measurement after surgery.³⁻⁹ Such events also vary among ASCs, suggesting possible variation in surgical care, post-surgical care, and the care and support provided to patients post discharge. We evaluated the rate of hospital visits following urology ASC procedures. In our analysis of a 20% sample of Medicare Fee-for-Service (FFS) data from 2013, the median observed rate of hospital visits following urology procedures performed at ASCs was 5.8% (the 25th and 75th percentiles were 3.3% and 8.5%, respectively). These results suggest a performance gap and opportunity for quality improvement efforts.

Providers at ASCs are often unaware of patients' subsequent acute care visits given that patients tend to present to the ED or to hospitals unaffiliated with the ASC.¹⁰ For these reasons, a quality measure of hospital visits following ASC surgery would serve to improve transparency, inform patients and providers, and foster quality improvement.

1.2 Measure Development

This measure is being developed consistent with CMS's measure development guidance. The primary measure developers, a multidisciplinary team of CORE clinicians, health services researchers, and statisticians, are supported and informed by a national technical expert panel (TEP) consisting of patients, surgeons, methodologists, researchers, and providers. At this time, CMS is seeking public comment to further inform measure development.

1.3 Measure Specifications

The population of interest for the measure is Medicare Fee-for-Service (FFS) patients aged 65 years and older, undergoing outpatient urology procedures at ASCs.

The measure's outcome of interest is any unplanned hospital visit (ED visit, observation stay, or unplanned inpatient admission) by a patient occurring within 7 days of an index procedure.

The measure will be risk adjusted. In order to help ensure that differences in the measure score do not reflect differences in the mix of patients and procedures across ASCs, the model will adjust for patient demographics, clinical characteristics, and surgical procedural complexity. We will adjust for these characteristics because they can vary across ASC patient populations, are unrelated to quality, and influence the outcome. To date, we have developed candidate risk

variables for the patient-level risk-adjustment model from which we will select the final variables based on clinical input and statistical testing.

The measure score will be an ASC-level risk-adjusted (risk-standardized) hospital visit rate (RSHVR). The RSHVR is calculated as the ratio of the predicted to the expected number of post-surgical unplanned hospital visits among the ASC's patients, multiplied by the national observed rate of unplanned hospital visits. For each ASC, the numerator of the ratio is the number of hospital visits predicted for the ASC's patients, accounting for its observed rate, the number of urology procedures performed at the ASC, and the case mix. The denominator is the expected number of hospital visits, given the ASC's case mix. This approach is analogous to an observed-to-expected ratio, but accounts for clustering and sample size variation across ASCs. A ratio less than one indicates that the ASC's patients have fewer post-surgical visits than expected, compared to ASCs with similar surgical procedures and patients. A ratio greater than one indicates that the ASC's patients have more visits than expected, compared to ASCs with similar surgical procedures and patients.

To calculate an ASC's predicted-to-expected (P/E) ratio, the measure will use a two-level hierarchical logistic regression model (see [Appendix D](#)). The log-odds of the outcome for an index procedure is modeled as a function of the patient demographic, clinical, and procedure characteristics, and a random ASC-specific intercept. This strategy accounts for within-facility correlation of the observed outcome and sample size differences and accommodates the assumption that underlying differences in quality across ASCs lead to systematic differences in outcomes. An ASC's P/E ratio is then multiplied by the overall national rate of unplanned hospital visits to calculate the ASC-level RSHVR.

1.4 Summary

This report describes the preliminary measure specifications for a risk-standardized quality measure of 7-day unplanned hospital visits following urology ASC surgeries. Stakeholder and expert input has informed measure development throughout. The purpose of this measure is to illuminate variation in performance as a possible indication of variation in quality of care for urology surgeries across ASCs, inform patient choice, and drive quality improvement. CMS invites comments on the measure's purpose, design, and potential application.

2. Introduction and Call for Public Comment

2.1 Background

National efforts to measure the quality of ambulatory surgical care are essential, given the increasing number of ASCs in the US and the increasing variety of procedures that they perform. ASCs have become the preferred setting for the provision of low-risk surgical and medical procedures in the US, including the provision of many types of urologic surgical care.¹ ASCs have gained favor among patients given their tendency toward shorter wait times, decreased need for hospitalization, and more rapid return to work when compared to similar patients managed in other types of healthcare facilities.¹ In 2014 alone, more than 3.4 million Medicare FFS beneficiaries were treated at ASCs.¹¹ Associated spending on ASC services by Medicare and its beneficiaries amounted to \$3.7 billion in 2013, an increase of more than 10% since 2007.¹¹ Due to advances in surgical and anesthetic techniques, nearly 70% of all surgical procedures in the US are performed in ambulatory settings,¹ with many of these procedures taking place as same-day surgeries at ASCs. The resultant shift in ASC utilization has led to an increase not only in ASC operative volume but also in the average age and complexity of patients managed at ASCs.^{12,13}

Using 5% national samples of Medicare FFS beneficiaries aged 65 years and older from 1998 to 2006, Hollingsworth et al. (2012) reported 30-day adjusted inpatient admission rates for patients who underwent one of 22 common outpatient urologic procedures at ASCs. The 30-day rate was 7.9% (0.4% same-day admission and 7.5% subsequent admission). Using a 20% national sample of 2013 Medicare FFS claims (20% FFS Sample), we identified, in 2013, 12,651 outpatient urology surgeries of the type included in this proposed measure (see [Section 3.3](#) for cohort definition) performed at 860 ASCs and that 121 ASCs have at least 30 such cases.

2.2 Definition of an Ambulatory Surgical Center (ASC)

Medicare defines ASCs as healthcare facilities that operate “exclusively for the purpose of providing surgical services to patients not requiring hospitalization and in which the expected duration of services [does] not exceed 24 hours following an admission” (42 CFR 416.2). Of interest for the measure under consideration, the types of urology procedures performed at ASCs range from very minor procedures, such as circumcision, to more major operations, such as sling procedures. These procedures typically have less than 90-minute operating times and 4- to 6-hour same-day recovery periods. The surgeries performed usually do not (1) involve major or prolonged invasion of body cavities, (2) require active medical monitoring and care overnight, (3) result in extensive blood loss, (4) directly involve major blood vessels, or (5) involve care that is either emergent or life-threatening (42 CFR 416.65).

Eligible ASCs vary in their organizational and financial structures. Many ASCs are hospital-owned; most are run by groups of physicians in the same specialty area and are limited to a single type of procedure, such as eye or urology surgery. Other ASCs conduct procedures in two or more specialty areas.

2.3 Importance of Assessing Unplanned Hospital Visits after ASC Procedures

Despite increasing availability of ASCs and their use by patients, there are few quality measures to gauge ASC performance. Existing ASC quality measures tend to focus on very rare, patient-safety related events. For example, one measure counts cases in which wrong site, wrong side, wrong patient, wrong procedure, and wrong implant events occurred.¹⁴ Understanding that such rare, patient-safety related events are important to assess, generally lacking at this time are measures designed to capture more common adverse outcomes that patients experience, such as urinary retention, urinary tract infection, pain, and other complications prompting acute care hospital visits or admissions.

Measuring ASC outcomes is an important strategy for improving transparency and fostering quality improvement. Facilities and surgical teams are often unaware of their patients' adverse events and hospitalizations following ASC procedures because separate providers (for example, emergency room physicians) tend to provide post-surgical care when it is required.

For this reason, consideration of unanticipated hospital visits following ASC procedures offers an important means of more broadly reflecting the quality of ASC care. Such visits are an unexpected and potentially preventable outcome for patients with a low anticipated perioperative risk. In the literature, hospital visit rates following outpatient surgery vary from 0.5-9.0%, based on the type of surgery, outcome measured (admissions alone or admissions and ED visits), and timeframe for measurement after surgery.²⁻⁹ These hospital visits can occur due to a range of well described adverse events, including major adverse events, such as bleeding, wound infection, septicemia, and venous thromboembolism. Patients also frequently report minor adverse events – for example, uncontrolled pain, nausea, and vomiting – that may result in unplanned acute care visits following surgery.

Several factors make unanticipated hospital visits a priority quality indicator. Because ASC providers are not aware of all post-surgical hospital visits that occur among their patients, reporting of this outcome will help to illuminate problems that may not be currently visible. In addition, the outcome of hospital visits is broad, patient-centered, and reflects the full range of reasons leading to hospital use among patients undergoing same-day surgery. Public reporting of this outcome measure will provide ASCs with critical information and incentives to implement strategies to reduce unplanned hospital visits.

Given that ASCs vary widely in their focus and in the number of procedures that they perform, narrowing in on a specific surgical subspecialty area, such as urology surgery, will enable a quality measure to make fair comparisons of outcome rates across facilities that perform similar procedures.

2.4 Related Measures Under Development

This measure of unplanned 7-day hospital visits following urology procedures performed at ASCs is being developed in conjunction with two additional quality measures – one that focuses on orthopedic and one that focuses on general surgery ASC procedures – that utilize the same hospital visits outcome. This hospital visits outcome is also the focus of 2 existing, National Quality Forum (NQF)-endorsed CMS quality measures: (1) Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy (NQF #2539) and (2) Hospital Visits after Hospital Outpatient Surgery (NQF #2687).

3. Measure Development Methods

3.1 Overview of Measure Development Process

CORE is leading the development of the urology ASC measure under the guidance of CMS. The CORE Project Team consists of a multidisciplinary group of clinicians, health services researchers, and statisticians with expertise in outcome measure development. We are obtaining clinical input from a urologist consultant and have convened, through a public process, a national TEP consisting of patients, expert clinicians, methodologists, researchers, and providers to provide input on the measure methodology. Additionally, a public comment period is now being held to solicit stakeholder input on the measure methodology.

3.2 Data Sources

The measure requires a data source that allows us to link patient data across care settings in order to identify appropriate surgical procedures for inclusion, comorbidities for risk adjustment, and the outcome of hospital visits.^{23–25} Therefore, claims data are used, as they support these linkages and are available for the patient population of interest.

We are using two sets of claims data for measure development.

1. To develop and test the patient-level model, we are using 2013 claims data from the Medicare Inpatient, Outpatient, and Carrier (Part B Physician) Standard Analytical Files (SAF). Outpatient urologic procedures performed at ASCs are identified using the Medicare 20% FFS Sample of beneficiaries' claims from the Carrier SAF, which includes the ASC facility claim (with a unique facility identifier). The outcomes of ED visits and observation stays after urology ASC surgery are identified from the hospital Outpatient SAF and inpatient hospital admissions from the Medicare Provider Analysis and Review (MedPAR) file. The measure cohort includes patients who underwent urology ASC procedures in 2013. Inpatient and outpatient claims data from 2012 and 2013 are used to identify comorbidities for risk adjustment for these patients. For measure development and testing, we will randomly split the 2013 data into Development and Validation Samples.
2. Testing ASC-level variation in the measure score will require a larger number of urologic procedures per facility than was available in the Medicare 20% sample. Therefore, we will use 2012-2013 Healthcare Cost and Utilization Project (HCUP) data from two states (Florida and New York) that provide linked records from the State Ambulatory Surgery Database (SASD), the State Emergency Department Database (SEDD), and the State Inpatient Database (SID). These datasets provide 100% of the claims for outpatient

surgeries performed at ASCs, linked to ED visits and hospital admissions after the surgery. A limitation of this dataset is that HCUP data do not consistently collect or include observation stay visits.

3.3 Cohort Definition

The target population for this measure is Medicare FFS patients aged 65 years and older, undergoing outpatient urology procedures that are typically performed by a urologist at ASCs. The Medicare FFS population was because of the availability of a national dataset (Medicare claims) that could be used to develop, test, and publicly report the measure. The target population is defined based on the following inclusion and exclusion criteria.

3.3.1 Inclusion Criteria

Included patients

- Medicare FFS patients aged 65 years and older.

Rationale: Medicare beneficiaries under age 65 typically are a highly diverse group with a higher burden of disability, and it is, therefore, difficult to adequately risk adjust for the under-65 population.

- Patients with continuous enrollment in Medicare FFS Parts A and B in the 12 months prior to the procedure.

Rationale: Patients with full enrollment have all claims available for identifying comorbidities for risk adjustment.

Included procedures

- Surgical procedures that (1) are routinely performed at ASCs, (2) involve some increased risk of post-surgery hospital visits, and (3) are routinely performed by urologists.
 - Procedures performed at ASCs were identified using Medicare's list of covered ASC procedures for 2013. This list of surgeries is publicly available at:
<https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ASCPayment/ASC-Regulations-and-Notices-Items/CMS-1589-FC.html>
(download Addendum AA). Surgeries on the ASC list of covered procedures do not involve or require major or prolonged invasion of body cavities, extensive blood loss,

major blood vessels, or care that is emergent or life threatening.¹

- To focus the measure on “major” and “minor” surgeries that impose a meaningful risk of post-procedure hospital visits, we use the Medicare Physician Fee Schedule global surgery indicator (GSI) values of 090 and 010, respectively. The GSI code reflects the number of post-operative days that are included in a given procedure’s global surgical payment and identifies surgical procedures of greater complexity and follow-up care.

