Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure: Draft Measure Methodology for Interim Public Comment

Submitted by

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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EXECUTIVE SUMMARY

Goal of Measure

The goal of developing a Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure, or HWM measure, is to be able to measure more broadly the quality of care across hospitals and also to be able to measure the quality of care in smaller volume hospitals. This will provide information to hospitals that can facilitate targeted quality improvement, provide more transparent information for the public, and allow policymakers to monitor a very important outcome.

Background and Rationale

Although uncommon, mortality is a significant outcome that is meaningful to patients and providers. The vast majority of patients admitted to the hospital have survival as a primary goal. Existing mortality measures provide specificity for targeted quality improvement work, and may have contributed to national declines in hospital mortality rates for measured conditions and/or procedures.[1] They do not, however, allow for measurement of a hospital's broader performance, nor do they meaningfully capture performance for smaller volume hospitals. While we do not ever expect mortality rates to be zero, we know that studies have shown mortality within 30 days of hospital admission to be related to quality of care and that high and variable mortality rates indicate opportunity for improvement.[2,3] In other words, literature indicates that interventions have been able to reduce 30-day mortality rates for a variety of specific conditions and procedures.[1] Therefore, it is reasonable to consider an all-condition, all-procedure, risk-standardized 30-day mortality rate as a quality measure.

Measure Development Process

This measure is currently under development and will be completed in 2017. This measure aims to report the hospital-level, risk-standardized rate of mortality within 30 days of hospital admission for any condition or procedure. CORE initiated development of the measure by conducting an extensive literature review and environmental scan to inform measure development of the cohort and risk variables. We have also engaged with several stakeholder groups continually during the development process, eliciting feedback on the measure concept, outcome, cohort, risk model variables, and how to present the measure results in a meaningful way for patients, family caregivers, and providers. These have included three formal advisory groups in the form of a Technical Work Group, Patient Work Group, and Family Caregiver Work Group. We also convened a national Technical Expert Panel (TEP) consisting of a diverse set of stakeholders, including providers and patients. We are now seeking input from the general public in this interim public comment period on the measure under development.

Preliminary (Incomplete) Measure Specifications

Our cohort definition attempts to capture as many admissions as possible for which survival would be a reasonable indicator of quality and for which adequate risk adjustment is possible. We assumed survival would be a reasonable indicator of quality for admissions fulfilling two criteria: 1) survival is most likely the primary goal of the patient when they enter the hospital; and 2) the hospital can reasonably impact

the chance of survival with improved quality of care. We also required that admissions have adequate patient data for risk adjustment, and that such risk adjustment was plausible using claims data. Therefore, we included in the measure all admissions except those for which 30-day mortality cannot reasonably be considered a signal of quality care, for which full data were not available, or for which risk adjustment presented specific challenges using claims data.

The outcome for this measure is unplanned all-cause 30-day mortality. We define mortality as death from any cause within 30 days of the index hospital admission date.

To compare mortality performance across hospitals, the measure will need to account for differences in patient characteristics (patient case mix) as well as differences in mixes of services and procedures offered by hospitals (hospital service mix). Rather than assume that the effect of risk variables would be homogeneous across all discharge condition categories, we are proposing to separate the cohort into 15 different service-line divisions and estimate separate risk models within each. We intend to derive a single summary score from the results of the 15 models by combining separate risk standardized ratios to get one hospital-wide mortality rate for each hospital. Using 15 models rather than a single model will allow for better risk adjustment for diverse patient groups, and will likely improve the usability of the measure. We plan to account for differences in patient case mix using patient clinical comorbidity variables and account for differences in hospital service mix using the patient's principal discharge diagnosis. We are still developing the 15 risk models at this time.

The remaining aspects of this measure, including the final risk variables, data element testing, and final model testing, are under development. This report serves as a summary of the measure development, stakeholder input, and preliminary specifications to date. Future measure development will incorporate stakeholder feedback from this interim public comment and will consist of risk model development and measure validation using clinical electronic health record data. We plan to have another public comment after measure completion.

1. PUBLIC COMMENT

1.1 Purpose of the Interim Public Comment Period

This interim public comment period seeks input from a wide variety of stakeholders regarding several key decisions made during initial measure development, including the measure cohort, the measure outcome, and the approach to risk adjustment. This is an interim public comment that we hope to use to inform further measure development prior to the completion of this measure. We plan to hold a second public comment for this measure upon measure completion.

We seek public comment on the measure under development of Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality described in this report. We hope to obtain feedback on the preliminary measure specifications (cohort and outcome), as well as any other topic addressed in this report. We flag questions throughout this report to draw attention to certain aspects of the methodology and future work in the following sections:

- **Proposed Measure Cohort (Section 3.2 Cohort)**
- **Proposed Measure Outcome (Section 3.3 Outcome)**
- **Proposed 15 Service-Line Divisions (Section 3.4.2 Defining Service-Line Divisions)**
- **Proposed Methods Addressing Surgical Admissions (Section 3.4.3 Surgical Admissions)**
- **Proposed Methods to Identify Risk Variables (Section 3.4.4 Risk Adjustment)**
- **Proposed Approach for Model Development (Section 3.5 Statistical Approach to Measure Development)**

1.2 Instructions for Providing Feedback

CMS requests that interested parties submit comments on the methodology under development for the Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality measure. Instructions are as follows:

- If you are providing comments on behalf of an organization, include the organization's name and contact information.
- If you are commenting as an individual, submit identifying or contact information.
- Comments are due by close of business December 14, 2016.
- Please do not include personal health information in your comments.
- Send your comments to cms_hwmmeasure@yale.edu.

2. INTRODUCTION

2.1 Overview of Measure

The Centers for Medicare & Medicaid Services (CMS) contracted with Yale New Haven Health System/Center for Outcomes Research and Evaluation (YNHHS/CORE) to develop a Hospital-Wide (All-Condition, All-Procedure) Risk-Standardized Mortality Measure based upon administrative claims data. Throughout this report, we refer to this measure as the Hospital-Wide Mortality or HWM measure. This hospital-level measure is intended to complement the existing CMS Hospital-Wide All-Cause Unplanned Risk-Standardized Readmission (HWR) Measure (National Quality Forum (NQF) #1789).

Although uncommon, mortality is a significant outcome that is meaningful to patients and providers. The vast majority of patients admitted to the hospital have survival as a primary goal. This important outcome is already the focus of existing CMS condition- and procedure-specific mortality quality measures; hospital-level risk-standardized mortality rates (RSMRs) are reported for patients admitted for heart failure, pneumonia, acute myocardial infarction, chronic obstructive pulmonary disease, stroke and coronary artery bypass graft surgery.[4,5] Existing mortality measures provide specificity for targeted quality improvement work, and may have contributed to national declines in hospital mortality rates for measured conditions and/or procedures.[1] They do not, however, allow for measurement of a hospital's broader performance, nor do they meaningfully capture performance for smaller volume hospitals.

In our measure development dataset from July 2014 - June 2015, there were over eight million inpatient admissions among Medicare fee-for-service (FFS) beneficiaries ages 65 and over across 4,766 United States (US) hospitals. The observed 30-day mortality rate was over 9%, ranging from 5.6% among 65-69 year olds (representing approximately 20% of this population) to 21.1% among 95-99 year olds (roughly 2% of the population). While existing CMS condition- and procedure-specific mortality measures address the most common and morbid healthcare conditions as identified by the Medicare Payment Advisory Commission (MedPAC), together, they captured only 4.8 million Medicare FFS beneficiary admissions in the most recent three-year public reporting period. This single HWM measure will likely capture nearly as many beneficiary admissions, around 4.5 million, in a single year.

Although difficult to precisely quantify, the excess cost of hospital-associated mortality is significant. Capturing monetary savings for mortality measures is challenging, as patients who die may incur fewer expenses than those who survive. Further, distinguishing between truly preventable hospital deaths and those deaths that are truly not preventable is challenging. However, using two recent estimates of the number of deaths due to preventable medical errors, and assuming an average of ten lost years of life per death (valued at $75,000 per year in lost quality adjusted life years), the annual direct and indirect cost of excess mortality could be as much as $73.5 to $735 billion.[6-8]

In this technical report we provide detailed information on the development and preliminary specifications of the HWM measure under development such as cohort, outcome, approach to risk adjustment, and considerations for reporting. Briefly, we are developing the measure as an all-

condition, all-procedure measure designed to capture mortality within 30 days of admission. The HWM measure aims to comply with accepted standards for outcomes measure development, including appropriate risk adjustment and transparency of specifications. Our goal is to include admissions for patients for whom mortality is likely to present a quality signal and those where the hospital has the ability to influence the outcome for the patient. The overall RSMR is still under development, but will likely be derived from the combined results of multiple statistical models built for groups of admissions that are clinically related and share similar risk prediction. This interim report reflects specifications to date that have been developed with close input from patients, caregivers, clinicians and methodological experts. In addition, the measure reflects input from a nationally convened Technical Expert Panel (TEP) representing a diverse set of stakeholders. Further development, testing, and validation against clinical data as well as continued broad stakeholder input will occur in the near future.

2.2 Hospital-Wide Mortality as a Quality Indicator

2.2.2 Importance

Mortality is an unwanted outcome for the majority of patients admitted to US hospitals. Although uncommon, when assessed among appropriate patients, it provides a concrete signal of care quality across conditions and procedures. It captures the result of care processes, such as peri-operative management protocols, and the impact of both optimal care and adverse events resulting from medical care.

Evidence supports that optimal disease care reduces mortality.[2,3] We know from ongoing improvements in condition- and procedure-specific mortality rates that interventions to improve these outcomes are feasible.[1] Multiple organizations, including the Institute for Healthcare Improvement (IHI), promote a range of evidence-based strategies to reduce hospital mortality.[9] These strategies include:

- Adoption of strategies shown to reduce ventilator-associated pneumonia;[10-12]
- Delivery of reliable, evidence-based care for acute myocardial infarction;[13,14]
- Prevention of adverse drug events though medication reconciliation;[15]
- Prevention of central line infections through evidence-based guideline-concordant care;[16] and
- Prevention of surgical site infections through evidence-based guideline-concordant care.[17,18]

To reduce mortality, the IHI further encourages hospitals to use multidisciplinary rounds to improve communication, employ Rapid Response Teams to attend to patients at the first sign of clinical decline, identify high-risk patients on admission and increase nursing care and physician contact accordingly, standardize patient handoffs to avoid miscommunication or gaps in care, and establish partnerships with community providers to promote evidenced-based practices to reduce hospitalizations before patients become critically ill.[19] The IHI's 100,000 Lives Campaign, which was created to enlist hospitals in a coordinated effort to adopt the above interventions, led to an estimated more than 120,000 lives saved over the first 18 months of the campaign.[20]

Some of the evidence-based recommendations above apply to specific diagnoses. While condition- and procedure-specific initiatives to reduce mortality may broadly impact mortality rates across other conditions and procedures, there is likely more to be gained by a measure of hospital-wide mortality that can inform and encourage quality improvement efforts for patients not currently captured by existing CMS mortality measures. This measure may provide important incentives for hospitals to examine their care processes and improve care, even for problems that are not systemic or broadly relevant to every hospitalized patient.