Rationale: Ambulatory procedures include a heterogeneous mix of non-surgical procedures, minor surgeries, and more substantive surgeries. We aim to include major and minor surgeries but not very low-risk (very minor) surgeries or non-surgical procedures that typically have a high volume and a very low outcome rate.

- To identify the subset of ASC procedures typically performed by urologists, we used the Clinical Classifications Software (CCS) developed by the Agency for Healthcare Research and Quality (AHRQ) to group procedures and surgeries into clinically-related mutually exclusive categories. For this measure, we use two of AHRQ’s “operations on the urinary system” and “operations on the male genital organs” groups of procedures.¹⁵ The CCS is maintained by AHRQ; thus, as new procedures and codes evolve, the list will evolve, facilitating measure updates. Nephrotomy and nephrostomy procedures (defined by AHRQ clinical category CCS 103) were removed because our experts indicated that these procedures are typically performed by interventional radiologists.
- We include cystoscopy with intervention.
 - We define cystoscopy with intervention using the procedure codes indicated in [Appendix A](#). We only consider cystoscopy with therapeutic intervention and do not include cystoscopy alone or cystoscopy with biopsy alone in the measure cohort. We do not include other endoscopy procedures in the measure cohort. These endoscopy procedures, such as colonoscopy, are lower risk procedures often with a high volume and a low outcome rate (much like minor surgeries), are often diagnostic procedures (rather than therapeutic), are not typically performed by

¹ This list of surgeries was used for several reasons. The ASC list is publicly available, is annually reviewed and updated by Medicare, and includes a transparent public comment submission and review process for addition and/or removal of procedures. Using an existing, defined list of same-day surgical procedures, rather than defining surgical procedures de novo, is useful for long-term measure maintenance. Procedures included on Medicare’s list of covered ASC procedures are defined using Healthcare Common Procedure Coding System (HCPCS) and CPT® codes.

surgical teams, and do not require an operating room.

Rationale: All endoscopy procedures are considered non-surgical procedures based on Medicare coding (GSI code 000) and are not included in the measure cohort. However, we include cystoscopy with intervention because it is a common procedure, often performed for therapeutic intervention by surgical teams, and our preliminary analysis indicated outcome rates and causes of hospital visits post-procedure similar to other procedures in the measure cohort.

With the exception of nephrotomy and nephrostomy procedures (defined by AHRQ clinical category CCS 103), the urology ASC measure cohort includes all other major and minor surgical procedures, plus cystoscopy with intervention, in AHRQ's "operations on the urinary system" and "operations on the genital organs" groups. See [Appendix A](#) for a complete listing of all CPT® procedure codes included in the measure cohort.

3.3.2 Exclusion Criteria

- Surgeries for patients who survived at least 7 days, but were not continuously enrolled in Medicare FFS Parts A and B in the 7 days after the surgery are excluded.

Rationale: These patients are excluded to ensure all patients have full data available for outcome assessment.

3.4 Outcome

3.4.1 Definition of Outcome

The outcome is any unplanned hospital visit within 7 days of an outpatient urology surgery. The outcome of hospital visits is the focus of this measure because this is a broad, patient-centered outcome that captures the full range of hospital visits resulting from adverse events or poor care coordination following outpatient surgery. This measure's goal is to measure and illuminate variation in risk-adjusted hospital visits following surgery for quality improvement purposes.

A hospital visit is defined as any ED visit, observation stay, or unplanned inpatient admission occurring after the ASC procedure; "planned" admissions for follow-up care are not included, as these hospital visits do not reflect quality differences (see [Section 3.4.5](#)). Hospital acute care visits and admissions are well-described and recognized indicators of quality for outpatient same-day surgery at ASCs (see [Section 2.3](#)).

We have developed two other risk-adjusted outpatient procedure measures that use this same 7-day unplanned hospital visit outcome, both of which have been endorsed by the National Quality Forum (NQF):

- Facility 7-Day Risk-Standardized Hospital Visit Rate after Outpatient Colonoscopy (NQF #2539)
- Hospital Visits after Hospital Outpatient Surgery (NQF #2687)

ED visits and observation stays are defined using billing codes or revenue center codes identified in Medicare Part B outpatient hospital claims (see [Appendix B](#)).

3.4.2 Outcome Timeframe

The outcome of hospital visits is limited to 7 days since existing literature suggests that the vast majority of adverse events after outpatient surgery occur within the first 7 days following the surgery.^{4,16} In addition, our data analysis showed the highest rates of hospital visits occurred within 7 days of urology ASC surgery. As the results in [Figure 1](#) show, the daily rate of unplanned hospital visits was highest immediately following the procedure and leveled off to a baseline rate of approximately 4.5 visits per 1,000 procedures after 7 days. Based on empiric analyses and expert input from our urologist consultant and TEP members, we concluded that unplanned hospital visits within 7 days is the optimal timeframe to ensure capture of surgery-related adverse events and to minimize capture of hospital visits unrelated to the surgery.

3.4.3 Multiple Qualifying Procedures within a 7-Day Period

When there are two or more qualifying surgical procedures within a 7-day period, we will consider all of them as index procedures; however, the timeframe for outcome assessment will be defined as the interval between procedures (including the day of the next procedure) and then 7 days after the last procedure. If the timeframe for outcome assessment were 7 days after each procedure that occurs within a 7-day period, it would be possible for a single outcome to be attributed to two or more index procedures. For example, consider the following scenario: Procedure #1 on Day 1, Procedure #2 on Day 4, and ED visit on Day 6. Using the standard 7-day timeframe, the outcome on Day 6 would be attributed to both of the procedures. Using the refined coding, however, the outcome on Day 6 would be attributed to only Procedure #2, and Procedure #1 would not have an outcome because there was no unplanned hospital visit between Procedures #1 and #2.

3.4.4 All-Cause Hospital Visits

We measure all-cause hospital visits to encourage facilities to minimize all types of risks that may lead to the need for a hospital visit after ASC surgery. Measuring only hospital visits that

are overtly related to a procedure, such as pain and bleeding, would limit the measure's impact on quality improvement efforts. Measuring all-cause patient outcomes encourages facilities to minimize the risk of a broad range of outcomes, including the risk of urinary retention, urinary tract infection, dehydration, nausea and vomiting, and dizziness. These are common problems that may or may not be related to a recent ASC surgery. Thus, the measure is structured so that facilities that most effectively minimize patient risk of these outcomes will perform better on the measure.

The rate of hospital visits is not expected to be zero since some patients will have visits for reasons completely unrelated to the procedure. The measure will be risk adjusted for patient demographics, clinical characteristics, and surgical procedural complexity so that facilities that experience more unrelated visits due to a generally higher-risk patient mix will not be disadvantaged.

3.4.5 Removal of Planned Admissions from the Outcome

For inpatient admissions occurring after urology procedures performed at ASCs, only unplanned admissions are included 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; these are not included in the outcome because variation in planned admissions would not reflect quality of care differences.

To identify admissions as planned or unplanned, we apply an algorithm we previously developed for CMS's hospital readmission measures, the CMS Planned Readmission Algorithm 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. 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.

See [Appendix C](#) for the detailed planned admission algorithm.

3.5 Model Development

3.5.1 Overview

The measure will adjust for ASC case mix based on patient demographics, clinical characteristics, and surgical procedural complexity. Risk adjustment is necessary to ensure that variation in the measure score among ASCs is due to differences in quality of care rather than differences in case mix.

The measure score will be an ASC-level RSHVR. The RSHVR is calculated as the ratio of the predicted to the expected number of post-surgical hospital visits among the ASC's patients, multiplied by the national observed rate of unplanned hospital visits. For each ASC, the numerator of the ratio is the number of hospital visits predicted for the ASC's patients, accounting for its observed rate, the number of urology procedures performed at the ASC, and the case mix. The denominator is the expected number of hospital visits given the ASC's case mix. This approach is analogous to an observed-to-expected ratio but accounts for clustering and sample size variation across ASCs. A ratio less than one indicates that the ASC's patients have fewer post-surgical visits than expected compared to ASCs with similar surgical procedures and patients. A ratio greater than one indicates that the ASC's patients have more visits than expected compared to ASCs with similar surgical procedures and patients.

To calculate an ASC's predicted-to-expected (P/E ratio, the measure will use a two-level hierarchical logistic regression model (see [Appendix D](#)). We model the log-odds of the outcome from an index procedure as a function of the patient demographic, clinical, and procedure characteristics, and a random outpatient facility-specific intercept. This strategy accounts for within-facility correlation of the observed outcome and sample size differences and accommodates the assumption that underlying differences in quality across ASCs lead to systematic differences in outcomes. An ASC's P/E ratio is then multiplied by the overall national rate of unplanned hospital visits to calculate the facility-level RSHVR. This approach is tailored to, and appropriate for, a publicly reported outcome measure as articulated in published scientific guidelines.¹⁷⁻¹⁹

3.5.2 Candidate Risk Factors for Patient-Level Risk Adjustment

The measure will adjust for differences across facilities in patient demographic and clinical factors, and in procedure-related risk. Potential candidate risk factors were identified through prior work on related quality measures and through a focused literature review. Specifically, we reviewed risk factors considered in developing a broader NQF-endorsed claims-based surgery measure with the same outcome: Hospital Visits after Hospital Outpatient Surgery (NQF #2687). To identify additional clinical and procedural risk factors, we searched the

literature for relevant peer-reviewed publications of claims-based variables that predicted hospital visits after outpatient surgery using Ovid MEDLINE. The search yielded a total of six studies relevant to the urology measure. We added variables from the literature to our list of candidate risk factors if they were significantly associated with unplanned hospital visits in bivariate or multivariable analyses at the 0.05 level. From the six studies, we identified four variables not included in the related measure: (1) prior hospital inpatient admission⁴, (2) procedure type²⁰, (3) anesthesia type²¹, and (4) diagnosis-related group²¹. Based on our findings, a preliminary list of risk factors was developed and then revised based on TEP and expert clinical input.

To operationalize the candidate risk factors, we defined the clinical risk factors in claims data using Version 22 of CMS's hierarchical condition categories (HCC) model, which classifies over 14,000 International Classification of Diseases, Ninth Revision (ICD-9) diagnosis codes into 189 clinically coherent condition categories. In some cases, (for example, morbid obesity), individual ICD-9 codes were used to define the risk factor. To address surgical procedural complexity, we used the work RVU of the procedure, an approach employed by the American College of Surgeons National Surgical Quality Improvement Program (NSQIP).²²

We reviewed the candidate risk factors with TEP members and clinical consultants. None of the clinical experts suggested removing any of the candidate risk factors from the list. Several TEP members suggested that we consider additional risk adjustment for procedural complexity, beyond work RVU. One TEP member suggested we consider risk adjusting for benign prostatic hyperplasia, nocturia, urinary frequency, use of alpha blockers, and anesthetic type. We reviewed the suggested risk factors and added benign prostatic hyperplasia, nocturia, and urinary frequency. We were not able to include alpha blockers because we do not have data on patient-level medication use, and we did not include anesthetic type because we do not risk adjust for discretionary procedure differences (such as approach to anesthesia or surgical techniques).

Finally, to consolidate similar risk factors into fewer, broader risk variables, we checked the bivariate direction and strength of association of the individual risk factors defined by condition categories or ICD-9 codes, and then combined risk factor diagnoses into clinically coherent comorbidity variables. For example, we created a "cancer" variable that combined several individual cancer diagnoses.

The list of candidate risk variables is in [Appendix E, Table E1](#). The CCs that are not risk adjusted for if they occur only at the time of the procedure are in [Appendix E, Table E2](#).

3.5.3 Final Risk-Adjustment Variable Selection

To select the final variables for inclusion in the risk-adjustment model, we will fit an initial logistic regression model with all candidate variables. To develop a parsimonious model, we will then iteratively remove non-significant variables from the initial model using a stepwise purposeful selection approach described by Hosmer and Lemeshow (2000).²³ We will retain all variables significant at $p < 0.05$ in the final model.

3.5.4 Statistical Software

All statistical analyses were performed using Statistical Analysis System (SAS) version 9.4 (SAS Institute Inc., Cary, NC). The hierarchical logistic regression model will be estimated using the GLIMMIX procedure in SAS.