While we do not expect optimal mortality rates to be zero, we know, as stated above, that studies have shown that mortality within 30 days is related to quality of care; that interventions have been able to reduce 30-day mortality rates for a variety of specific conditions; and that high and variable mortality rates indicate opportunity for improvement. Therefore, it is reasonable to consider an all-condition, all-procedure risk-standardized 30-day mortality rate as an important quality performance measure for hospitals.

2.2.3 Feasibility

Hospital-wide mortality has been the focus of a number of previous quality reporting initiatives in the US and other countries. Prior efforts have met with some success and a number of challenges. Despite these challenges, some countries continue to report measures of HWM.[21]

From 1986 through 1993, CMS measured hospital-wide mortality, but this effort was stopped partly due to concerns over the adequacy of the case-mix adjustment using administrative claims data.[22-24] Other hospital-wide mortality measures have been reported in the United Kingdom and Canada. These prior efforts to measure hospital-wide mortality were similarly not well received for a variety of reasons, including: inadequate exclusion of patients for whom survival is not the primary goal, such as hospice and palliative care patients; inadequate risk adjustment for disease severity; failure to satisfactorily distinguish between conditions present on admission and events occurring after admission; and concerns of adequately addressing imbalances in both case mix and capability (e.g., coronary artery bypass graft surgery performed or not) across hospitals.[22,25-27] Although hospitals used this information to reduce avoidable deaths and closely examine hospital care processes, several high profile examples exposed the measures' flaws and led to general dismissal of hospital-wide mortality measurement.[28-30]

However, since the initial CMS hospital-wide mortality effort, much has changed. As of 2015, administrative claims coding has advanced significantly. Advancements include allowing up to 25 diagnostic codes per admission encounter (an increase from previous 10 available diagnostic codes) and expanding the use of present on admission codes to signify conditions that were present prior to admission. CMS also has the benefit of years of experience successfully calculating and reporting the claims-based condition- and procedure-specific mortality measures. Additionally, CMS has reported results for the claims-based HWR Measure since July 2013, which utilizes novel methods to aggregate readmission rates across diverse patient cohorts, to adjust more accurately for case mix. Finally, CMS has further evolved its measure development approach to expand stakeholder engagement across all phases of measure development and to specifically include patients' perspectives and input to ensure

more patient-centered measures. Therefore, it is now feasible to construct a measure which will be scientifically sound and acceptable to stakeholders.

2.2.4 Usability

A primary motivation for this measure is to provide policymakers with a summary performance assessment, particularly for lower volume hospitals that care for insufficient numbers of patients to produce stable, reportable performance estimates using condition- and procedure-specific measures. In addition, from the outset, CMS and CORE sought to make this measure broadly usable by both patients and providers, as well as policymakers. Therefore, we approached this measure development from three distinct perspectives – policymakers; providers; and patient and family caregivers – in order to create a measure that provides meaningful, scientifically acceptable hospital performance information for all of these user groups.

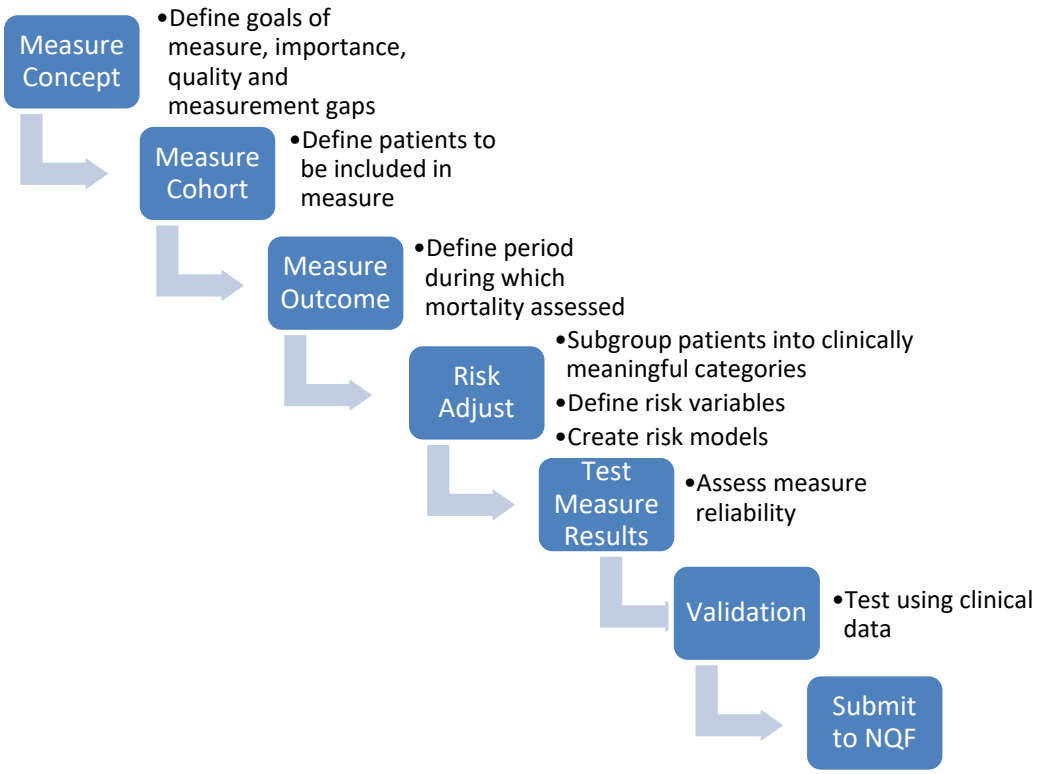
2.3 Approach to Measure Development

We are developing this measure in consultation with national guidelines for publicly reported outcomes measures, following the technical approach to outcomes measurement set forth in NQF guidance for outcomes measures, CMS Measure Management System guidance, and the guidance articulated in the American Heart Association scientific statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes."[31,32] Further, we have engaged with several stakeholder groups continuously during the development process, eliciting feedback on the measure concept, outcome, cohort, risk model variables, and how to present the measure results in a meaningful way for patients, family caregivers, and providers. These have included three formal advisory groups:

- A Technical Work Group, comprised of clinicians and a statistician;
- A Patient Work Group, comprised of patients who have had multiple encounters with the healthcare system; and
- A Family Caregiver Work Group, comprised of family members of and caregivers for patients who have had multiple encounters with the healthcare system.

We also convened a national TEP of diverse stakeholders, including providers and patients. We are now seeking input from the general public in this interim public comment period on this measure, while it is still under development. We are specifically seeking comment on the measure cohort, outcome, our approach to risk adjustment, and plans for presenting the results to the public. We plan to hold an additional public comment period after the measure is fully developed and validated. Below is a timeline showing an overview of the measurement development process, in Figure 1.

Figure 1. Timeline Showing an Overview of the Measurement Development Process



3. METHODS

3.1 Overview

This measure aims to report the preliminary specifications of the measurement of hospital-level, risk-standardized mortality within 30 days of hospital admission for any condition or procedure. The measure will likely comprise of a single summary score, derived from the results of several different risk-adjustment models, one for each of several mutually exclusive divisions (groups of discharge condition categories and procedure categories), each of which will be described in greater detail below. Currently, we have specified 15 mutually exclusive and collectively exhaustive divisions and will continue to work with patients, providers and methodology experts to determine the optimal final number of divisions from which to derive the final risk-standardized mortality rate. Hospitalizations are eligible for inclusion in the measure if the patient was hospitalized at a non-Federal short-stay acute-care hospital or critical access hospital. To compare mortality performance across hospitals, the measure will account for differences in patient characteristics (patient case mix) as well as differences in mixes of services and procedures offered by hospitals (hospital service mix). Within a single year, the measure will cover approximately 71% of hospitalized Medicare FFS beneficiaries, based upon data from July 1, 2014 – June 30, 2015.

This section provides details about the preliminary measure development of the hospital-level, risk-standardized mortality measure. Below we detail the data sources used, the measure cohort inclusion and exclusion criteria, the outcome definition and attribution, and the approach for the development of the risk models. We are currently seeking comment on each of these. This work is still under development; future work will include a clinical validation assessment of the cohort definition, risk adjustment, and measure results using electronic health record data. In a future report for public comment, we will present the final measure methodology, including final risk model and a summary of the testing approach used to assess the measure results.

3.1 Data Sources

To develop the measure, we constructed three datasets:

1. An index dataset that contains administrative inpatient hospitalization data, enrollment data, and post-discharge mortality status for FFS Medicare beneficiaries, 65 and older on admission, hospitalized from July 1, 2014 – June 30, 2015. This was used to create the patient cohort, determine the mortality outcome, and identify and select risk-adjustment variables from the index admission.

2. A history dataset that includes inpatient hospitalization data on each patient for the 12 months prior to the index admission; this was used for identifying and selecting risk-adjustment variables.

3. A history dataset that includes revenue center-level records for standalone emergency department (ED) stays (that do not result in admission to the facility) that are within one day prior to the index admission; these data were used to explore 'transfer from an outside ED' as a candidate risk variable.

We obtained index admission and inpatient comorbidity data from the Medicare Inpatient Standard Analytic File (SAF). Enrollment and mortality status were obtained from the Medicare Enrollment Database, which contains beneficiary demographic, benefit, coverage, and vital status information. ED stays were obtained from the Medicare Outpatient SAF.

A separate dataset was constructed to be used in the defining surgical procedure algorithm (described in detail in Section 3.4.3). This dataset included the major surgical procedures from the two years prior to our dataset, including admissions from July 1, 2012 – June 30, 2014.