4. Results

4.1 Overall Summary

After applying all inclusion and exclusion criteria, the 2013 Medicare 20% FFS Sample included 12,651 urology procedures performed at 861 ASCs. The average age of patients was 75.7 years. [Table 1](#) presents the top 20 most common surgeries included in the 2013 urology ASC measure cohort; they represent 87.3% of all surgeries in the cohort. The overall national 7-day unplanned hospital visit rate was 6.2%. Of these hospital visits, 4.5% were ED or observation stay visits, and 1.7% were unplanned inpatient admissions ([Table 2](#)).

Across ASCs in the 2013 20% FFS Sample, the median volume of urology procedure cases in the cohort was 6 and ranged from 1 to 264 procedures per ASC (the 25th and 75th percentiles were 2 and 17 procedures, respectively). These results show that there were many ASCs with few cases in the 2013 Medicare FFS 20% Sample – 121 ASCs had more than 30 cases. Note: For public reporting, CMS will use complete data files and may combine two years of data to ensure reliable estimates.

The distribution of unadjusted outcome rates was skewed, suggesting variation in quality. Among the 121 ASCs with at least 30 cases in the 2013 20% FFS Sample, the unadjusted rate of unplanned hospital visits across ASCs ranged from 0% to 16.7%. Among these ASCs, 7.4% of ASCs had a rate of 0%; however, the top 10% of ASCs with 30 or more cases had rates exceeding 10.8% ([Figure 2](#)). The results show important variation in performance across ASC facilities. While many achieve very low rates, there is a wide range of outcome rates, suggesting room for improvement.

Hospital visits after urology ASC procedures were for a diverse array of reasons. Potentially preventable causes, such as urinary retention, urinary tract infection, pain, nausea, vomiting, and other surgery-related complications, were common diagnoses associated with unplanned hospital visits across the AHRQ clinical categories included in the measure cohort ([Table 3](#)).

4.2 Patient-Level Risk-Adjustment Model

4.2.1 Candidate and Final Model Variables

Candidate variables are presented in [Appendix E](#). Final variable selection, as described in [Section 3.5.3](#) above, is pending.

4.3 Additional Testing to be Performed

To finalize the urology measure, additional model development and testing will be performed.

Final variable selection

- We will revise the candidate variable list if needed based on public comment, then select final risk model variables as outlined in [Section 3.5.3](#).

Model performance and validation:

- To assess performance of the patient-level risk-adjustment model, the area under the receiver operating characteristic (ROC) curve as measured by the c-statistic will be calculated. To test model discrimination and model, we will calculate observed hospital visit rates in the lowest and highest deciles of patient risk and compare them to predicted hospital visit probabilities derived from the model.
- Several analyses to validate the patient-level risk-adjustment model will be performed. First, we will compare model performance in the 2013 Development and Validation Samples. The c-statistic, model information criteria (Akaike Information Criteria [AIC], Bayesian Information Criteria [BIC]), and model discrimination [predictive ability] will be compared.²⁴ Second, we will examine the stability of the risk variable frequencies and regression coefficients across the development and validation datasets. Third, we will calculate over-fitting indices in the Validation Sample. Over-fitting refers to the phenomenon in which a model describes the relationship between predictive variables and outcome well in the development dataset but fails to provide valid predictions in new patients. Estimated calibration values of γ_0 far from 0 and estimated values of γ_1 far from one provide evidence of over-fitting.

Facility-level measure scores and variation:

- ASCs' measure scores will be estimated by fitting the hierarchical logistic regression model to the combined 2012-2013 HCUP data for Florida and New York. We will calculate the RSHVR for each ASC by computing the ratio of the number of predicted unplanned hospital visits to the number of expected unplanned hospital visits and then multiplying the ratio by the overall national outcome rate. Then, we will evaluate variation in the risk-adjusted measure score among ASCs using the 2012-2013 HCUP data for Florida and New York.

Facility-level measure score reliability testing:

- Reliability of the ASC-level measure score will be tested by calculating the intra-class correlation coefficient (ICC) of the measure score. To calculate the ICC, multiple years of HCUP data for ASCs with more than urology surgeries will be combined and then randomly split into two samples within each facility. The ICC evaluates the agreement between the RSHVRs calculated in the two randomly selected samples.²⁵

Facility-level measure score disparities testing:

- The potential impact of race and socioeconomic status (SES) will be evaluated to consider the implications for measure reporting using two methods.
 - First, at the patient level, we will assess whether adjustment for Medicaid dual-eligibility status (as a marker of low SES) and race affects ASC measure scores by comparing the ASC-specific measure score with and without adjustment for SES and race.
 - Second, at an ASC level, we will assess whether ASCs with a high proportion of dual-eligible patients (a marker of socioeconomic burden) or of African-American patients perform as well on the measure as ASCs with a lower proportion of dual-eligible or African-American patients. To perform this analysis, we will categorize ASCs into quartiles based on the proportion of Medicaid dual-eligible patients and the proportion of African-American patients and then examine the distribution of measure scores across quartiles.

5. Summary and Discussion

Outpatient urology surgery is commonly performed on Medicare beneficiaries. Using a national Medicare FFS 20% sample, it is estimated that approximately 63,255 outpatient urology surgeries were performed in 2013 at ASCs using the cohort definition for the measure under consideration. Our analysis suggests that 6.2% of urology procedures at ASCs among Medicare FFS patients aged 65 years and older are followed by unplanned hospital visits within 7 days. Hospital visits often occur due to potentially preventable adverse events, such as urinary retention, bleeding, postoperative pain, and nausea and vomiting. Our results also showed significant variation in unplanned hospital visits among ASCs after adjusting for case mix, which suggests variation in quality of care.

Because many ASCs have small patient volumes, the use of outcome measures to assess quality of care is challenging. ASCs with few cases in a given year provide unreliable information about quality for statistical estimation purposes. It should be noted that the measure testing presented in this report is based upon a 20% sample of Medicare FFS claims, whereas for public reporting, CMS will use complete administrative claims data files and may use more than one year of data to ensure reliable estimates.

Hospital visits following outpatient surgery are unexpected by patients, currently largely invisible to providers, and costly to the healthcare system. The measure as specified has the potential to illuminate these quality differences, inform patient choice, drive quality improvement, and enhance care coordination, with the ultimate goal of reducing unplanned hospital visits following outpatient urology procedures.

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7. Tables

Table 1. Top 20 procedures in the urology cohort (data source: Medicare 20% FFS Sample, 2013)

CPT®	CPT® code short description	Number of procedures	% of all surgeries
50590	fragmenting of kidney stone	1,655	13.1%
52281	cystoscopy and treatment	1,436	11.4%
52332	cystoscopy and treatment	892	7.1%
52310	cystoscopy and treatment	869	6.9%
52234	cystoscopy and treatment	793	6.3%
52224	cystoscopy and treatment	705	5.6%
52353	cystouretero w/lithotripsy	694	5.5%
52235	cystoscopy and treatment	634	5.0%
52601	prostatectomy (turp)	484	3.8%
52648	laser surgery of prostate	480	3.8%
52214	cystoscopy and treatment	350	2.8%
54161	circum 28 days or older	321	2.5%
52276	cystoscopy and treatment	306	2.4%
52240	cystoscopy and treatment	277	2.2%
55875	transperi needle place pros	259	2.1%
57288	repair bladder defect	248	2.0%
52260	cystoscopy and treatment	167	1.3%
55040	removal of hydrocele	162	1.3%
52287	cystoscopy chemodenervation	157	1.2%
52352	cystouretero w/stone remove	154	1.2%

Table 2. Number and frequency of emergency department visits, observation stays, and unplanned inpatient admissions (data source: Medicare 20% FFS Sample, 2013)

Number of urology procedures	Number with unplanned hospital visits outcome	Overall 7-day unplanned hospital visit rate
12,651	780	6.2%
Outcome type	#	%
Emergency department visit or observation stay visit	565	4.5%
Unplanned inpatient admission	215	1.7%

Table 3. Top hospital visit diagnoses for any hospital visit within 7 days of urology procedures (data source: Medicare 20% FFS Sample, 2013)

AHRQ clinical category	Number of unplanned hospital visits	Rate of unplanned hospital visits (%)	Top 10 primary diagnoses at hospital	ICD-9 diagnosis description	Frequency of diagnosis
100 -Endoscopy and endoscopic biopsy of the urinary tract	328	5.5%	78820	Retention urine NOS	3
			99631	Malfunc urethral cath	2
			78659	Chest pain NEC	1
			5849	Acute kidney failure NOS	1
			59960	Urinary obstruction NOS	1
			78829	Oth spcf retention urine	1
			7802	Syncope and collapse	1
			99676	Comp-genitourin dev/grft	1
			43491	Crbl art ocl NOS w infrc	1
			5589	Noninf gastroenterit NEC	1
101 - Transurethral excision, drainage, or removal urinary obstruction	4,091	6.1%	78820	Retention urine NOS	34
			5990	Urin tract infection NOS	19
			99811	Hemorrhage complic proc	13
			59970	Hematuria NOS	8
			5921	Calculus of ureter	8
			9975	Surg compl-urinary tract	7
			5920	Calculus of kidney	6
			0389	Septicemia NOS	6
			78909	Abdmnal pain oth spcf st	6
			99631	Malfunc urethral cath	6
102 - Ureteral catheterization	892	7.5%	5921	Calculus of ureter	8
			5990	Urin tract infection NOS	7
			78820	Retention urine NOS	4

AHRQ clinical category	Number of unplanned hospital visits	Rate of unplanned hospital visits (%)	Top 10 primary diagnoses at hospital	ICD-9 diagnosis description	Frequency of diagnosis
			591	Hydronephrosis	4
			0389	Septicemia NOS	4
			99665	React-oth genitourin dev	3
			9975	Surg compl-urinary tract	3
			7880	Renal colic	2
			78702	Nausea alone	2
			5849	Acute kidney failure NOS	2
106 - Genitourinary incontinence procedures	334	2.4%	7295	Pain in limb	1
			56400	Constipation NOS	1
			5184	Acute lung edema NOS	1
			8830	Open wound of finger	1
			78839	Oth urinry incontinence	1
			5990	Urin tract infection NOS	1
			7804	Dizziness and giddiness	1
			78820	Retention urine NOS	1
107 - Extracorporeal lithotripsy, urinary	2,349	6.7%	5921	Calculus of ureter	23
			5920	Calculus of kidney	16
			78820	Retention urine NOS	11
			5990	Urin tract infection NOS	8
			7880	Renal colic	7
			99859	Other postop infection	6
			99812	Hematoma complic proc	5
			59970	Hematuria NOS	5
			78909	Abdmnal pain oth spcf st	4
			99676	Comp-genitourin dev/grft	3

AHRQ clinical category	Number of unplanned hospital visits	Rate of unplanned hospital visits (%)	Top 10 primary diagnoses at hospital	ICD-9 diagnosis description	Frequency of diagnosis
109 - Procedures on the urethra	1,743	3.8%	78820	Retention urine NOS	15
			59970	Hematuria NOS	3
			5990	Urin tract infection NOS	3
			59971	Gross hematuria	2
			99811	Hemorrhage complic proc	2
			7881	Dysuria	2
			99631	Malfunc urethral cath	2
			78079	Malaise and fatigue NEC	1
			78720	Dysphagia NOS	1
			5609	Intestinal obstruct NOS	1
111 - Other non-OR therapeutic procedures of urinary tract	12	16.7%	5990	Urin tract infection NOS	1
			5951	Chr interstit cystitis	1
112 - Other OR therapeutic procedures of urinary tract	442	6.6%	78820	Retention urine NOS	5
			78650	Chest pain NOS	2
			42731	Atrial fibrillation	2
			8082	Fracture of pubis-closed	2
			42820	Systolic hrt failure NOS	1
			59970	Hematuria NOS	1
			V553	Atten to colostomy	1
			78791	Diarrhea	1
			5920	Calculus of kidney	1
			78900	Abdmnal pain unspcf site	1
113 - Transurethral resection of prostate (TURP)	579	14.0%	78820	Retention urine NOS	23
			59970	Hematuria NOS	12
			99811	Hemorrhage complic proc	8

AHRQ clinical category	Number of unplanned hospital visits	Rate of unplanned hospital visits (%)	Top 10 primary diagnoses at hospital	ICD-9 diagnosis description	Frequency of diagnosis
			5990	Urin tract infection NOS	4
			59971	Gross hematuria	3
			9975	Surg compl-urinary tract	3
			V536	Fitting urinary devices	3
			59960	Urinary obstruction NOS	2
			78829	Oth spcf retention urine	2
			5960	Bladder neck obstruction	1
114 - Open prostatectomy	35	8.6%	78701	Nausea with vomiting	1
			5990	Urin tract infection NOS	1
			78830	Urinary incontinence NOS	1
115 - Circumcision	322	2.8%	8505	Concussion w coma NOS	1
			5589	Noninf gastroenterit NEC	1
			49121	Obs chr bronc w(ac) exac	1
			43491	Crbl art ocl NOS w infrc	1
			99673	Comp-ren dialys dev/grft	1
			8082	Fracture of pubis-closed	1
			51851	Acute respirtatory failue following trauma/surgery	1
			72887	Muscle weakness-general	1
			78659	Chest pain NEC	1
116 - Diagnostic procedures, male genital	81	1.2%	99676	Comp-genitourin dev/grft	1
117 - Other non-OR therapeutic procedures, male genital	298	5.0%	78820	Retention urine NOS	7
			56211	Dvrtcli colon w/o hmrhg	1
			43491	Crbl art ocl NOS w infrc	1
			42731	Atrial fibrillation	1
			78900	Abdmnal pain unspcf site	1

AHRQ clinical category	Number of unplanned hospital visits	Rate of unplanned hospital visits (%)	Top 10 primary diagnoses at hospital	ICD-9 diagnosis description	Frequency of diagnosis
			V536	Fitting urinary devices	1
			59971	Gross hematuria	1
			496	Chr airway obstruct NEC	1
			7881	Dysuria	1
118 - Other OR therapeutic procedures, male genital	1,145	6.5%	78820	Retention urine NOS	11
			99811	Hemorrhage complic proc	6
			5990	Urin tract infection NOS	6
			99676	Comp-genitourin dev/grft	3
			59970	Hematuria NOS	3
			99631	Malfunc urethral cath	3
			V536	Fitting urinary devices	2
			486	Pneumonia, organism NOS	2
			7802	Syncope and collapse	2
			7820	Skin sensation disturb	2

8. Figures

Figure 1. Timing of hospital visits within 30 days of urology ASC procedures (Event Rate per day post discharge for 0- through 30-day period) (data source: Medicare 20% FFS Sample, 2013)

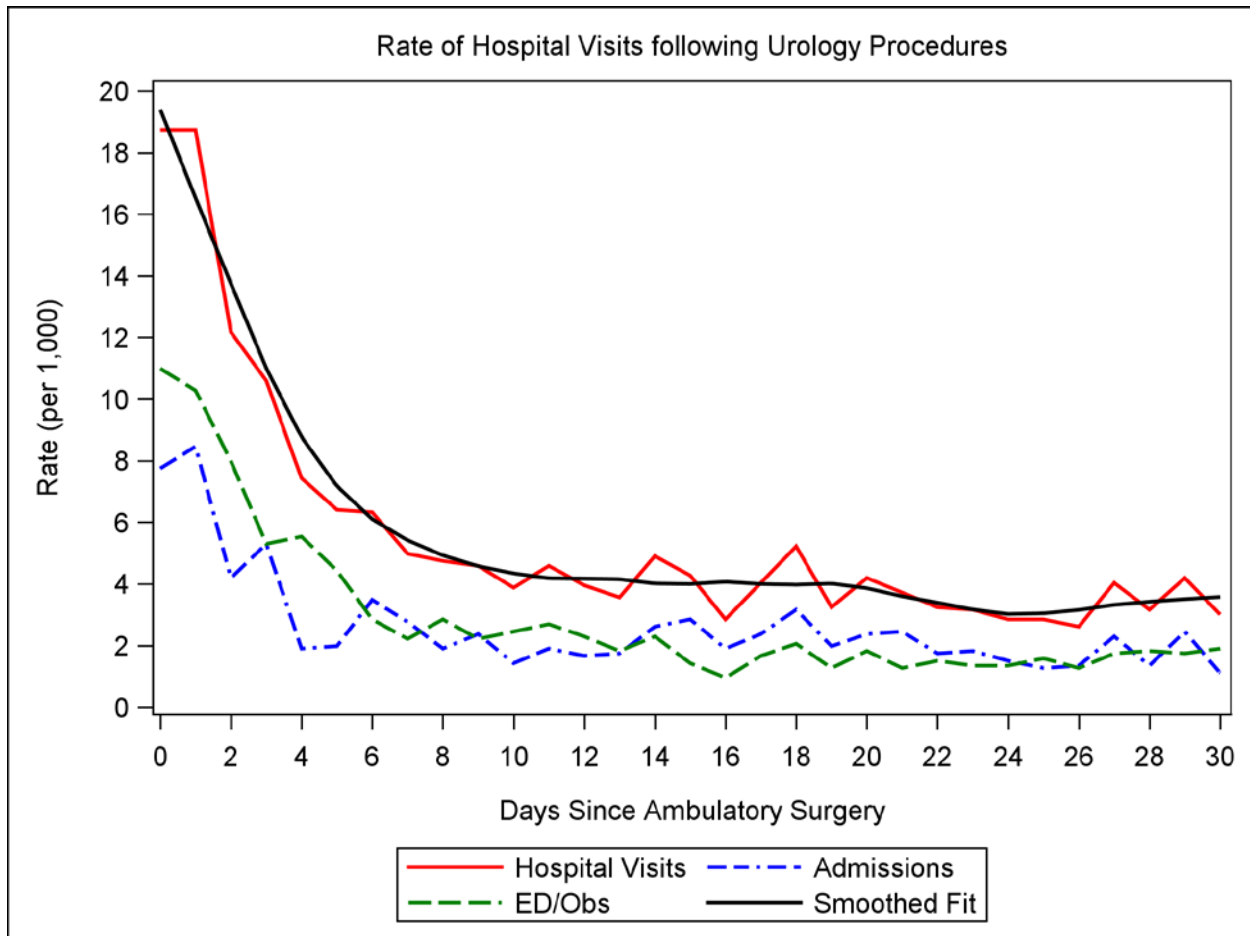
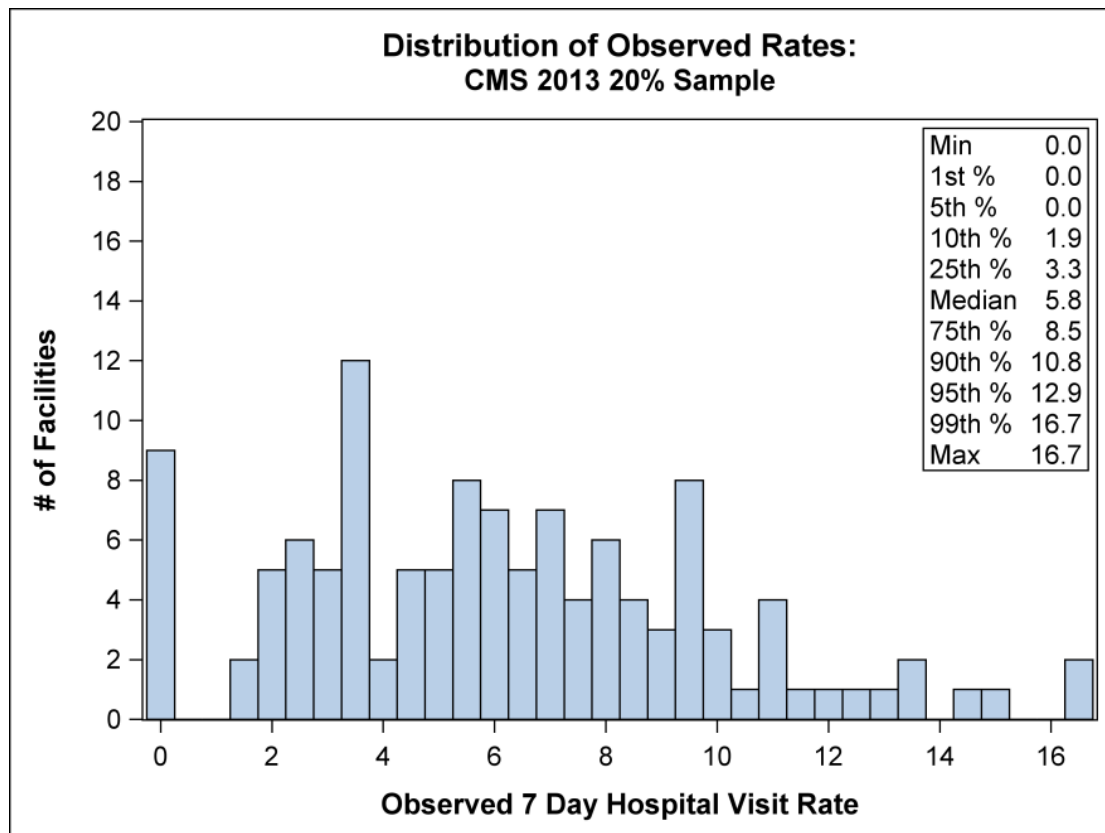


Figure 2. Distribution of unadjusted hospital visit rates following urology ASC procedures
(data source: Medicare 20% FFS Sample, facilities with ≥ 30 cases, 2013)



9. Appendices

Appendix A: List of Included Current Procedural Terminology (CPT®) Codes Defining Urology Procedures

Table A1. List of included Current Procedural Terminology (CPT®) codes defining urology procedures

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
100	Endoscopy and endoscopic biopsy of the urinary tract	52276	cystoscopy and treatment	000
		52354	cystouretero w/biopsy	000
101	Transurethral excision, drainage, or removal urinary obstruction	52500	Revision of bladder neck	090
		52640	Relieve bladder contracture	090
102	Ureteral catheterization	50948	Laparo new ureter/bladder	090
		50947	Laparo new ureter/bladder	090
106	Genitourinary incontinence procedures	51992	Laparo sling operation	090
		57220	Revision of urethra	090
		57288	Repair bladder defect	090
		53440	Male sling procedure	090
		53447	Remove/replace ur sphincter	090
		53449	Repair uro sphincter	090
		53445	Insert uro/ves nck sphincter	090
		53442	Remove/revise male sling	090
		57287	Revise/remove sling repair	090
107	Extracorporeal lithotripsy, urinary	50590	Fragmenting of kidney stone	090
109	Procedures on the urethra	53250	Removal of urethra gland	090
		53405	Revise urethra stage 2	090
		53275	Repair of urethra defect	010
		53270	Removal of urethra gland	010
		53446	Remove uro sphincter	090

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		53400	Revise urethra stage 1	090
		53260	Treatment of urethra lesion	010
109	Procedures on the urethra	54308	Reconstruction of urethra	090
		52400	Cystouretero w/congen repr	090
		53265	Treatment of urethra lesion	010
		53410	Reconstruction of urethra	090
		53460	Revision of urethra	090
		53520	Repair of urethra defect	090
		53444	Insert tandem cuff	090
		53510	Repair of urethra injury	090
		53000	Incision of urethra	010
		53230	Removal of urethra lesion	090
		53215	Removal of urethra	090
		53860	Transurethral rf treatment	090
		53502	Repair of urethra injury	090
		53220	Treatment of urethra lesion	090
		53010	Incision of urethra	090
		53210	Removal of urethra	090
		54312	Reconstruction of urethra	090
		53505	Repair of urethra injury	090
		53515	Repair of urethra injury	090
		54318	Reconstruction of urethra	090
		54316	Reconstruction of urethra	090
		53430	Reconstruction of urethra	090
		53420	Reconstruct urethra stage 1	090
		53425	Reconstruct urethra stage 2	090
		53040	Drainage of urethra abscess	090
		53450	Revision of urethra	090
		53240	Surgery for urethra pouch	090

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		53431	Reconstruct urethra/bladder	090
		53235	Removal of urethra lesion	090
109	Procedures on the urethra	53060	Drainage of urethra abscess	010
111	Other non-OR therapeutic procedures of urinary tract	50688	Change of ureter tube/stent	010
		50592	Perc rf ablate renal tumor	010
112	Other OR therapeutic procedures of urinary tract	50593	Perc cryo ablate renal tum	010
		57320	Repair bladder-vagina lesion	090
		51535	Repair of ureter lesion	090
		51020	Incise & treat bladder	090
		51040	Incise & drain bladder	090
		51080	Drainage of bladder abscess	090
		51520	Removal of bladder lesion	090
		50727	Revise ureter	090
		51030	Incise & treat bladder	090
		51880	Repair of bladder opening	090
		53080	Drainage of urinary leakage	090
		50562	Renal scope w/tumor resect	090
		51045	Incise bladder/drain ureter	090
		53085	Drainage of urinary leakage	090
		51065	Remove ureter calculus	090
		51050	Removal of bladder stone	090
		51500	Removal of bladder cyst	090
113	Transurethral resection of prostate (TURP)	52601	Prostatectomy (TURP)	090
		53852	Prostatic rf thermotx	090
		52630	Remove prostate regrowth	090
		53850	Prostatic microwave thermotx	090
114	Open prostatectomy	55873	Cryoablate prostate	090
115	Circumcision	54161	Circum 28 days or older	010
		54160	Circumcision neonate	010