3.2 Cohort

Our guiding principle for defining eligible admissions was that the measure should appropriately reflect a meaningful quality signal across a large number of acute care hospitals. Therefore, our cohort should capture as many admissions as possible for which survival would be a reasonable indicator of quality and for which adequate risk adjustment was possible. We defined an admission as having a reasonable indicator of quality if it fulfilled two criteria: 1) survival was most likely the primary goal of the patient when they entered the hospital (for example, a patient admitted at the end of their life under hospice care for comfort measures may not have survival as their primary goal); and 2) the hospital could be reasonably expected to impact the chance of survival with improved quality of care (for example, the hospital does not have the ability to meaningfully impact the chance of survival for a patient admitted with brain death). Therefore, we included in the measure all admissions except those for which full data were not available, for which 30-day mortality cannot reasonably be considered a signal of quality care, or for which risk adjustment presented specific challenges using claims data. For each inclusion and exclusion criteria below, using these principles, we completed multiple rounds of clinical review internally, and then reviewed and validated each decision with our Technical Work Group, TEP, and specific decisions with our Patient and Family Caregiver Work Groups.

3.2.1 Grouping Patients into Clinically Coherent Categories

For our previous claims-based condition- and procedure-specific outcome measures, we have used individual International Classification of Diseases, Ninth Revision (ICD-9) codes of the index admission to define the cohort. CMS's existing HWR measure groups ICD-9 codes using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) into clinically meaningful categories and uses those CCS categories for further cohort decisions and risk-adjustment modeling. Similar to the HWR measure, we chose to use the AHRQ CCS to group the principal discharge diagnoses and major procedures.

CCS is a software tool developed as part of the Healthcare Cost and Utilization Project (HCUP), a Federal-State-Industry partnership sponsored by the AHRQ. It collapses ICD-9 condition and procedure codes

into a smaller number of clinically meaningful condition and procedure categories that can be used for more meaningful results.[33] There are about 14,000 ICD-9 condition codes, grouped into 285 mutually exclusive AHRQ condition categories, most of which are single, homogenous diseases such as pneumonia or acute myocardial infarction. However, some are aggregates of conditions, such as "other bacterial infections." There are also about 3,900 ICD-9 procedure codes, grouped into 231 mutually exclusive CCS procedure categories.

Rationale:

- Using ICD-9 codes would have been impractical because there are potentially thousands of ICD-9 codes, some of which occur so infrequently that using this level of detail in statistical modeling would produce unreliable results.
- AHRQ CCS categories are grouped specifically for the purpose of clinical coherence. They have been deployed in many other policy and research projects to analyze outcomes and utilization of services in hospitals.
- By using a categorization taxonomy that is widely known, publically available, and clinically coherent, the methods are more transparent and the results are more easily interpreted.
- The AHRQ CCS categorization is consistent with the methods used in the existing CMS HWR measure, and this measure is being built to complement the HWR measure.

3.2.2 Inclusion Criteria

An index admission is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

a. Enrolled in Medicare FFS Part A for the 12 months prior to the date of admission and during the index admission [Note: The vast majority of patients without 12 months of prior enrollment are individuals 65 years old who were not eligible for Medicare in the prior year];
   Rationale: This is to ensure that patients are Medicare FFS beneficiaries and that their comorbidities are captured from prior claims for adequate risk adjustment. [Note: Based upon input from our work groups and TEP, we will explore whether a full 12 months of prior Medicare enrollment is required for risk adjustment during future testing and validation.]

b. Have not been transferred from another inpatient facility;
   Rationale: This measure considers multiple contiguous hospitalizations as a single acute episode of care. Transfer patients are identified by tracking claims for inpatient short-term acute care hospitalizations over time. Admissions to an acute care hospital within one day of discharge from another acute care hospital are considered transfers regardless of whether or not the first institution indicates intent to transfer the patient in the discharge disposition code, and regardless of principal discharge diagnosis. Transferred patients are included in the measure cohort, but it is the initial hospitalization, rather than any "transfer-in" hospitalization(s), that is included as the index admission.

c. Admitted for acute care:
    i. Do not have a principle discharge diagnosis of a psychiatric disease (CCSs 650, 651, 652, 654, 655, 656, 657, 658, 659, 662 & 670);
    Rationale: Patients admitted primarily for psychiatric treatment are typically cared for in separate psychiatric hospitals which are not comparable to acute care hospitals. [Note: This measure does include patients who are admitted for acute medical conditions and also have comorbid psychiatric disease.]
    ii. Do not have a principal discharge diagnosis of "rehabilitation care; fitting of prostheses and adjustment devices" (CCS 254);
    Rationale: Patients admitted for rehabilitation services are not typically admitted to an acute care hospital and are not admitted for acute care.

d. Aged between 65 and 94 years;
Rationale: Medicare patients younger than 65 usually qualify for the program due to severe disability. They are not included in the measure because they are considered to be too clinically distinct from Medicare patients between 65 and 94 years. The characteristics and outcomes of these patients may not be representative of the larger population of patients. While we acknowledge that many elderly patients do have survival beyond 30 days as a primary goal for their hospitalization, we also understand that, on average, very old patients may be less likely to have survival as a primary goal and that the hospital may not always be able to impact the chance of survival in the oldest elderly patients. In order to avoid holding hospitals responsible for the survival of the oldest elderly patients and with the guidance of our work groups and TEP, we decided to only include patients between 65 and 94 years of age.

e. Not enrolled in hospice at the time of or in the 12 months prior to their index admission;
Rationale: Patients enrolled in hospice in the prior 12 months or at the time of admission are unlikely to have 30-day survival as a primary goal of care.

f. Without a principal diagnosis of cancer and enrolled in hospice during their index admission (See Appendix B AHRQ CCSs for Cancer and Metastatic Cancer for full list of CCSs capturing cancer principal discharge diagnosis codes);
Rationale: Patients admitted primarily for their cancer who are enrolled in hospice during admission are unlikely to have 30-day survival as a primary goal of care. [Note: Based upon input from our work groups and TEP, we will explore if any modifications to this inclusion criterion should be made based upon results of our empiric analyses and validation work.]

g. Without any diagnosis of metastatic cancer (See Appendix B AHRQ CCSs for Cancer and Metastatic Cancer for full list of CCSs capturing metastatic cancer principal discharge diagnosis codes);
Rationale: Although some patients admitted with a diagnosis of metastatic cancer will have 30-day survival as a primary goal of care, it is more likely than not that death may be a clinically reasonable and patient-centered decision for this group of patients and therefore they are unlikely to have 30-day survival as a primary goal of care. [Note: Based upon input from our work groups and TEP, we will explore if all metastatic cancer patients

should be excluded or if we should apply additional or modified inclusion criteria during validation.]

h. Without a principal discharge diagnosis of a condition which hospitals have limited ability to influence survival, including: anoxic brain damage (ICD-9 3481), persistent vegetative state (ICD-9 78003), prion diseases such as Creutzfeldt-Jakob disease (ICD-9 04619), Cheyne-Stokes respiration (ICD-9 78604), brain death (ICD-9 34882), respiratory arrest (ICD-9 7991), or cardiac arrest (ICD-9 4275) without a secondary diagnosis of acute myocardial infarction.
Rationale: Hospitals have little ability to impact mortality for these conditions.

3.2.3 Exclusion Criteria

We then applied several exclusion criteria to the measure population. This measure will exclude index admission for patients:

a. With inconsistent or unknown vital status;
Rationale: We do not include stays for patients where the admission date is after the date of death in the Medicare Enrollment Database, or where the date of death occurs before the date of discharge but the patient was discharged alive.

b. Discharged against medical advice (AMA);
Rationale: Hospitals had limited opportunity to implement high-quality care and is not responsible for events that follow a discharge AMA.

c. With an admission for crush injury (CCS 234), burn (CCS 240), intracranial injury (CCS 233) or spinal cord injury (CCS 227);
Rationale: Even though a hospital likely can influence the outcome of some of these conditions, we felt that there were specific challenges to risk adjustment using claims data. These conditions are less frequent events that are unlikely to be uniformly distributed across hospitals and may entail distinct risk profiles. Therefore, we chose to exclude these admissions in this iteration of the measure and plan to revisit them in future iterations. [Note: We will revisit the inclusion of crush injury (CCS 234), burn (CCS 240), intracranial injury (CCS 233), and spinal cord injury (CCS 227) for future iterations.]

3.2.4 Other Cohort Considerations

a. The measure does not currently utilize billing codes for do-not-resuscitate (DNR) for cohort decisions, as this is not a reliable method for determining a patient's wishes at the time of or during the admission. [Note: We will explore clinically relevant data variables related to patient care preferences for end-of-life care during validation.]

b. The measure currently includes patients without a principle discharge diagnosis of cancer who are enrolled in hospice during their admission or upon discharge. [Note: We will explore these patients in greater detail during validation and adjust the cohort definition based upon results of our empiric analyses and continued feedback from our TEP and work groups.]

3.2.5 Addressing Patients with Multiple Admissions

The risk of mortality is not independent of the number of admissions a patient has had in a given time period, as a patient with multiple admissions can have at most one negative outcome (death). In addition, we know that the overall mortality rate for patients admitted more than once is higher than for those patients with only one admission. We also know that the percent of patients with multiple admissions that a hospital cares for varies. While patients do not always go back to the same hospital for repeat admissions, empiric analyses of Medicare data demonstrate that the majority of patients return to the same hospital. Other condition-specific hospital mortality measures reported by CMS address this issue by randomly selecting only one admission per patient per year.

As this measure includes all conditions and procedures, we systemically investigated different approaches to handling the issue of patients with multiple admissions within the measurement period. There was no practical statistical modeling approach that could account or adjust for the complex relationship between the number of admissions and risk of mortality in the context of a hospital-wide mortality measure. Therefore, in order to provide a scientifically rigorous, statistically appropriate, and technically feasible measure that provides transparency, and where appropriate, emphasizes simplicity, we used the approach currently employed in existing CMS mortality measures of including only one randomly selected admission per patient in the one-year measurement period. This reduces the number of admissions, but does not exclude any patients from the measure.

Rationale: Random selection better reflects that the results of their hospitalizations can be death or survival when patients enter the hospital. Selecting the last admission would not be as accurate a reflection of the risk of death as random selection; last admission is inherently associated with higher mortality risk.

The selection of the proposed cohort is presented in the Results section (Figure 5).

We seek public comment on the proposed measure cohort (Section 3.2 Cohort).

3.3 Outcome

The outcome for this measure is unplanned all-cause 30-day mortality. We define mortality as death from any cause within 30 days of the index hospital admission date. We identify deaths for Medicare FFS patients using the Medicare Enrollment Database.

3.3.1 Thirty-Day Timeframe

We combined input from clinical experts with empiric analyses, published literature and consistency with existing CMS mortality measures to define the 30-day timeframe for capturing mortality.

It is imperative to have a standard period of assessment so that the outcome for each patient is measured consistently from the date of admission. Without a standard period, variation in length of stay would have an undue influence on mortality rates, and hospitals would have an incentive to adopt

strategies to shift deaths out of the hospital without improving quality. Most prior all-condition mortality measures that assess a standard time frame and all existing CMS condition- and procedure-specific hospital mortality measures utilize a 30-day timeframe, starting the day of admission, for assessing mortality.

To evaluate the appropriateness of the 30-day time frame across the HWM cohort, we reviewed survival curves for Medicare beneficiaries 65 years and older across all diagnostic CCS groupings up to 90 days following admission. We found that diagnostic CCS groups with the highest mortality rates had their steepest declines in the first few days and the curves continued to decline but at a slower rate after that time. In general, few diagnostic CCS groups showed complete leveling off of mortality, even at 90 days. However, the 30-day period does capture the largest declines in mortality. At the request of our TEP, we also reproduced these survival curves for the final 15 divisions, shown in Figure 2 for non-surgical divisions, and Figure 3 for surgical divisions, below.

Figure 2. Survival Curves from 0 to 90 Days, for Non-Surgical Divisions

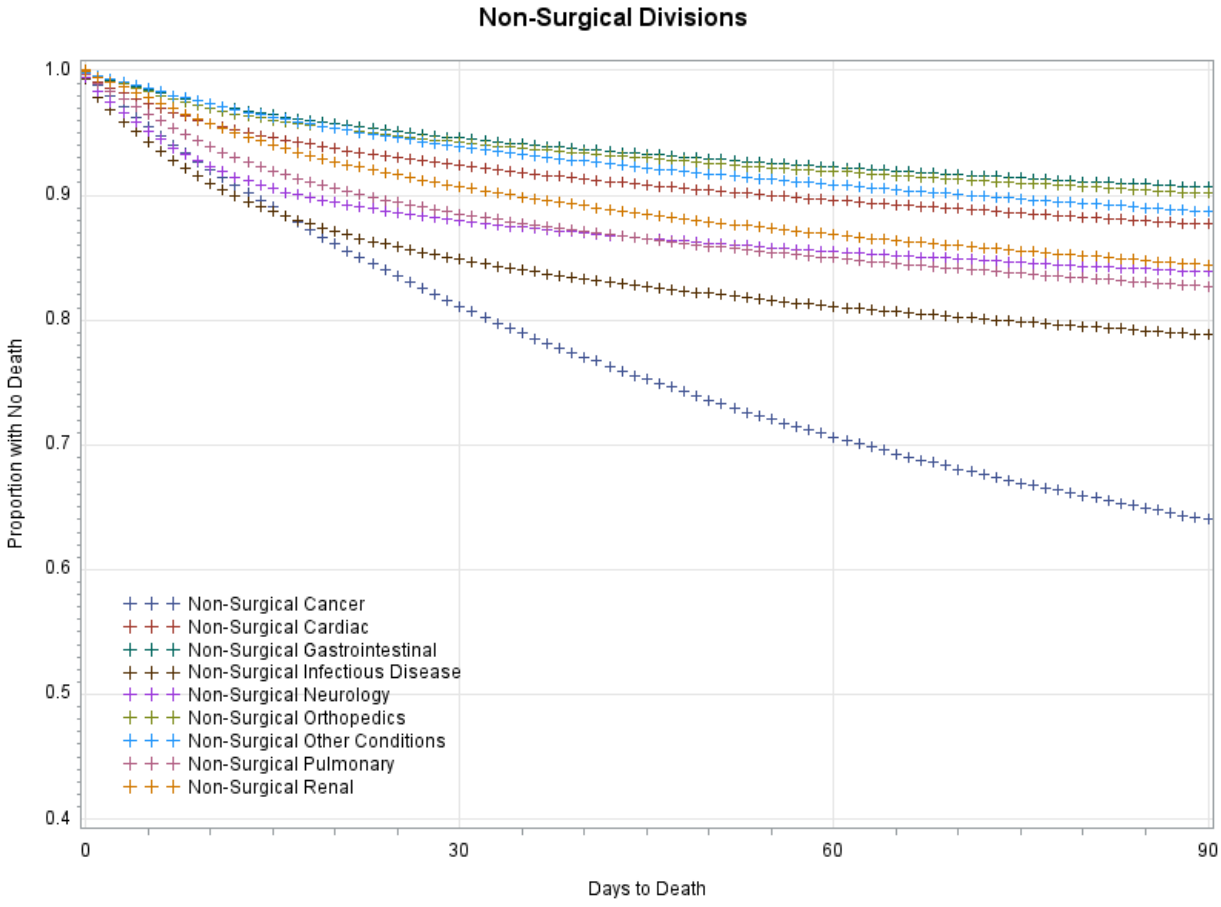
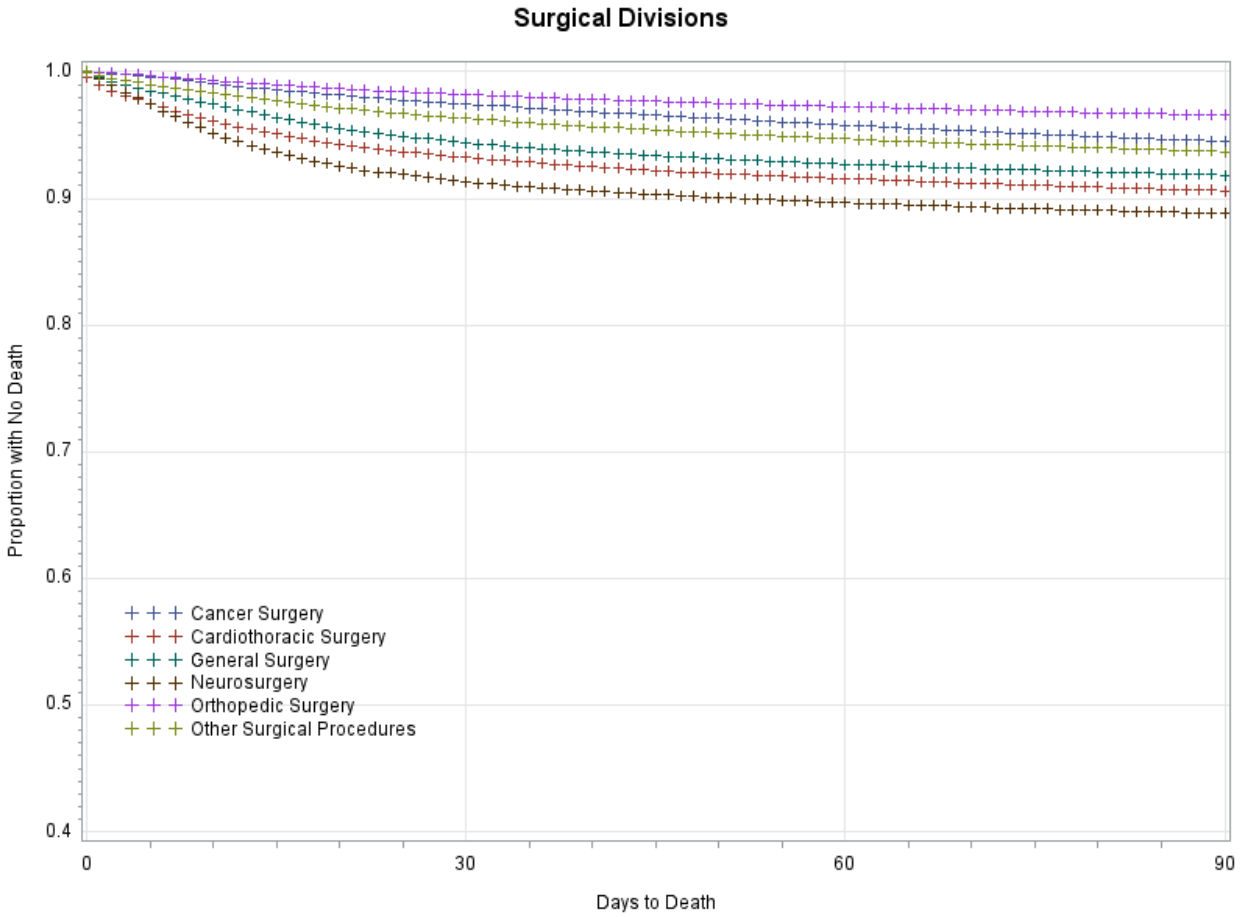


Figure 3. Survival Curves from 0 to 90 Days, for Surgical Divisions



Additional support for the 30-day time frame stems from evidence that mortality death can be influenced by hospital care and the early transition to the outpatient setting during this time. Finally, we reviewed the 30-day timeframe with our Technical, Patient, and Family Caregiver Work Groups and TEP, and they supported the 30-day timeframe. In summary, we chose a post-admission observation period of 30-days balancing considerations of empiric data findings, actionability, cross-measure consistency, and fairness of attribution.

3.3.2 All-Cause Mortality

We defined the outcome as "all-cause" mortality rather than related to the index hospitalization for multiple reasons. First, from the patient perspective, mortality for any reason is an undesirable outcome of care. In defining the measure cohort, we worked with clinical experts and patients to only include patients for whom it is reasonable to assume that 30-day survival is a primary goal of care. Second, there is no reliable way to determine whether mortality is related to the index hospitalization based on the documented cause of mortality. As with readmissions, many deaths that might not be deemed related are in fact influenced by the care received during hospitalization. For example, a heart failure patient who is discharged with inappropriately dosed medications may develop renal failure from over diuresis and die. It would be inappropriate to treat this death as unrelated to the care the patient

received for heart failure. Third, all existing CMS mortality measures report all-cause mortality, making this approach consistent with existing measures. Finally, defining the outcome as all-cause mortality may encourage hospitals to implement broader initiatives aimed at improving the overall care within the hospital and transitions from the hospital setting instead of limiting the focus to a narrow set of condition- or procedure-specific approaches.