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period) 010 = minor procedure (10-day post-operative period) 000 = minor procedure (0-day post-operative period)</i>
		54163	Repair of circumcision	010
116	Diagnostic procedures, male genital	55110	Explore scrotum	090
		54865	Explore epididymis	090
		54105	Biopsy of penis	010
		54505	Biopsy of testis	010
		55705	Biopsy of prostate	010
		55706	Prostate saturation sampling	010
117	Other non-OR therapeutic procedures, male genital	55250	Removal of sperm duct(s)	090
		55450	Ligation of sperm duct	010
		54057	Laser surg penis lesion(s)	010
		55200	Incision of sperm duct	090
		54000	Slitting of prepuce	010
		54055	Destruction penis lesion(s)	010
		54056	Cryosurgery penis lesion(s)	010
		55120	Removal of scrotum lesion	090
		54200	Treatment of penis lesion	010
		54001	Slitting of prepuce	010
		55875	Transperi needle place pros	090
		55100	Drainage of scrotum abscess	010
		54050	Destruction penis lesion(s)	010
118	Other OR therapeutic procedures, male genital	55040	Removal of hydrocele	090
		55180	Revision of scrotum	090
		52647	Laser surgery of prostate	090
		54348	Secondary urethral surgery	090
		55550	Laparo ligate spermatic vein	090
		54115	Treatment of penis lesion	090
		55520	Removal of sperm cord lesion	090
		54860	Removal of epididymis	090

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		54700	Drainage of scrotum	010
		54861	Removal of epididymis	090
118	Other OR therapeutic procedures, male genital	54692	Laparoscopy orchiopexy	090
		54324	Reconstruction of urethra	090
		55725	Drainage of prostate abscess	090
		55600	Incise sperm duct pouch	090
		54120	Partial removal of penis	090
		54680	Relocation of testis(es)	090
		54111	Treat penis lesion graft	090
		54420	Revision of penis	090
		54408	Repair multi-comp penis pros	090
		54060	Excision of penis lesion(s)	010
		54840	Remove epididymis lesion	090
		55041	Removal of hydroceles	090
		54322	Reconstruction of urethra	090
		55680	Remove sperm pouch lesion	090
		54410	Remove/replace penis prosth	090
		54326	Reconstruction of urethra	090
		54512	Excise lesion testis	090
		52649	Prostate laser enucleation	090
		54110	Treatment of penis lesion	090
		54901	Fusion of spermatic ducts	090
		54112	Treat penis lesion graft	090
		54690	Laparoscopy orchiectomy	090
		54162	Lysis penil circumic lesion	010
		54530	Removal of testis	090
		54640	Suspension of testis	090
		54406	Remove muti-comp penis pros	090
		54015	Drain penis lesion	010

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		54385	Repair penis	090
		54205	Treatment of penis lesion	090
118	Other OR therapeutic procedures, male genital	54304	Revision of penis	090
		55500	Removal of hydrocele	090
		54600	Reduce testis torsion	090
		55400	Repair of sperm duct	090
		54830	Remove epididymis lesion	090
		55530	Revise spermatic cord veins	090
		54380	Repair penis	090
		54400	Insert semi-rigid prosthesis	090
		55535	Revise spermatic cord veins	090
		55720	Drainage of prostate abscess	090
		54405	Insert multi-comp penis pros	090
		52450	Incision of prostate	090
		54550	Exploration for testis	090
		54352	Reconstruct urethra/penis	090
		54344	Secondary urethral surgery	090
		54401	Insert self-contd prosthesis	090
		54415	Remove self-contd penis pros	090
		55860	Surgical exposure prostate	090
		54416	Remv/repl penis contain pros	090
		54620	Suspension of testis	010
		55060	Repair of hydrocele	090
		54065	Destruction penis lesion(s)	010
		54560	Exploration for testis	090
		54435	Revision of penis	090
		54360	Penis plastic surgery	090
		54164	Frenulotomy of penis	010
		54340	Secondary urethral surgery	090

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		52700	Drainage of prostate abscess	090
		54522	Orchiectomy partial	090
118	Other OR therapeutic procedures, male genital	55150	Removal of scrotum	090
		52648	Laser surgery of prostate	090
		54300	Revision of penis	090
		54660	Revision of testis	090
		55175	Revision of scrotum	090
		54328	Revise penis/urethra	090
		54670	Repair testis injury	090
		54900	Fusion of spermatic ducts	090
		54520	Removal of testis	090
Therapeutic cystoscopy procedures				
100	Endoscopy and endoscopic biopsy of the urinary tract	52276	Cystoscopy and treatment	000
		52354	Cystouretero w/biopsy	000
101	Transurethral excision, drainage, or removal urinary obstruction	52345	Cysto/uretero w/up stricture	000
		52310	Cystoscopy and treatment	000
		52235	Cystoscopy and treatment	000
		52346	Cystouretero w/renal strict	000
		52300	Cystoscopy and treatment	000
		52341	Cysto w/ureter stricture tx	000
		52343	Cysto w/renal stricture tx	000
		52344	Cysto/uretero stricture tx	000
101	Transurethral excision, drainage, or removal urinary obstruction	52315	Cystoscopy and treatment	000
		52330	Cystoscopy and treatment	000
		52240	Cystoscopy and treatment	000
		52320	Cystoscopy and treatment	000
		52325	Cystoscopy stone removal	000
		52305	Cystoscopy and treatment	000
		52352	Cystouretero w/stone remove	000

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
		52301	Cystoscopy and treatment	000
		52214	Cystoscopy and treatment	000
101	Transurethral excision, drainage, or removal urinary obstruction	52224	Cystoscopy and treatment	000
		52234	Cystoscopy and treatment	000
		52342	Cysto w/up stricture tx	000
102	Ureteral catheterization	52332	Cystoscopy and treatment	000
103	Nephrotomy and nephrostomy	52334	Create passage to kidney	000
107	Extracorporeal lithotripsy, urinary	52353	Cystouretero w/lithotripsy	000
109	Procedures on the urethra	52282	Cystoscopy implant stent	000
		52281	Cystoscopy and treatment	000
		52270	Cystoscopy & revise urethra	000
		52287	Cystoscopy chemodenervation	000
		52285	Cystoscopy and treatment	000
		52283	Cystoscopy and treatment	000
		52275	Cystoscopy & revise urethra	000
		52277	Cystoscopy and treatment	000
		52290	Cystoscopy and treatment	000
		52400	Cystouretero w/congen repr	090
111	Other non-OR therapeutic procedures of urinary tract	52265	Cystoscopy and treatment	000
112	Other OR therapeutic procedures of urinary tract	52260	Cystoscopy and treatment	000
		52317	Remove bladder stone	000
		52318	Remove bladder stone	000
		52327	Cystoscopy inject material	000
		52355	Cystouretero w/excise tumor	000
		52250	Cystoscopy and radiotracer	000

AHRQ clinical category	AHRQ clinical category description	Current Procedural Terminology (CPT®) code	Short description of CPT® code	Global Surgical Package Status <i>090 = major procedure (90-day post-operative period)</i> <i>010 = minor procedure (10-day post-operative period)</i> <i>000 = minor procedure (0-day post-operative period)</i>
118	Other OR therapeutic procedures, male genital	52402	Cystourethro cut ejacul duct	000

Appendix B: Emergency Department Visits and Observation Stays Definition

Table B1. HCPCS Codes or Revenue Center Codes that Define ED Visits and Observation Stays

Billing (HCPCS) or Revenue Code*	Description
0450	Emergency Room
0451	Emergency Room: EM/EMTALA
0452	Emergency Room: ER/Beyond EMTALA
0456	Emergency Room: Urgent care
0459	Emergency Room: Other emergency room
0981	Professional fees (096x) Emergency room
G0378†	Hospital observation service, per hour

*Identified in Medicare Part B Outpatient hospital claims.

†Denotes HCPCS Codes, all other codes are revenue center codes.

Appendix C: Planned Admission Algorithm

C1. Planned Admission Algorithm Overview

The planned admission algorithm is adapted from the CMS Planned Readmission Algorithm Version 4.0. The algorithm is a set of criteria for classifying hospital inpatient admissions occurring after a urology ASC procedure as planned or unplanned using Medicare claims. CMS seeks to count only unplanned admissions in the measure outcome because variation in planned admissions does not reflect quality differences. CORE developed the Planned Readmission Algorithm under contract to CMS based on a hospital-wide (not condition-specific) cohort of patients.²⁶

The algorithm classifies admissions as planned or unplanned using a flow chart ([Figure PA1](#)) and four tables of procedures and conditions ([Table PA1–Table PA4](#)). [Table PA1](#) identifies procedures that, if present in an admission, classify the admission as planned. [Table PA2](#) identifies principal discharge diagnoses that classify admissions as planned. [Table PA3](#) identifies procedures that, if present, classify an admission as planned as long as that admission does not have an acute (unplanned) principal discharge diagnosis. [Table PA4](#) lists the acute (unplanned) principal discharge diagnoses that disqualify admissions with a potentially planned procedure in [Table PA3](#) as planned.

The algorithm uses the Agency for Healthcare Research and Quality's (AHRQ's) Clinical Classifications Software (CCS) (<http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp>) codes to group thousands of individual procedure and diagnosis ICD-9-CM codes into clinically

coherent, mutually exclusive procedure CCS categories and mutually exclusive diagnosis CCS categories, respectively.

C2. Detailed Description of Planned Readmission Algorithm Version 4.0 – Urology ASC Measure

The planned admission algorithm uses the flow chart ([Figure PA1](#)) and [Table PA1–Table PA4](#)). [Table PA4](#), adapted for the urology ASC procedure population, to identify specific procedure categories and discharge diagnosis categories to classify admissions as planned or unplanned. As illustrated in the flow chart ([Figure PA1](#)), admissions that include certain procedures ([Table PA1](#)) or are for certain diagnoses [Table PA2](#) are always considered planned. If the admission does not include a procedure or diagnosis in [Table PA1](#) or [Table PA2](#) that is always considered planned, the algorithm checks whether the admission has at least 1 procedure that is considered potentially planned ([Table PA3](#)). If the admission has no procedures from [Table PA3](#), the admission is considered unplanned. [Table PA3](#) includes AHRQ procedure CCS categories and individual ICD-9-CM procedure codes. Examples of potentially planned procedures are total hip replacement (Procedure CCS 153) and hernia repair (Procedure CCS 85).

If the admission has at least 1 potentially planned procedure from [Table PA3](#), the algorithm checks for a principal discharge diagnosis that is considered acute ([Table PA4](#)). If the admission has an acute principal discharge diagnosis from [Table PA4](#), the admission is considered unplanned. Otherwise, it is considered planned. The list of acute principal discharge diagnoses includes diagnosis groups from AHRQ condition categories and groupings of individual ICD-9-CM diagnosis codes that represent cardiac diagnoses that would not be associated with a planned admission. Examples of acute principal discharge diagnoses that identify admissions with potentially planned procedures as unplanned are pneumonia (Diagnosis CCS 122) and cardiac arrest (Diagnosis CCS 107).