3.3.3 Outcome Attribution

Outcomes are attributed to the admitting hospital. In cases of transfers, the sequence of hospitalizations is treated as one episode of care and the admission and associated outcome are attributed to the first admitting hospital. For example, if a patient is admitted to acute care Hospital A, and then transferred to acute care Hospital B, the admission and associated outcome (survival or death within 30-days) is attributed only to Hospital A.

We seek public comment on the proposed measure outcome (Section 3.3 Outcome).

3.4 Approach to Risk Adjustment

Below we describe our approach to developing the measure risk model. First we describe our general approach to build 15 (six surgical and nine non-surgical) service-line divisions. Then we describe in greater details how surgical patients are identified and assigned to surgical divisions. Finally, we present our anticipated steps for risk model development for the 15 risk models that will be combined to produce the single overall hospital-wide mortality RSMR. This aspect of the measure specifications remains under development and will be updated based upon input form this interim public comment and ongoing empiric testing and validation.

3.4.1 Multiple Model Approach

Because the risk of mortality varies with patient clinical factors, including age and comorbidities, hospital performance measurements using mortality rates need to account for differences in these factors. To adjust for such “case mix” differences, we use logistic regression models, including age and comorbidities as risk variables. We identify comorbidities using methods used in prior measures outlined in Section 3.4.4 Risk Adjustment.

It is unlikely that the effect of risk variables (such as diabetes) would be homogeneous across all discharge condition categories. Therefore, we chose to group our cohort into clinically-related, service-line divisions where risk factors would likely be less heterogeneous, and then estimate separate regression models within each division. For this multiple model approach, we have currently created and are testing 15 different risk models for 15 different service-line divisions (detailed below in Section 3.4.2 Defining Service-Line Divisions and supported by our work groups and TEP) and plan to derive a single summary score from the results of the 15 models to get a single hospital-wide mortality rate for each hospital. This approach allows risk variables to have different effects for different conditions. For

example, the effect of the comorbid risk factor of having diabetes may be different for a patient who is admitted for pneumonia than for a patient admitted for a knee replacement surgery.

In particular, we also want to be careful to fully account for the differences in mortality risk between surgical and non-surgical patients. Our analyses found that even within the same discharge condition, patient risk was strongly affected by whether a major surgical procedure was performed during hospitalization. Patients undergoing major surgical procedures are typically clinically different than those that are admitted with the same discharge condition but do not undergo a major surgical procedure. For example, a patient admitted for a hip fracture (CCS 226) that undergoes a major surgical procedure such as hip replacement to treat their fracture is likely considered healthy enough to have the surgery, compared to patients who are so ill that they either would not survive or choose not to risk surgery. In this example, surgery is associated with a lower raw mortality rate. In other examples, surgery is likely an indicator of more severe disease. For example, patients with a principle discharge diagnosis gastrointestinal ulcer (except hemorrhage) (CCS 139) that undergo a major surgery are generally those that have ulcers causing perforation or obstruction, which are markers of more severe disease compared to patients without perforation and obstruction requiring only medical therapy or minor surgical interventions.

In theory, estimating many more models, such as a separate model for each of the diagnostic condition categories, would provide optimal discrimination of mortality risk at the patient level. However, if we did so, many hospitals would not be included in most of the models; for all but the most common discharge condition categories, many hospitals would not have an index admission in that category during a given year. In addition, most other hospitals would have only very small numbers of index admissions in each discharge condition category, meaning that the model would contribute very little to their overall measurement. We are attempting to balance the desire for more models to maximize discrimination of mortality risk with the need to minimize the number of models to ensure reliable results would be obtainable for most hospitals. Thus, we are currently proposing to use models for 15 distinct divisions. This aspect of the measure development and the full risk model are still under development.

Finally, and most importantly, through input from the TEP and all of the work groups, we heard the importance of providing more detailed information than a single summary score for the usability of this measure for both clinicians and patients. The multiple model approach, which uses results for each of the service-line division models to create the overall hospital-wide mortality measure score, could increase the practical utility of the measure by providing information on differences in performance among divisions (service-line areas) within hospitals. This aspect of the measure will allow hospitals to better target quality improvement efforts and was strongly supported by patients and family caregivers. In addition, as expressed by all of our work groups and our TEP, in order for this measure to be more useful and meaningful, some additional information should be available to the public at a level that is more granular than a single summary hospital RSMR. However, the final decision to share divisional or other granular performance information that is supplemental to the overall HWM measure result will need to balance the input of patients and providers, who seek greater transparency and granularity, with the fact that such granular information may be less reliable or accurate than the aggregated HWM

measure result. Clinicians, patients, and family caregivers all supported the concept of combining some of the divisions into a smaller number of specialty cohorts. We combined related surgical and non-surgical divisions into specialty cohorts that could potentially include both surgical and non-surgical patients. For example, the two non-surgical cancer and surgical cancer divisions became a single cancer specialty cohort. We will continue to solicit broad stakeholder input on the optimal measure specifications and approach to measure result presentation to make this measure as usable to all stakeholder groups as possible while maintaining stringent methodological criteria.

In summary, using 15 models rather than a single model may allow for better risk adjustment for diverse patient groups, and will likely improve the usability of the measure. Using many more models may not be feasible given the number of cases per hospital in each condition.

3.4.2 Defining Service-Line Divisions

We expect the hospital component of mortality risk to be in part related to the care provided by a team of doctors, nurses, care coordinators, pharmacists, etc. Conditions typically cared for by the same team of clinicians would therefore be expected to experience similar added (or reduced) levels of mortality risk. Therefore, we grouped discharge condition categories typically cared for by the same group of clinicians into 15 divisions (See Table 1). Organizing results by care team in this way will allow hospitals to identify areas of strength and weakness if hospital performance varies across divisions. This approach also addresses the strong preference of patients and caregivers to have a better understanding of the hospital's performance for certain conditions or procedures.

These 15 service-line divisions were created through a detailed process, led by clinicians and vetted by all of our work groups and TEP. The process consisted of the following steps:

1. Identify surgical versus non-surgical admissions;
2. Group admissions into 10 surgical sub-divisions and 23 non-surgical subdivisions based on clinical coherence and care teams;
3. Combine subdivisions into five surgical divisions and nine non-surgical divisions based on clinical coherence and risk variable performance; and
4. Present results to work groups and TEP and, in response to feedback, add additional surgical division of surgical cancer, to create the proposed 15 divisions.

Surgical vs. Non-Surgical Assignment

Admissions are first screened for the presence of an eligible surgical procedure category. These are defined as "major surgical procedures," representing procedures for which a patient is likely to be cared for primarily by a surgical service and identified using the approach used by the HWR measure to identify surgical admissions. Admissions with any such major surgical procedures are assigned to a surgical division, regardless of the principal discharge diagnosis code for the admission. (See more detailed explanation of the handling of surgical procedures below in Section 3.4.3 Surgical Admissions.)

All remaining admissions are assigned to divisions on the basis of the principal discharge condition category.

Grouping of Sub-Divisions

For surgical admissions, we used work done previously for the HWR measure, which identified and then classified each major surgical procedure CCS into one of 10 surgical sub-divisions based on surgical service-line; these groupings were reviewed by five physicians on our team as well as our TEP.

For the non-surgical admissions, two physicians at CORE reviewed the CCS categories for principal discharge diagnoses and grouped them into 23 clinically coherent non-surgical sub-divisions based upon service line. These sub-divisions were reviewed by three additional physicians and any discrepancies were resolved by consensus among all physicians.

Combining Sub-Divisions into Divisions

For each of the 23 non-surgical and 10 surgical sub-divisions, we then calculated the odds ratios (OR) for risk of 30-day mortality with 95% confidence intervals (CI) for all of the candidate comorbidity variables (see Section 3.4.4 Risk Adjustment) and, for each of the surgical sub-divisions, we also calculated the OR for risk of 30-day mortality with 95% CI for all of the principal discharge diagnosis CCSs. This ensured that the reason for admission for the surgical patients (the principal discharge diagnosis) was also considered for combining sub-divisions. This was not necessary for non-surgical divisions, as the non-surgical divisions were defined using the principal discharge diagnosis CCS. We also calculated the number of patients within each sub-division to understand possible case volume limitations across the sub-divisions. We used this information to further combine sub-divisions into divisions based on clinical coherence as well as similar directionality across the majority of the comorbid conditions, while still trying to ensure adequate case volume.

Using this approach, we combined the 23 non-surgical sub-divisions into nine divisions, and the 10 surgical sub-divisions into five surgical divisions, for a total of 14 divisions.

Proposed 15 Divisions

We presented the original 14 divisions to our work groups and TEP and, based upon their feedback, we added a 15th division (surgical cancer). The AHRQ CCS procedure categories for the major surgical procedures by division are shown in Appendix C Procedure Categories Defining the Surgery Cohort. The list of the AHRQ discharge condition categories for each non-surgical division are shown in Appendix D Condition Categories Assigned to the Non-Surgical Divisions. Table 1 shows the number of admissions in each of the 15 divisions.

Table 1. Service-Line Divisions Admissions (July 1, 2014 – June 30, 2015)

Division	Admissions
Non-Surgical Divisions	
Cancer	38,395
Cardiac	684,261
Gastrointestinal	351,795
Infectious Disease	558,747

Division	Admissions
Neurology	270,839
Orthopedics	132,237
Pulmonary	550,689
Renal	241,608
Other Conditions	430,300
Surgical Divisions	
Cancer	89,380
Cardiothoracic	113,815
General	186,559
Neurosurgery	28,561
Orthopedics	668,389
Other Surgical Procedures	168,391
Total Cohort	**4,513,966**

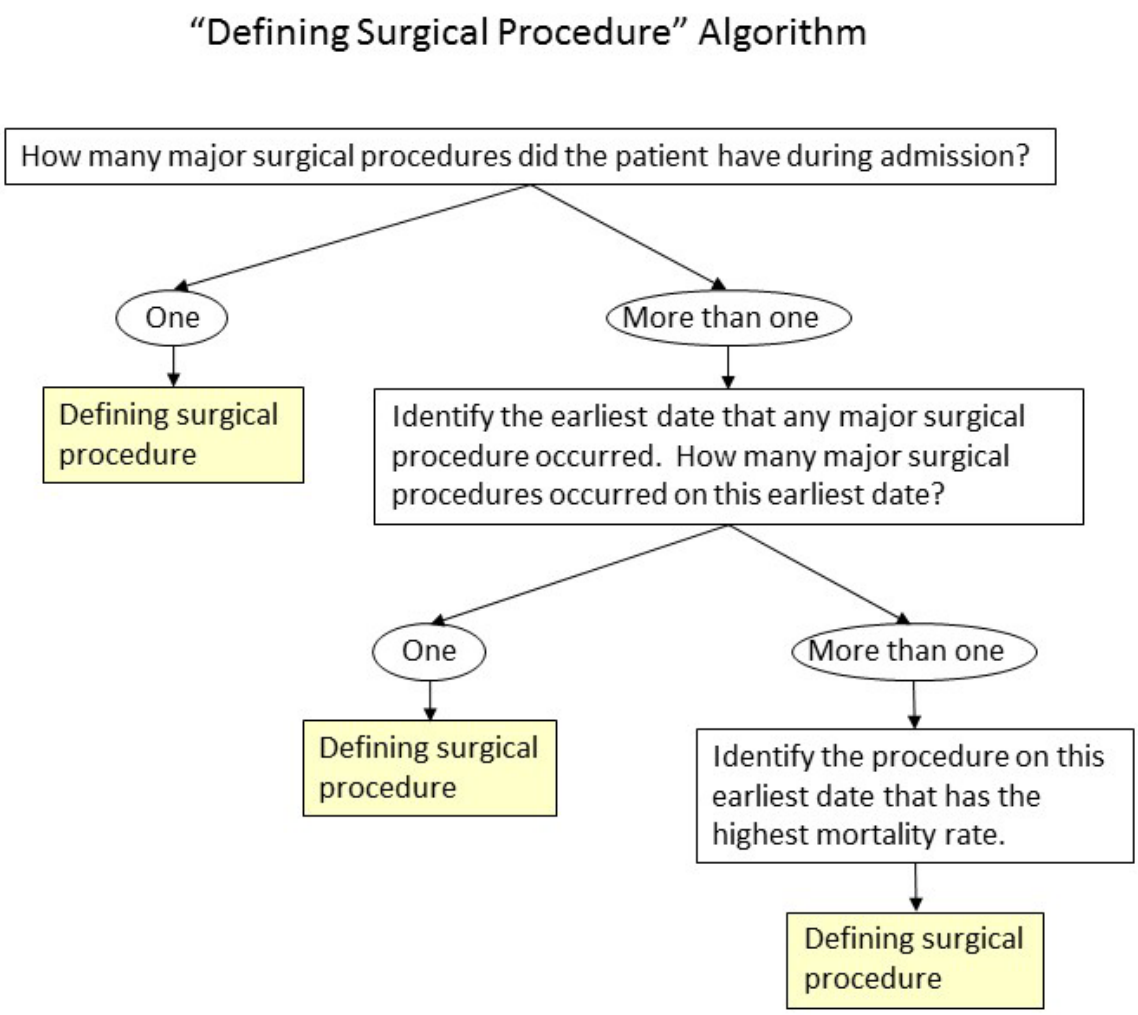
We seek public comment on the proposed 15 service-line divisions (Section 3.4.2 Defining Service-Line Divisions).

3.4.3 Surgical Admissions

Identifying the Defining Surgical Procedure

Unlike principal discharge diagnoses, of which there can only be one per admission, patients can undergo multiple surgical procedures during a hospital stay, and it is not possible in claims data to determine which, if any, procedure was related to the reason for admission. In order to report on service-line divisions that are more granular than a single division containing all surgical patients, we created an algorithm to assign a "defining surgical procedure" (Figure 4). If a patient only has one major surgical procedure, that procedure will be the "defining surgical procedure." However, if a patient has more than one major surgical procedure, the first dated major surgical procedure will be assigned as the "defining surgical procedure." If there is more than one major surgical procedure that occurs on that earliest date, the procedure with the highest mortality rate (defined by unadjusted mortality rates for all admissions with major surgical procedures from the two years prior to our dataset, including admissions from July 1, 2012 – June 30, 2014) will be the "defining surgical procedure."

Figure 4. "Defining Surgical Procedure" Algorithm



Surgical Transfers

A surgical transfer patient is defined as a patient who is originally admitted to one hospital where no major surgical procedure is performed and is then transferred to a different hospital where they receive a major surgical procedure. Given that surgical transfer patients are more likely to have risks that are similar to other surgical patients (rather than non-surgical patients), we propose assigning surgical transfer patients to a surgical division for risk adjustment and reporting (rather than a non-surgical division). However, the mortality outcome remains attributed to the original admitting hospital that made the decision to both admit and transfer the patient.

We seek public comment on the methods addressing surgical admissions (Section 3.4.3 Surgical Admissions).

3.4.4 Risk Adjustment

The goal of risk adjustment is to account for differences across hospitals in patient demographic and clinical characteristics that might be related to the outcome but are unrelated to quality of care. Risk adjustment for this measure is complicated by the fact that it includes many different discharge condition categories as well as patients undergoing surgical procedures. We must therefore adjust both for case mix differences (clinical status of the patient on admission, accounted for by adjusting for comorbidities and diagnoses present on admission) and service mix differences (the types of conditions/procedures cared for by the hospital, accounted for by adjusting for the discharge condition category).

Comorbidities for inclusion in risk adjustment are identified in inpatient hospital administrative claims during the 12 months prior to and including the index admission. To assemble the more than 14,000 ICD-9 codes into clinically coherent variables for risk adjustment, the measure employs the publicly available CMS condition categories (CMS-CCs) to group codes into CMS-CCs, and selects comorbidities on the basis of clinical relevance and statistical significance.[34]

We do not plan to adjust for patients' admission source or discharge disposition (for example, skilled nursing facilities) because these factors are associated with structure of the health care system, and may reflect the quality of care delivered by the system. We are currently not planning on adjusting for socioeconomic status, gender, race, or ethnicity because hospitals should not be held to different standards of care based on the demographics of their patients; however, we will examine these factors during validation and testing and consider the most recent guidance from the NQF in our final decision.

Complications of Hospitalization

Complications occurring during hospitalization are not comorbid illnesses, may reflect hospital quality of care, and therefore should **not** be used for risk adjustment. Although adverse events during hospitalization may increase the risk of mortality, including them as risk factors in a risk-adjusted model could attenuate the measure's ability to characterize the quality of care delivered by hospitals. We have previously reviewed every CMS-CC and identified those which, if they occur only during the index hospitalization and not in the 12 months prior to admission, would be considered potential complications rather than comorbidities. For example: fluid, electrolyte or base disorders; sepsis; and acute liver failure are all examples of CMS-CCs that could potentially be complications of care (see Appendix E Complications for the preliminary list).

For the HWM measure, we took a two-step approach to identifying complications of care. First, we applied the conditions listed in Appendix E Complications to all potential risk variables. CMS-CCs on this list were flagged for potential removal as a risk factor in our analyses if they appeared only on the index admission. Second, we considered "present on admission" codes to better differentiate between comorbidities and complications during the index admission. We searched the secondary diagnosis codes in the index admission claim for any ICD-9 code associated with a CMS-CC in Appendix E Complications. If such a code was found **and** the code was indicated as "present on admission" then the flag for removal of the CMS-CC as a risk factor was eliminated and the CMS-CC was considered a

comorbid illness. In this way, a hospital coding a condition as present on admission will ensure that the covariate is included in the risk model even if that condition was never coded prior to the index admission.

Case Mix Adjustment: Comorbid Risk Variables

Our goal is to develop parsimonious models that include clinically relevant variables strongly associated with the risk of mortality in the 30 days following an index admission. For candidate variable selection, using the development sample, we started with the CMS-CCs grouper, used in previous CMS risk-standardized outcomes measures, to group ICD-9-CM codes into comorbid risk-adjustment variables.

To select candidate variables, a team of clinicians reviewed all CMS-CCs and combined some of these CMS-CCs into clinically coherent groups to ensure adequate case volume. Any combined CMS-CCs were combined using both clinical coherence and consistent direction of mortality risk prediction across the CMS-CC groups in the majority of the 15 divisions. Other candidate risk variables included age and transfer-in from an outside emergency department. All candidate risk variables are listed in Appendix F Candidate Comorbid Risk Variables.

Final Comorbid Risk Variable Selection

To inform variable selection, we performed a modified approach to logistic model regression. We used the development sample to create 500 bootstrap samples for each of the 15 service-line divisions. For each sample, we ran a standard logistic regression model that included all candidate variables. The results were summarized to show the percentage of times that each of the candidate variables was significantly associated with 30-day mortality (at the p<=0.05 level) in the 500 bootstrap samples (for example, 70% would mean that the candidate variable was significant at p<=0.05 in 70% of the bootstrap samples). We also assessed the direction and magnitude of the regression coefficients.

We propose to use a fixed, common set of comorbidity variables in all of our models for simplicity and ease of implementation and analysis. We describe below the steps for variable selection.

a. The CORE Project Team reviewed the bootstrapping results and decided to provisionally examine risk-adjustment variables at or above a 90% cutoff in one of the 15 service-line division models (in other words, retain variables that were significant at the p<=0.05 level in at least 90% of the bootstrap samples for each division). We chose the 90% cutoff because variables at or above this threshold demonstrated a relatively stable association with 30-day mortality.
b. In order to develop a meaningful and parsimonious set of comorbid risk variables, we then chose to limit the variables to those that were significant in at least 13/15 divisions, including 19 conditions and age, for a total of 20 risk variables. This resulted in C-statistics that did not change by more than 0.02 in any of the 15 divisions compared to models that contained all possible risk variables (See Table 2).

Table 2. Risk Model C-Statistics Comparing All Potential Risk Variables to Limited (20) Risk Variables

Division (ordered by # of patients)	Number of Patients	C-statistic All Candidate Risk Variables + CCS	C-statistic 20 Variables + CCS (significant 13/15 divisions)
Neurosurgery (Surgical Division)	28,561	0.91	0.91
Non-Surgical Cancer	38,395	0.76	0.75
Cancer Surgery	89,380	0.84	0.82
Cardiothoracic Surgery	113,815	0.82	0.80
Non-Surgical Orthopedics	132,237	0.82	0.81
Other Surgical Procedures	168,391	0.88	0.87
General Surgery	186,559	0.88	0.87
Non-Surgical Renal	241,608	0.80	0.78
Non-Surgical Neurology	270,839	0.86	0.85
Non-Surgical Gastrointestinal	351,795	0.84	0.83
Other Non-Surgical Conditions	430,300	0.81	0.80
Non-Surgical Pulmonary	550,689	0.82	0.81
Non-Surgical Infectious Disease	558,747	0.85	0.84
Orthopedic Surgery	668,389	0.90	0.90
Non-Surgical Cardiac	684,261	0.84	0.84

Service Mix Adjustment: Condition Risk Variables

For all AHRQ CCS principal discharge diagnoses with sufficient volume, we plan to also include a condition-specific indicator in the model. This will ensure that the principal discharge diagnosis for each patient is also included in the risk model, in addition to the 20 variable described above.