Figure PA1. Planned admission algorithm flowchart

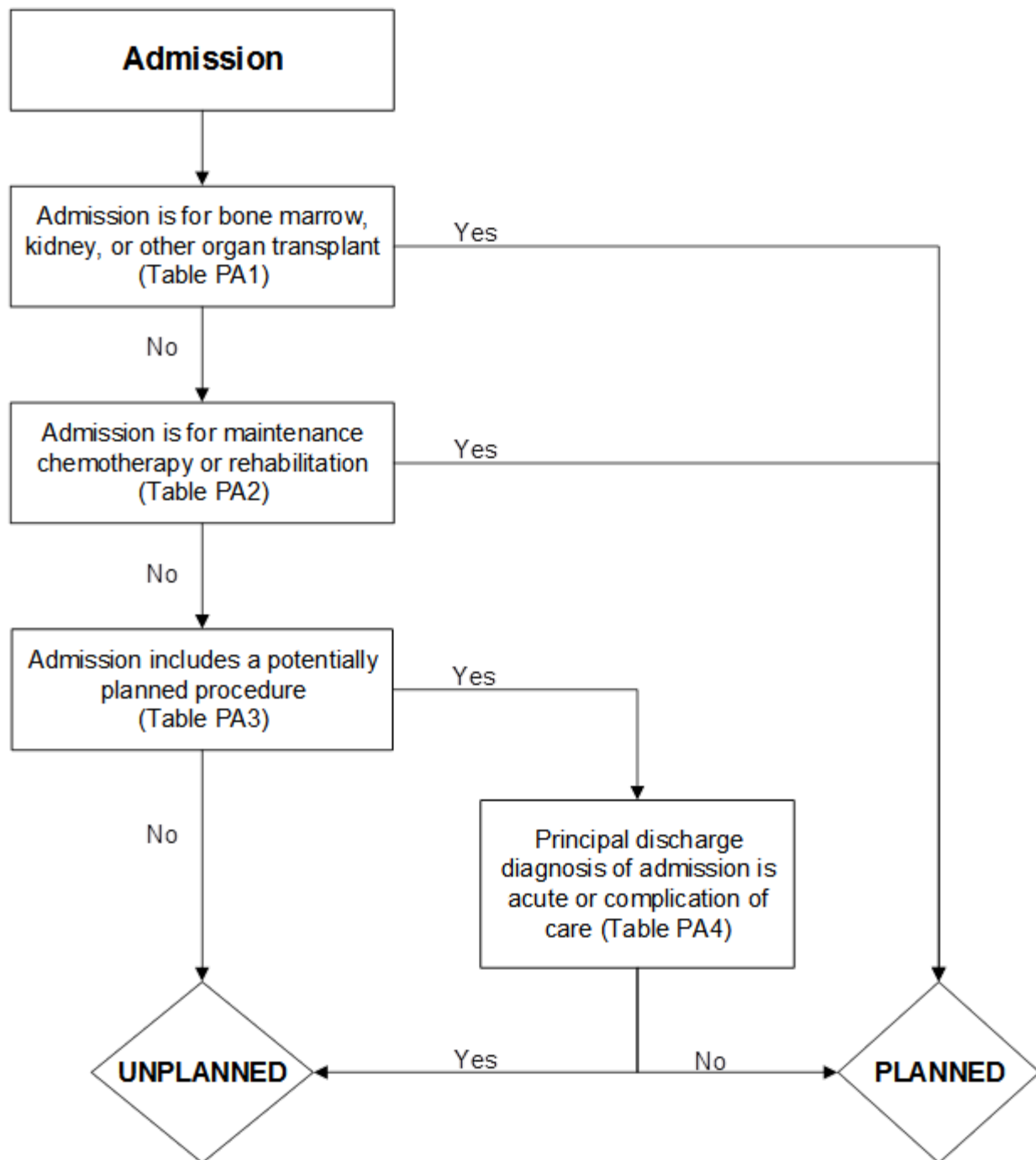


Table PA1. Procedure categories that are always planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0)

Procedure CCS (ICD-9 & ICD-10)	Description
64	Bone marrow transplant
105	Kidney transplant
176	Other organ transplantation (in ICD-10 version, description adds: “[other than bone marrow corneal or kidney]”)

Table PA2. Diagnosis categories that are always planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0)

Diagnosis CCS (ICD-9 & ICD-10)	Description
45	Maintenance chemotherapy
254	Rehabilitation

Table PA3. Procedure categories that are potentially planned (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0)

Code	Description
Procedure CCS (ICD-9 & ICD-10)	
1	Incision and excision of central nervous system (CNS)
3	Laminectomy; excision intervertebral disc (in ICD-10 version, description is: “Excision, destruction or resection of intervertebral disc”)
5	Insertion of catheter or spinal stimulator and injection into spinal canal
9	Other OR therapeutic nervous system procedures
10	Thyroidectomy; partial or complete
12	Other therapeutic endocrine procedures (in ICD-10 version, description is: “Therapeutic endocrine procedures”)
33	Other OR therapeutic procedures on nose; mouth and pharynx
36	Lobectomy or pneumonectomy
38	Other diagnostic procedures on lung and bronchus
40	Other diagnostic procedures of respiratory tract and mediastinum
43	Heart valve procedures
44	Coronary artery bypass graft (CABG)
45	Percutaneous transluminal coronary angioplasty (PTCA) (in ICD-10 version, description adds: “with or without stent”)
49	Other OR heart procedures
51	Endarterectomy; vessel of head and neck
52	Aortic resection; replacement or anastomosis
53	Varicose vein stripping; lower limb
55	Peripheral vascular bypass

Code	Description
56	Other vascular bypass and shunt; not heart
59	Other OR procedures on vessels of head and neck
66	Procedures on spleen
67	Other therapeutic procedures; hemic and lymphatic system
74	Gastrectomy; partial and total
78	Colorectal resection
79	Local excision of large intestine lesion (not endoscopic)
84	Cholecystectomy and common duct exploration
85	Inguinal and femoral hernia repair
86	Other hernia repair
99	Other OR gastrointestinal therapeutic procedures
104	Nephrectomy; partial or complete
106	Genitourinary incontinence procedures
107	Extracorporeal lithotripsy; urinary
109	Procedures on the urethra
112	Other OR therapeutic procedures of urinary tract
113	Transurethral resection of prostate (TURP)
114	Open prostatectomy
119	Oophorectomy; unilateral and bilateral
120	Other operations on ovary
124	Hysterectomy; abdominal and vaginal
129	Repair of cystocele and rectocele; obliteration of vaginal vault
132	Other OR therapeutic procedures; female organs
142	Partial excision bone
152	Arthroplasty knee
153	Hip replacement; total and partial
154	Arthroplasty other than hip or knee
158	Spinal fusion
159	Other diagnostic procedures on musculoskeletal system
166	Lumpectomy; quadrantectomy of breast
167	Mastectomy
170 (only in ICD-9 version of algorithm)	Excision of skin lesion
172	Skin graft
175 (only in ICD-10 version of algorithm)	Other OR therapeutic procedures on skin subcutaneous tissue fascia and breast

Code	Description
ICD-9-PCS Code	
30.1	Hemilaryngectomy
30.29	Other partial laryngectomy
30.3	Complete laryngectomy
30.4	Radical laryngectomy
31.74	Revision of tracheostomy
34.6	Scarification of pleura
38.18	Endarterectomy, lower limb arteries
55.03	Percutaneous nephrostomy without fragmentation
55.04	Percutaneous nephrostomy with fragmentation
94.26	Subconvulsive electroshock therapy
94.27	Other electroshock therapy
ICD-10-PCS Code	
0CBS0ZZ	Excision of Larynx, Open Approach
0CBS3ZZ	Excision of Larynx, Percutaneous Approach
0CBS4ZZ	Excision of Larynx, Percutaneous Endoscopic Approach
0CBS7ZZ	Excision of Larynx, Via Natural or Artificial Opening
0CBS8ZZ	Excision of Larynx, Via Natural or Artificial Opening Endoscopic
0CBS0ZZ	Excision of Larynx, Open Approach
0CBS3ZZ	Excision of Larynx, Percutaneous Approach
0CBS4ZZ	Excision of Larynx, Percutaneous Endoscopic Approach
0CBS7ZZ	Excision of Larynx, Via Natural or Artificial Opening
0CBS8ZZ	Excision of Larynx, Via Natural or Artificial Opening Endoscopic
0B110F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Open Approach
0B110Z4	Bypass Trachea to Cutaneous, Open Approach
0B113F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Approach
0B113Z4	Bypass Trachea to Cutaneous, Percutaneous Approach
0B114F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Endoscopic Approach
0B114Z4	Bypass Trachea to Cutaneous, Percutaneous Endoscopic Approach
0CTS0ZZ	Resection of Larynx, Open Approach
0CTS4ZZ	Resection of Larynx, Percutaneous Endoscopic Approach
0CTS7ZZ	Resection of Larynx, Via Natural or Artificial Opening
0CTS8ZZ	Resection of Larynx, Via Natural or Artificial Opening Endoscopic
0B110F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Open Approach
0B110Z4	Bypass Trachea to Cutaneous, Open Approach
0B113F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Approach

Code	Description
0B113Z4	Bypass Trachea to Cutaneous, Percutaneous Approach
0B114F4	Bypass Trachea to Cutaneous with Tracheostomy Device, Percutaneous Endoscopic Approach
0B114Z4	Bypass Trachea to Cutaneous, Percutaneous Endoscopic Approach
0CTS0ZZ	Resection of Larynx, Open Approach
0CTS4ZZ	Resection of Larynx, Percutaneous Endoscopic Approach
0CTS7ZZ	Resection of Larynx, Via Natural or Artificial Opening
0CTS8ZZ	Resection of Larynx, Via Natural or Artificial Opening Endoscopic
0GTG0ZZ	Resection of Left Thyroid Gland Lobe, Open Approach
0GTG4ZZ	Resection of Left Thyroid Gland Lobe, Percutaneous Endoscopic Approach
0GTH0ZZ	Resection of Right Thyroid Gland Lobe, Open Approach
0GTH4ZZ	Resection of Right Thyroid Gland Lobe, Percutaneous Endoscopic Approach
0GTK0ZZ	Resection of Thyroid Gland, Open Approach
0GTK4ZZ	Resection of Thyroid Gland, Percutaneous Endoscopic Approach
0WB60ZZ	Excision of Neck, Open Approach
0WB63ZZ	Excision of Neck, Percutaneous Approach
0WB64ZZ	Excision of Neck, Percutaneous Endoscopic Approach
0WB6XZZ	Excision of Neck, External Approach
0BW10FZ	Revision of Tracheostomy Device in Trachea, Open Approach
0BW13FZ	Revision of Tracheostomy Device in Trachea, Percutaneous Approach
0BW14FZ	Revision of Tracheostomy Device in Trachea, Percutaneous Endoscopic Approach
0WB6XZ2	Excision of Neck, Stoma, External Approach
0WQ6XZ2	Repair Neck, Stoma, External Approach
0B5N0ZZ	Destruction of Right Pleura, Open Approach
0B5N3ZZ	Destruction of Right Pleura, Percutaneous Approach
0B5N4ZZ	Destruction of Right Pleura, Percutaneous Endoscopic Approach
0B5P0ZZ	Destruction of Left Pleura, Open Approach
0B5P3ZZ	Destruction of Left Pleura, Percutaneous Approach
0B5P4ZZ	Destruction of Left Pleura, Percutaneous Endoscopic Approach
04CK0ZZ	Extirpation of Matter from Right Femoral Artery, Open Approach
04CK3ZZ	Extirpation of Matter from Right Femoral Artery, Percutaneous Approach
04CK4ZZ	Extirpation of Matter from Right Femoral Artery, Percutaneous Endoscopic Approach
04CL0ZZ	Extirpation of Matter from Left Femoral Artery, Open Approach
04CL3ZZ	Extirpation of Matter from Left Femoral Artery, Percutaneous Approach
04CL4ZZ	Extirpation of Matter from Left Femoral Artery, Percutaneous Endoscopic Approach
04CM0ZZ	Extirpation of Matter from Right Popliteal Artery, Open Approach
04CM3ZZ	Extirpation of Matter from Right Popliteal Artery, Percutaneous Approach

Code	Description
04CM4ZZ	Extirpation of Matter from Right Popliteal Artery, Percutaneous Endoscopic Approach
04CN0ZZ	Extirpation of Matter from Left Popliteal Artery, Open Approach
04CN3ZZ	Extirpation of Matter from Left Popliteal Artery, Percutaneous Approach
04CN4ZZ	Extirpation of Matter from Left Popliteal Artery, Percutaneous Endoscopic Approach
04CP0ZZ	Extirpation of Matter from Right Anterior Tibial Artery, Open Approach
04CP3ZZ	Extirpation of Matter from Right Anterior Tibial Artery, Percutaneous Approach
04CP4ZZ	Extirpation of Matter from Right Anterior Tibial Artery, Percutaneous Endoscopic Approach
04CQ0ZZ	Extirpation of Matter from Left Anterior Tibial Artery, Open Approach
04CQ3ZZ	Extirpation of Matter from Left Anterior Tibial Artery, Percutaneous Approach
04CQ4ZZ	Extirpation of Matter from Left Anterior Tibial Artery, Percutaneous Endoscopic Approach
04CR0ZZ	Extirpation of Matter from Right Posterior Tibial Artery, Open Approach
04CR3ZZ	Extirpation of Matter from Right Posterior Tibial Artery, Percutaneous Approach
04CR4ZZ	Extirpation of Matter from Right Posterior Tibial Artery, Percutaneous Endoscopic Approach
04CS0ZZ	Extirpation of Matter from Left Posterior Tibial Artery, Open Approach
04CS3ZZ	Extirpation of Matter from Left Posterior Tibial Artery, Percutaneous Approach
04CS4ZZ	Extirpation of Matter from Left Posterior Tibial Artery, Percutaneous Endoscopic Approach
04CT0ZZ	Extirpation of Matter from Right Peroneal Artery, Open Approach
04CT3ZZ	Extirpation of Matter from Right Peroneal Artery, Percutaneous Approach
04CT4ZZ	Extirpation of Matter from Right Peroneal Artery, Percutaneous Endoscopic Approach
04CU0ZZ	Extirpation of Matter from Left Peroneal Artery, Open Approach
04CU3ZZ	Extirpation of Matter from Left Peroneal Artery, Percutaneous Approach
04CU4ZZ	Extirpation of Matter from Left Peroneal Artery, Percutaneous Endoscopic Approach
04CV0ZZ	Extirpation of Matter from Right Foot Artery, Open Approach
04CV3ZZ	Extirpation of Matter from Right Foot Artery, Percutaneous Approach
04CV4ZZ	Extirpation of Matter from Right Foot Artery, Percutaneous Endoscopic Approach
04CW0ZZ	Extirpation of Matter from Left Foot Artery, Open Approach
04CW3ZZ	Extirpation of Matter from Left Foot Artery, Percutaneous Approach
04CW4ZZ	Extirpation of Matter from Left Foot Artery, Percutaneous Endoscopic Approach
04CY0ZZ	Extirpation of Matter from Lower Artery, Open Approach
04CY3ZZ	Extirpation of Matter from Lower Artery, Percutaneous Approach
04CY4ZZ	Extirpation of Matter from Lower Artery, Percutaneous Endoscopic Approach
0T9030Z	Drainage of Right Kidney with Drainage Device, Percutaneous Approach
0T9040Z	Drainage of Right Kidney with Drainage Device, Percutaneous Endoscopic Approach
0T9130Z	Drainage of Left Kidney with Drainage Device, Percutaneous Approach