> **Rationale:** Condition categories differ in their baseline mortality risks and hospitals will differ in their relative distribution of these condition categories (service mix) within each division. Therefore, adjusting for condition categories levels the playing field across hospitals with different service mixes. [Note: This represents a preliminary approach to selecting risk variables for the 15

division-level models. The final approach, division-level risk models and final method for combining the 15 division-level models into a single hospital-level risk-standardized mortality measure is still under development.]

We seek public comment on the proposed methods to identify risk variables (Section 3.4.4 Risk Adjustment).

3.5 Statistical Approach to Measure Development

This aspect of the measure is still under development.

We used a full year of admission data from July 1, 2014 – June 30, 2015, with 12 months of history data, to create the service-line divisions and select risk variables. We are currently creating the 15 service-line division patient-level risk-adjustment models using logistic regression, with the outcome equal to 1 if the patient died within 30 days of admission, and 0 otherwise. The patient-level risk-adjustment models allow us to assess risk factors and model performance without reference to the variation in performance across hospitals. Once the preliminary risk-adjustment models are completed, to assess reliability of each model, we plan to combine two years of admission data (July 1, 2013 – June 30, 2014 and July 1, 2014 – June 30, 2015), randomly split this dataset, run the models on each split sample, and compare performance.

To obtain the hospital-level results for each of the 15 service-line divisions, we plan to use hierarchical logistic regression models where death within 30 days is modeled as a function of patient-level demographic and clinical characteristics and a random hospital-level intercept. This will account both for the natural clustering of observations within hospitals and capture a hospital-specific signal. We plan to use the results of each hierarchical logistic regression model to calculate a standardized risk ratio (SRR) for each hospital. The SRR would be computed as the predicted mortality (predicted number of deaths) divided by the expected mortality (number of deaths expected based on average hospital performance) at each hospital for each division. These contributing SRRs would then be pooled for each hospital to create a composite hospital-wide SRR. To aid interpretation, this ratio would then be multiplied by the overall national observed mortality rate for all index admissions in all cohorts, to produce **the RSMR**.

We seek public comment on the proposed statistical approach for measure development (Section 3.5 Statistical Approach to Measure Development).

3.6 Approach to Testing

This aspect of the measure is still under development.

3.6.1 Reliability Testing

Data Element Reliability Testing

This aspect of the measure is still under development.

In constructing the HWM measure we aim to utilize only those data elements from the claims that have both face validity and reliability. We avoid the use of fields that are thought to be coded inconsistently across hospitals or providers. Additionally, CMS has in place several hospital auditing programs used to assess overall claims code accuracy, to ensure appropriate billing, and for overpayment recoupment. CMS routinely conducts data analysis to identify potential problem areas and detect fraud, and audits important data fields used in our measures.

We plan to we assess the reliability of the data elements by comparing risk factor frequencies and ORs in two randomly-selected samples.

Measure Results Reliability Testing

This aspect of the measure is still under development.

We plan to assess reliability of each model by combining two years of admission data (July 1, 2013 – June 30, 2014 and July 1, 2014 – June 30, 2015), randomly split this dataset, running the models on each split sample, and comparing performance.

3.6.2 Validity Testing

Data Element Validity Testing

This aspect of the measure is still under development.

A clinical validation project using clinical electronic health record data is planned. That work will specifically investigate the validity of the cohort definition, particularly as it relates to determining goals of care, case mix risk adjustment, and identification of complications of care.

Measure Results Validity Testing

This aspect of the measure is still under development.

We are developing this measure in consultation with national guidelines for publicly reported outcomes measures, with outside experts, and with the public. The measure will be consistent with the technical approach to outcomes measurement set forth in NQF guidance for outcomes measures, CMS Measure Management System guidance, and the guidance articulated in the American Heart Association scientific statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes.[31,32,35]

In order to examine the validity of our methods to calculate 30-day, hospital-wide mortality, we plan to compare our approach with other condition- and procedure-specific 30-day mortality and other outcome measures that assess hospital care quality and patient safety.

In addition, to further assess face validity, we plan to survey the TEP and ask each member to rate the following statement using a six-point scale (1=Strongly Disagree, 2=Moderately Disagree, 3=Somewhat Disagree, 4=Somewhat Agree, 5=Moderately Agree, and 6=Strongly Agree): "The HWM measure as

specified reflects hospital-level risk-standardized 30-day mortality." The TEP members will provide the following responses: Strongly Disagreed (X), Somewhat Agreed (X), Moderately Agreed (X), and Strongly Agreed (X). We plan to summarize the TEP members' responses within the publically posted TEP Summary Report.

We plan to validate the statistical performance our models using July 1, 2015 – June 30, 2016 data.

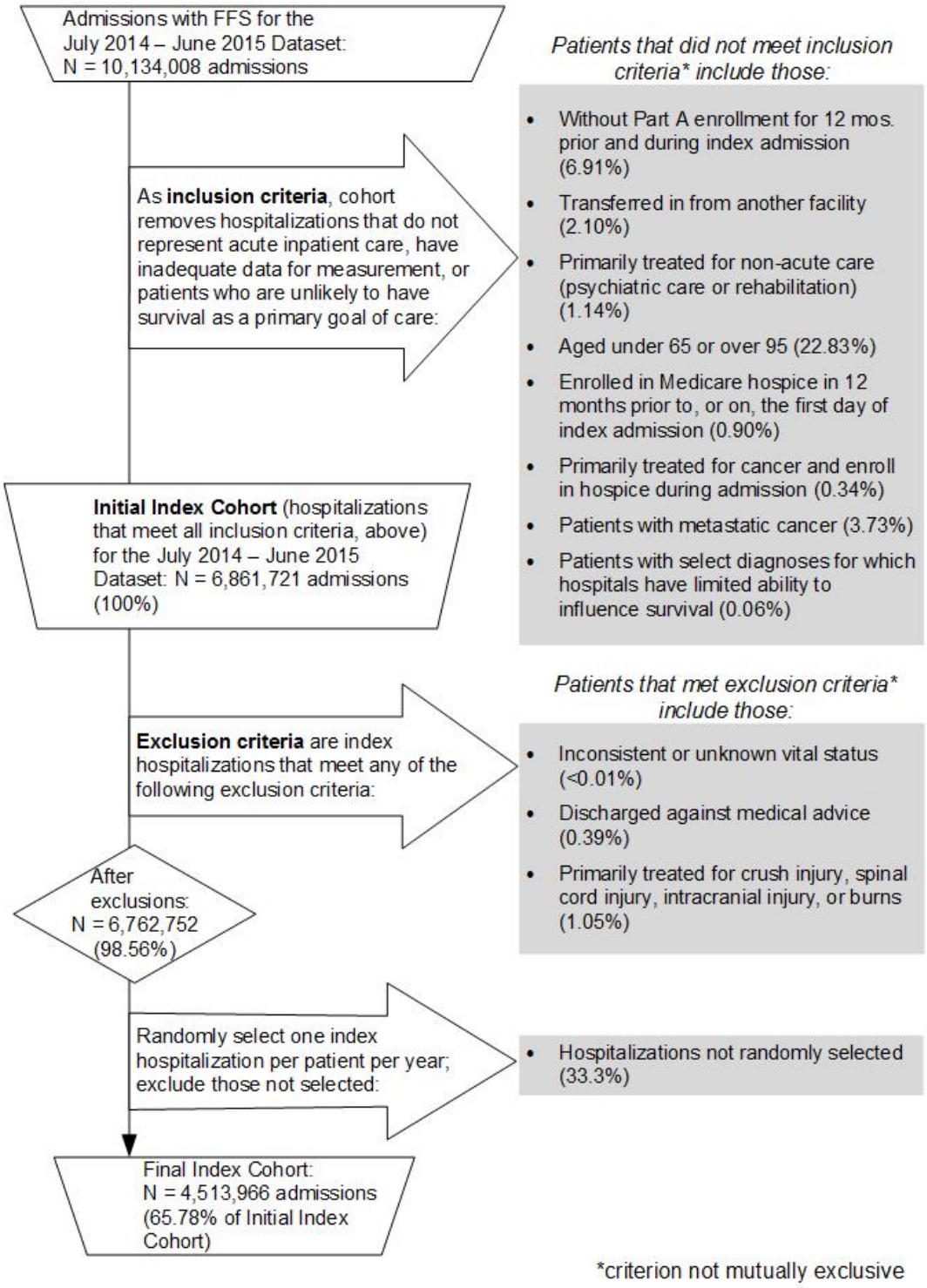
We seek public comment on plans for our planned approach to reliability and validity testing (Section 3.6 Approach to Testing)

4. RESULTS

4.1 Preliminary Cohort

As show in Figure 5 below, our original dataset with Medicare FFS admissions from July 1, 2014 – June 30, 2015 contained 10,134,008 admissions. After applying inclusion criteria, our initial index cohort contained 6,861,721 admissions. We then applied exclusion criteria, and randomly selected one index admission per patient per year. This resulted in a preliminary index cohort of 4,513,966 admissions (patients), which was 65.78% of the admissions in the initial index cohort.

Figure 5. Preliminary Index Cohort Flowchart with Results



4.2 Proposed Division Definitions

As discussed in Section 3.4.2 Defining Service-Line Divisions, after determining our 15 divisions, we calculated for each division at the patient-level the number of admissions, unadjusted 30-day mortality rate, and the c-statistic for the patient level logistic regression models. Results are shown below in Table 3.