Code	Description
OT9140Z	Drainage of Left Kidney with Drainage Device, Percutaneous Endoscopic Approach
OTC03ZZ	Extirpation of Matter from Right Kidney, Percutaneous Approach
OTC04ZZ	Extirpation of Matter from Right Kidney, Percutaneous Endoscopic Approach
OTC13ZZ	Extirpation of Matter from Left Kidney, Percutaneous Approach
OTC14ZZ	Extirpation of Matter from Left Kidney, Percutaneous Endoscopic Approach
OTF33ZZ	Fragmentation in Right Kidney Pelvis, Percutaneous Approach
OTF34ZZ	Fragmentation in Right Kidney Pelvis, Percutaneous Endoscopic Approach
OTF43ZZ	Fragmentation in Left Kidney Pelvis, Percutaneous Approach
OTF44ZZ	Fragmentation in Left Kidney Pelvis, Percutaneous Endoscopic Approach
GZB4ZZZ	Other Electroconvulsive Therapy
GZB0ZZZ	Electroconvulsive Therapy, Unilateral-Single Seizure
GZB1ZZZ	Electroconvulsive Therapy, Unilateral-Multiple Seizure
GZB2ZZZ	Electroconvulsive Therapy, Bilateral-Single Seizure
GZB3ZZZ	Electroconvulsive Therapy, Bilateral-Multiple Seizure
GZB4ZZZ	Other Electroconvulsive Therapy

Table PA4. Diagnosis categories that are acute (Planned Readmission Algorithm Version 4.0 – adapted for Urology ASC Measure Version 1.0)

Code	Description
Diagnosis CCS (ICD-9 & ICD-10)	
1	Tuberculosis
2	Septicemia (except in labor)
3	Bacterial infection; unspecified site
4	Mycoses
5	HIV infection
7	Viral infection
8	Other infections; including parasitic
9	Sexually transmitted infections (not HIV or hepatitis)
54	Gout and other crystal arthropathies
55	Fluid and electrolyte disorders
60	Acute posthemorrhagic anemia
61	Sickle cell anemia
63	Diseases of white blood cells
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
78	Other CNS infection and poliomyelitis
82	Paralysis

Code	Description
83	Epilepsy; convulsions
84	Headache; including migraine
85	Coma; stupor; and brain damage
87	Retinal detachments; defects; vascular occlusion; and retinopathy
89	Blindness and vision defects
90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)
91	Other eye disorders
92	Otitis media and related conditions
93	Conditions associated with dizziness or vertigo
99	Hypertension with complications and secondary hypertension
100	Acute myocardial infarction (with the exception of ICD-9 codes 410.x2)
102	Nonspecific chest pain
104	Other and ill-defined heart disease
107	Cardiac arrest and ventricular fibrillation
109	Acute cerebrovascular disease
112	Transient cerebral ischemia
116	Aortic and peripheral arterial embolism or thrombosis
118	Phlebitis; thrombophlebitis and thromboembolism
120	Hemorrhoids
122	Pneumonia (except that caused by TB or sexually transmitted disease)
123	Influenza
124	Acute and chronic tonsillitis
125	Acute bronchitis
126	Other upper respiratory infections
127	Chronic obstructive pulmonary disease and bronchiectasis
128	Asthma
129	Aspiration pneumonitis; food/vomitus
130	Pleurisy; pneumothorax; pulmonary collapse
131	Respiratory failure; insufficiency; arrest (adult)
135	Intestinal infection
137	Diseases of mouth; excluding dental
139	Gastroduodenal ulcer (except hemorrhage)
140	Gastritis and duodenitis
142	Appendicitis and other appendiceal conditions
145	Intestinal obstruction without hernia
146	Diverticulosis and diverticulitis

Code	Description
148	Peritonitis and intestinal abscess
153	Gastrointestinal hemorrhage
154	Noninfectious gastroenteritis
157	Acute and unspecified renal failure
159	Urinary tract infections
165	Inflammatory conditions of male genital organs
168	Inflammatory diseases of female pelvic organs
172	Ovarian cyst
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
225	Joint disorders and dislocations; trauma-related
226	Fracture of neck of femur (hip)
227	Spinal cord injury
228	Skull and face fractures
229	Fracture of upper limb
230	Fracture of lower limb
232	Sprains and strains
233	Intracranial injury
234	Crushing injury or internal injury
235	Open wounds of head; neck; and trunk
237	Complication of device; implant or graft
238	Complications of surgical procedures or medical care
239	Superficial injury; contusion
240	Burns
241	Poisoning by psychotropic agents
242	Poisoning by other medications and drugs
243	Poisoning by non-medicinal substances
244	Other injuries and conditions due to external causes
245	Syncope
246	Fever of unknown origin
247	Lymphadenitis
249	Shock
250	Nausea and vomiting
251	Abdominal pain
252	Malaise and fatigue
253	Allergic reactions
259	Residual codes; unclassified

Code	Description
650	Adjustment disorders
651	Anxiety disorders
652	Attention-deficit, conduct, and disruptive behavior disorders (in ICD-10 version, description is: "Attention-deficit")
653	Delirium, dementia, and amnestic and other cognitive disorders (in ICD-10 version, description is: "Delirium")
656	Impulse control disorders, NEC (in ICD-10 version, description is: "Impulse control disorders")
658	Personality disorders
660	Alcohol-related disorders
661	Substance-related disorders
662	Suicide and intentional self-inflicted injury
663	Screening and history of mental health and substance abuse codes
670	Miscellaneous disorders
Acute ICD-9 codes within Diagnosis CCS 97: Peri-; endo-; and myocarditis; cardiomyopathy	
3282	Diphtheritic myocarditis
3640	Meningococcal carditis NOS
3641	Meningococcal pericarditis
3642	Meningococcal endocarditis
3643	Meningococcal myocarditis
7420	Coxsackie carditis NOS
7421	Coxsackie pericarditis
7422	Coxsackie endocarditis
7423	Coxsackie myocarditis
11281	Candida endocarditis
11503	Histoplasma capsulatum pericarditis
11504	Histoplasma capsulatum endocarditis
11513	Histoplasma duboisii pericarditis
11514	Histoplasma duboisii endocarditis
11593	Histoplasmosis pericarditis
11594	Histoplasmosis endocarditis
1303	Toxoplasma myocarditis
3910	Acute rheumatic pericarditis
3911	Acute rheumatic endocarditis
3912	Acute rheumatic myocarditis
3918	Acute rheumatic heart disease NEC
3919	Acute rheumatic heart disease NOS

Code	Description
3920	Rheumatic chorea w heart involvement
3980	Rheumatic myocarditis
39890	Rheumatic heart disease NOS
39899	Rheumatic heart disease NEC
4200	Acute pericarditis in other disease
42090	Acute pericarditis NOS
42091	Acute idiopathic pericarditis
42099	Acute pericarditis NEC
4210	Acute/subacute bacterial endocarditis
4211	Acute endocarditis in other diseases
4219	Acute/subacute endocarditis NOS
4220	Acute myocarditis in other diseases
42290	Acute myocarditis NOS
42291	Idiopathic myocarditis
42292	Septic myocarditis
42293	Toxic myocarditis
42299	Acute myocarditis NEC
4230	Hemopericardium
4231	Adhesive pericarditis
4232	Constrictive pericarditis
4233	Cardiac tamponade
4290	Myocarditis NOS
Acute ICD-10 codes within Diagnosis CCS 97: Peri-; endo-; and myocarditis; cardiomyopathy	
A3681	Diphtheritic cardiomyopathy
A3950	Meningococcal carditis, unspecified
A3951	Meningococcal endocarditis
A3952	Meningococcal myocarditis
A3953	Meningococcal pericarditis
B3320	Viral carditis, unspecified
B3321	Viral endocarditis
B3322	Viral myocarditis
B3323	Viral pericarditis
B376	Candida endocarditis
B394	Histoplasmosis capsulati, unspecified
B395	Histoplasmosis duboisii
B399	Histoplasmosis, unspecified
B5881	Toxoplasma myocarditis

Code	Description
I010	Acute rheumatic pericarditis
I011	Acute rheumatic endocarditis
I012	Acute rheumatic myocarditis
I018	Other acute rheumatic heart disease
I019	Acute rheumatic heart disease, unspecified
I020	Rheumatic chorea with heart involvement
I090	Rheumatic myocarditis
I0989	Other specified rheumatic heart diseases
I099	Rheumatic heart disease, unspecified
I300	Acute nonspecific idiopathic pericarditis
I308	Other forms of acute pericarditis
I309	Acute pericarditis, unspecified
I310	Chronic adhesive pericarditis
I311	Chronic constrictive pericarditis
I312	Hemopericardium, not elsewhere classified
I314	Cardiac tamponade
I32	Pericarditis in diseases classified elsewhere
I330	Acute and subacute infective endocarditis
I339	Acute and subacute endocarditis, unspecified
I39	Endocarditis and heart valve disorders in diseases classified elsewhere
I400	Infective myocarditis
I401	Isolated myocarditis
I408	Other acute myocarditis
I409	Acute myocarditis, unspecified
I41	Myocarditis in diseases classified elsewhere
I514	Myocarditis, unspecified
Acute ICD-9 codes within Diagnosis CCS 105: Conduction disorders	
4260	Atrioventricular
42610	Atrioventricular block NOS
42611	Atrioventricular block-1st degree
42612	Atrioventricular block-Mobitz II
42613	Atrioventricular block-2nd degree NEC
4262	Left bundle branch hemiblock
4263	Left bundle branch block NEC
4264	Right bundle branch block
42650	Bundle branch block NOS
42651	Right bundle branch block/left posterior fascicular block

Code	Description
42652	Right bundle branch block/left ant fascicular block
42653	Bilateral bundle branch block NEC
42654	Trifascicular block
4266	Other heart block
4267	Anomalous atrioventricular excitation
42681	Lown-Ganong-Levine syndrome
42682	Long QT syndrome
4269	Conduction disorder NOS
Acute ICD-10 codes within Diagnosis CCS 105: Conduction disorders	
I442	Atrioventricular block, complete
I4430	Unspecified atrioventricular block
I440	Atrioventricular block, first degree
I441	Atrioventricular block, second degree
I4469	Other fascicular block
I444	Left anterior fascicular block
I445	Left posterior fascicular block
I4460	Unspecified fascicular block
I447	Left bundle-branch block, unspecified
I4510	Unspecified right bundle-branch block
I4430	Unspecified atrioventricular block
I4439	Other atrioventricular block
I454	Nonspecific intraventricular block
I452	Bifascicular block
I453	Trifascicular block
I455	Other specified heart block
I456	Pre-excitation syndrome
I4581	Long QT syndrome
I459	Conduction disorder, unspecified
Acute ICD-9 codes within Diagnosis CCS 106: Dysrhythmia	
4272	Paroxysmal tachycardia NOS
7850	Tachycardia NOS
42789	Cardiac dysrhythmias NEC
4279	Cardiac dysrhythmia NOS
42769	Premature beats NEC
Acute ICD-10 codes within Diagnosis CCS 106: Dysrhythmia	
I479	Paroxysmal tachycardia, unspecified
I4949	Other premature depolarization

Code	Description
I498	Other specified cardiac arrhythmias
I499	Cardiac arrhythmia, unspecified
R000	Tachycardia, unspecified
R001	Bradycardia, unspecified
Acute ICD-9 codes within Diagnosis CCS 108: Congestive heart failure; non-hypertensive	
39891	Rheumatic heart failure
4280	Congestive heart failure
4281	Left heart failure
42820	Unspecified systolic heart failure
42821	Acute systolic heart failure
42823	Acute on chronic systolic heart failure
42830	Unspecified diastolic heart failure
42831	Acute diastolic heart failure
42833	Acute on chronic diastolic heart failure
42840	Unspecified combined systolic & diastolic heart failure
42841	Acute combined systolic & diastolic heart failure
42843	Acute on chronic combined systolic & diastolic heart failure
4289	Heart failure NOS
Acute ICD-10 codes within Diagnosis CCS 108: Congestive heart failure; non-hypertensive	
I0981	Rheumatic heart failure
I509	Heart failure, unspecified
I501	Left ventricular failure
I5020	Unspecified systolic (congestive) heart failure
I5021	Acute systolic (congestive) heart failure
I5023	Acute on chronic systolic (congestive) heart failure
I5030	Unspecified diastolic (congestive) heart failure
I5031	Acute diastolic (congestive) heart failure
I5033	Acute on chronic diastolic (congestive) heart failure
I5040	Unspecified combined systolic and diastolic (congestive) heart failure
I5041	Acute combined systolic (congestive) and diastolic (congestive) heart failure
I5043	Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure
I509	Heart failure, unspecified
Acute ICD-9 codes within Diagnosis CCS 149: Biliary tract disease	
5740	Calculus of gallbladder with acute cholecystitis
57400	Calculus of gallbladder with acute cholecystitis without mention of obstruction
57401	Calculus of gallbladder with acute cholecystitis with obstruction

Code	Description
5743	Calculus of bile duct with acute cholecystitis
57430	Calculus of bile duct with acute cholecystitis without mention of obstruction
57431	Calculus of bile duct with acute cholecystitis with obstruction
5746	Calculus of gallbladder and bile duct with acute cholecystitis
57460	Calculus of gallbladder and bile duct with acute cholecystitis without mention of obstruction
57461	Calculus of gallbladder and bile duct with acute cholecystitis with obstruction
5748	Calculus of gallbladder and bile duct with acute and chronic cholecystitis
57480	Calculus of gallbladder and bile duct with acute and chronic cholecystitis without mention of obstruction
57481	Calculus of gallbladder and bile duct with acute and chronic cholecystitis with obstruction
5750	Acute cholecystitis
57512	Acute and chronic cholecystitis
5761	Cholangitis
Acute ICD-10 codes within Diagnosis CCS 149: Biliary tract disease	
K8000	Calculus of gallbladder with acute cholecystitis w/o obstruction
K8001	Calculus of gallbladder with acute cholecystitis with obstruction
K8042	Calculus of bile duct with acute cholecystitis w/o obstruction
K8043	Calculus of bile duct with acute cholecystitis with obstruction
K8062	Calculus of GB and bile duct with acute cholecystitis w/o obstruction
K8063	Calculus of GB and bile duct with acute cholecystitis with obstruction
K8066	Calculus of GB and bile duct with acute and chronic cholecystitis w/o obstruction
K8067	Calculus of GB and bile duct with acute and chronic cholecystitis with obstruction
K810	Acute cholecystitis
K812	Acute cholecystitis with chronic cholecystitis
K830	Cholangitis
Acute ICD-9 codes with Diagnosis CCS 152: Pancreatic disorders	
5770	Acute Pancreatitis
Acute ICD-10 codes with Diagnosis CCS 152: Pancreatic disorders	
K859	Acute pancreatitis, unspecified

Appendix D: Measure Score Calculation and Reporting

D1. Risk-Standardized Measure Score Calculation Algorithm

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

$$h(Y_{ij}) = \alpha_i + \beta Z_{ij} \quad (1)$$

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

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

Where Y_{ij} denotes the outcome (equal to 1 if patient has an eligible hospital visit within 7 days of a surgery procedure, 0 otherwise) for the j -th patient who had a surgery procedure at the i -th ASC; $Z_{ij} = (Z_{1ij}, Z_{2ij}, \dots, Z_{pij})$ is a set of p patient-specific covariates derived from the data; and I denotes the total number of ASCs and n_i the number of surgeries performed at ASC i . The facility-specific intercept of the i -th ASC, α_i , defined above, is comprised of μ , the adjusted average intercept over all ASCs 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 if ASC performance is worse or better compared to the adjusted average outcome.

The HGLM is estimated using the SAS software system (GLIMMIX procedure).

D2. Provider Performance Reporting

Using the HGLM defined by Equations (1) - (2), we estimate the parameters $\hat{\mu}$, $\{\hat{\alpha}_1, \hat{\alpha}_2, \dots, \hat{\alpha}_I\}$, $\hat{\beta}$, and $\hat{\tau}^2$. We calculate the measure score, s_i , for each ASC by computing the ratio of the number of predicted hospital visits to the number of expected hospital visits. Specifically, we calculate:

Predicted	$\hat{y}_{ij}(Z) = h^{-1}(\hat{\alpha}_i + \hat{\beta} Z_{ij})$
Expected	$\hat{e}_{ij}(Z) = h^{-1}(\hat{\mu} + \hat{\beta} Z_{ij})$
Measure score	$\hat{s}_i(Z) = \frac{\sum_{j=1}^{n_i} \hat{y}_{ij}(Z)}{\sum_{j=1}^{n_i} \hat{e}_{ij}(Z)}$

If the “predicted” number of hospital visits is higher (lower) than the “expected” number of hospital visits, then that ASC’s \hat{s}_i will be higher (lower) than 1.0.

Appendix E: Risk-Adjustment Model Development

Table E1. Candidate variables considered for the risk-adjustment model

Patient demographic, comorbidity, and procedural complexity candidate variables for risk adjustment	
Variable category	Definition
Age	
Sex	
Number of qualifying procedures	Defined as 1, 2, or ≥ 3
Work relative value units (work RVUs)	Work RVUs are assigned to each CPT®) procedure code and approximate procedure complexity by incorporating elements of physician time and effort
Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	CC 2
History of Infection	CC 1, 3-7
Metastatic and Other Major Cancers	CC 8, 9, 10, 13
Bladder, Prostate, Urinary, and Other Cancers	CC 11, 12, 14
Diabetes and Diabetes Mellitus Complications	CC 17, 18, 19, 122, 123
Protein-Calorie Malnutrition	CC 21
Disorders of Fluid/Electrolyte/Acid-Base Balance	CC 23, 24
Other endocrine/metabolic/nutritional disorders	CC 26
Liver or Biliary Disease	CC 27, 28, 29, 30, 31, 32
Intestinal Obstruction/Perforation	CC 33
Chronic Pancreatitis; and Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders	CC 34, 36
Inflammatory Bowel Disease	CC 35
Other gastrointestinal disorders	CC 38
Bone/Joint/Muscle Infections/Necrosis	CC 39
Rheumatoid and Osteoarthritis	CC 40-42
Osteoporosis and other Bone/Cartilage Disorders	CC 43
Hematological Disorders Including Coagulation Defects and Iron Deficiency	CC 46, 48, 49
Disorders of Immunity	CC 47
Delirium and Encephalopathy	CC 50
Dementia or Senility	CC 51-53
Drug/Alcohol Abuse/Dependence/Psychosis	CC 54, 55, 56 (remove ICD-9-CM diagnosis code 3051)
Psychiatric Disorders	CC 57-63
Hemiplegia, Paraplegia, Paralysis, Functional Disability	CC 70, 71, 73, 74, 103, 104
Amputation Status	CC 189, 190
Polyneuropathy	CC 75, 81
Multiple Sclerosis	CC 77
Coma, Brain Compression/Anoxic Damage	CC 80

Patient demographic, comorbidity, and procedural complexity candidate variables for risk adjustment	
Variable category	Definition
Parkinson's, Huntington's Diseases; Seizure Disorders and Convulsions	CC 78, 79
Cardiorespiratory Arrest, Failure and Respiratory Dependence	CC 82, 83, 84
Congestive Heart Failure	CC 85
Ischemic Heart Disease	CC 86, 87, 88, 89
Valvular and Rheumatic Heart Disease	CC 91
Hypertension and Hypertensive Disease	CC 94, 95
Specified Arrhythmias and other heart rhythm disorders	CC 96, 97
Other and Unspecified Heart Disease	CC 98
Stroke	CC 99, 100
Pre-cerebral arterial occlusion and transient cerebral ischemia	CC 101
Cerebrovascular Disease	CC 102, 105
Vascular or Circulatory Disease	CC 106, 107, 108, 109
Chronic Lung Disease	CC 111, 112, 113
Pneumonia	CC 114, 115, 116
Pleural Effusion/Pneumothorax	CC 117
Other Respiratory Disorders	CC 118
Retinal Disorders, Except Detachment and Vascular Retinopathies	CC 125
Glaucoma	CC 126
Other Eye Disorders	CC 128
Significant Ear, Nose, and Throat Disorders	CC 129
Hearing Loss	CC 130
Other Ear, Nose, Throat, and Mouth Disorders	CC 131
Dialysis Status	CC 134
Renal Failure	CC 135, 136, 137, 138, 139, 140
Nephritis	CC 141
Urinary Obstruction and Retention	CC 142
Urinary Incontinence	CC 143
UTI and other Urinary Tract Disorders	CC 144, 145
Pelvic Inflammatory Disease and Other Specified Female Genital Disorders	CC 147
Male Genital Disorders (without Benign Prostatic Hyperplasia [BPH])	CC 149 (excluding ICD-9 codes 60000, 60001, 60020, 60021, 60090, 60091)
Benign Prostatic Hyperplasia	ICD-9-CM diagnosis codes 60000, 60001, 60020, 60021, 60090, 60091
Decubitus Ulcer or Chronic Skin Ulcer	CC 157, 158, 159, 160, 161
Cellulitis, Local Skin Infection	CC 164
Other Dermatological Disorders	CC 165
Trauma	CC 166, 167, 168, 170, 171, 172
Vertebral Fractures	CC 169

Patient demographic, comorbidity, and procedural complexity candidate variables for risk adjustment	
Variable category	Definition
Poisonings and Allergic Reactions	CC 175
Complications of Specified Implanted Device or Graft	CC 176
Other Complications of Medical Care	CC 177
Major Symptoms, Abnormalities	CC 178
Minor Symptoms, signs, findings	CC 179
Urinary System Symptoms	ICD-9-CM codes 7880, 7881, 78841, 78842, 78843, 7885, 78861, 78862, 78864, 78865, 78869, 7887, 7888, 78899
Morbid Obesity	ICD-9-CM codes 27801, V8541, V8542, V8543, V8544, V8545
Tobacco Use	ICD-9-CM diagnosis code 3051

Table E2. Condition Categories (CCs) that are not risk adjusted for if they occur only at the time of the procedure

Condition Category (CC)	CC description
CC 2	Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock
CC 7	Other Infectious Diseases
CC 17	Diabetes with Acute Complications
CC 24	Disorders of Fluid/Electrolyte/Acid-Base
CC 30	Acute Liver Failure/Disease
CC 33	Intestinal Obstruction/Perforation
CC 36	Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders
CC 50	Delirium and Encephalopathy
CC 80	Coma, Brain Compression/Anoxic Damage
CC 82	Respirator Dependence/Tracheostomy Status
CC 83	Respiratory Arrest
CC 84	Cardio-Respiratory Failure and Shock
CC 85	Congestive Heart Failure
CC 86	Acute Myocardial Infarction
CC 87	Unstable Angina and Other Acute Ischemic Heart Disease
CC 96	Specified Heart Arrhythmias
CC 97	Other Heart Rhythm and Conduction Disorders
CC 98	Other and Unspecified Heart Disease
CC 99	Cerebral Hemorrhage
CC 100	Ischemic or Unspecified Stroke
CC 101	Precerebral Arterial Occlusion and Transient Cerebral Ischemia
CC 103	Hemiplegia/Hemiparesis
CC 104	Monoplegia, Other Paralytic Syndromes
CC 107	Vascular Disease with Complications
CC 114	Aspiration and Specified Bacterial Pneumonias

Condition Category (CC)	CC description
CC 115	Pneumococcal Pneumonia, Emphysema, Lung Abscess
CC 117	Pleural Effusion/Pneumothorax
CC 135	Acute renal failure
CC 140	Unspecified renal failure
CC 141	Nephritis
CC 142	Urinary Obstruction and Retention
CC 143	Urinary Incontinence
CC 144	Urinary Tract Infection
CC 164	Cellulitis, Local Skin Infection
CC 168	Concussion or Unspecified Head Injury
CC 175	Poisonings and Allergic and Inflammatory Reactions
CC 176	Complications of Specified Implanted Device or Graft
CC 177	Other Complications of Medical Care