Table 3. Patient-Level (Not Hospital-Level) Number of Admissions in each Division, with Unadjusted 30-day Mortality Rate and C-statistic (July 1, 2014 – June 30, 2015)

Division	Admissions	Unadjusted 30-Day Mortality (%)	C-statistic 2014-2015
Non-Surgical Divisions			
Cancer	38,395	18.9	0.75
Cardiac	684,261	7.6	0.83
Gastrointestinal	351,795	5.4	0.83
Infectious Disease	558,747	15.2	0.84
Neurology	270,839	12.0	0.85
Orthopedics	132,237	5.8	0.81
Pulmonary	550,689	11.5	0.81
Renal	241,608	9.3	0.78
Other Conditions	430,300	6.1	0.80
Surgical Divisions			
Cancer Surgery	89,380	2.6	0.82
Cardiothoracic Surgery	113,815	6.8	0.80
General Surgery	186,559	5.6	0.87
Neurosurgery	28,561	8.7	0.91
Orthopedic Surgery	668,389	1.8	0.90
Other Surgical Procedures	168,391	3.7	0.87
Total Cohort	**4,513,966**	--	--

4.3 Volume Distribution by Hospital and Division

This aspect of the measure is still under development.

In our preliminary analysis, Table 4 shows the total number of hospitals that have admitted any patients in each division. It also shows the distribution of the number of admissions per hospital in each division. For example, in the non-surgical cancer division 3,208 hospitals have admitted at least one patient from the non-surgical cancer division. Median number of admissions for all hospitals with at least one admission was 6, and mean was 11.97.

Table 4. Hospital Volume Distributions by Division

Division	Hospitals	Min	P25	Median	Mean	Std Dev	P75	P99	Max
Non-Surgical Divisions									
Cancer	3,208	1	2	6	11.97	18.85	14	87	391
Cardiac	4,501	1	17	63	152.02	201.35	220	890	2,105
Gastrointestinal	4,456	1	13	40	78.95	97.16	113	440	1,334
Infectious Disease	4,552	1	20	64	122.75	147.33	179.50	666	1,624
Neurology	4,311	1	7	24	62.83	86.57	88	383	816
Orthopedics	4,341	1	5	13	30.46	42.71	40	196	646
Pulmonary	4,566	1	31	74.50	120.61	128.56	170	580	1,504
Renal	4,476	1	9	27	53.98	65.94	80	303	831
Other Conditions	4,587	1	13	40	93.81	127.01	134	573	2,015
Surgical Divisions									
Cancer Surgery	3,269	1	3	9	27.34	49.85	30	244	660
Cardiothoracic Surgery	2,906	1	2	9	39.17	70.67	47	323	996
General Surgery	4,045	1	6	24	46.12	59.61	63	275	705
Neurosurgery	2,008	1	2	6	14.22	22.84	16.5	119	294
Orthopedic Surgery	3,880	1	20	85	172.27	237.09	243	1,049	4,482
Other Surgical Procedures	3,650	1	4	18	46.13	67.14	62	306	736

4.4 Proposed Risk Variables

This aspect of the measure is still under development.

As described earlier, we selected potential comorbid risk variables based on their significance in at least 13/15 divisions, limiting our co-morbid risk variables to 19 conditions and age, for a total of 20 comorbidity variables. The results of this selection are listed in Table 5 with the number of divisions where they were significant.

We also developed 15 separate patient-level models, one for each service-line division. Appendix G Patient-Level Modeling shows the full list of risk variables for each model, including the frequency in the development dataset, and the ORs with 95% Cis for mortality risk in the development dataset. Results were calculated using logistic regression models. Each table shows results for a single patient-level model. Please note that these are patient-level models and do not represent hospital-level results.

Table 5. Proposed Risk Variables with the Number of Divisions where Significant (Total of 15 Divisions)

Risk variable	# Divisions where Significant
Age, years	15
Pneumonia (CC 114-116)	14
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	13
Acute or Unspecified Renal Failure (CC 135, 140)	13
Poisonings and Allergic and Inflammatory Reactions (CC 175)	13
Minor Symptoms, Signs, Findings (CC 179)	15
Protein-Calorie Malnutrition (CC 21)	14
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	13
Disorders of Lipoid Metabolism (CC 25)	13
Liver Failure (CC 27, 30)	14
Other GI Disorders (CC 34, 35, 37, 38)	15
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	13
Hematologic or Immunity Disorders (CC 46-48)	13
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	14
Other Infectious Diseases (CC 7)	13
Metastatic & Severe Cancers (CC 8, 9)	13
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	13
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	14
Congestive Heart Failure (CC 85)	14
Hypertension and hypertensive heart disease (CC 94, 95)	14

4.5 Data Element Reliability and Validation Testing

This aspect of the measure is under development.

4.6 Model Validation

This aspect of the measure is under development.

4.7 Hospital-Level Division-Level Results

This aspect of the measure is under development.

4.8 Final Measure Results

This aspect of the measure is under development.

4.9 Presenting Results

This aspect of the measure is under development.

In developing this measure, our goal was to produce a valid, single summary measure of hospital-wide mortality that would be able to be used by policy-makers, clinicians, and patients and family caregivers. During the process of development, we consistently heard from stakeholders the importance of having more granular level information available, not only for hospitals, but for the public. As we continue to build this measure, we will continue to explore how to present more granular information in a manner that is usable and accurate, without being misleading.

At this point in measure development, we expect that we will not be able to accurately report meaningful information on the 15 divisions used to create the single summary score. Through feedback from our TEP, Technical Work Group, and Patient and Family Caregiver Work Groups, we have combined the 15 divisions into eight specialty cohorts which combine related surgical and non-surgical divisions, as presented in Table 6. Until measure development is complete, it is unclear what information will be made available on these specialty cohorts, if any. Our goal in presenting results will continue to be providing scientific, accurate, and meaningful information in a manner that is as transparent as possible.

Table 6. Proposed 15 Divisions Combined into 8 Specialty Cohorts

Proposed Specialty Cohorts (8)	Original Divisions Included (15)
CANCER	Non-Surgical and Surgical Cancer
RENAL	Renal
NEUROLOGY	Neurology and Neurosurgery
ABDOMINAL/ORGAN TRANSPLANTS	Non-Surgical Gastrointestinal and General Surgery (including all transplants)
INFECTIONS	Infectious Disease
OTHER CONDITIONS AND PROCEDURES	Other Non-Surgical Conditions and Other Surgical Procedures
ORTHOPEDICS	Non-Surgical and Surgical Orthopedics
HEART/LUNGS	Non-Surgical Cardiac and Pulmonary, and Cardiothoracic Surgery

5. Glossary

Case mix: The particular illness severity and age characteristics of patients with index admissions at a given hospital.

Cohort: The index admissions used to calculate the measure after inclusion and exclusion criteria have been applied.

Comorbidities: Medical conditions the patient had in addition to his/her primary reason for admission to the hospital.

Complications: Medical conditions that may have occurred as a consequence of care rendered during hospitalization.

Condition Categories (CMS-CCs): Groupings of ICD-9-CM diagnosis codes in clinically relevant categories, from the Hierarchical Condition Categories (HCCs) system. CMS uses the grouping but not the hierarchical logic of the system to create risk factor variables. Description of the Condition Categories can be found at http://www.cms.hhs.gov/Reports/downloads/pope_2000_2.pdf.

Confidence interval (CI): A CI is a range of probable values for an estimate that characterizes the amount of associated uncertainty. For example, the 95% CI for the ORs associated with risk-adjustment variables in the model indicates there is 95% confidence that the OR lies between the lower and the upper limit of the interval. The 95% CI serves as a proxy for statistical significance for ORs; if the CI does not contain the value of 1.0 the association is considered significant.

Discharge Condition Category: A group of related discharge diagnosis ICD-9 codes (principal diagnoses), as grouped by the AHRQ CCS.

Division: A group of index admissions for patients with related condition categories or procedure categories that are likely treated by similar care teams. This measure includes fifteen divisions, each with its own risk model.

Expected mortality*:* The number of deaths expected based on average hospital performance with a given hospital's case mix and service mix.

Hierarchical model: A widely accepted statistical method that enables fair evaluation of relative hospital performance by accounting for patient risk factors as well as the number of patients a hospital treats. This statistical model accounts for the structure of the data (patients clustered within hospitals) and calculates (1) how much variation in hospital mortality rates overall is accounted for by patients' individual risk factors (such as age and other medical conditions); and (2) how much variation is accounted for by hospital contribution to mortality risk

Index admission: Any admission included in the measure calculation as the initial admission for an episode of care to which the outcome is attributed.

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

National observed mortality rate: All included hospitalizations with the outcome divided by all included hospitalizations.

Odds ratio (OR): The ORs express the relative odds of the outcome for each of the predictor variables. For example, the OR for Protein-calorie malnutrition (CC 21) represents the odds of the outcome for patients with that risk variable present relative to those without the risk variable present. The model coefficient for each risk variable is the log (odds) for that variable.

Outcome: The result of a broad set of healthcare activities that affect patients' well-being. For this measure, the outcome is mortality within 30 days of admission.

Predicted mortality*:* The number of deaths within 30 days predicted based on the hospital's performance with its observed case mix and service mix.

Risk-adjustment variables: Patient demographics and comorbidities used to adjust for differences in case mix and service mix across hospitals.

Service Mix: The particular conditions and procedures of the patients with index admissions at a given hospital.

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7. APPENDIX A – Acknowledgement Details

We would like to thank the members of a TEP. The TEP members provided important insight and feedback on key measure decisions for the development of the hospital-wide mortality measure.

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8. Appendix B – AHRQ CCSs for Cancer and Metastatic Cancer

Table 7. AHRQ CCS Primary Discharge Diagnosis Categories for Cancer, Not Included in Initial Index Cohort of Measure if Patient Also Enrolled in Hospice

AHRQ Diagnosis CCS	Description of CCS
11	Cancer of head and neck
12	Cancer of esophagus
13	Cancer of stomach
14	Cancer of colon
15	Cancer of rectum and anus
16	Cancer of liver and intrahepatic bile duct
17	Cancer of pancreas
18	Cancer of other GI organs; peritoneum
19	Cancer of bronchus; lung
20	Cancer; other respiratory and intrathoracic
21	Cancer of bone and connective tissue
22	Melanomas of skin
23	Other non-epithelial cancer of skin
24	Cancer of breast
25	Cancer of uterus
26	Cancer of cervix
27	Cancer of ovary
28	Cancer of other female genital organs
29	Cancer of prostate
30	Cancer of testis
31	Cancer of other male genital organs
32	Cancer of bladder
33	Cancer of kidney and renal pelvis
34	Cancer of other urinary organs
35	Cancer of brain and nervous system
36	Cancer of thyroid
37	Hodgkin`s disease
38	Non-Hodgkin`s lymphoma
39	Leukemias
40	Multiple myeloma
41	Cancer; other and unspecified primary
43	Malignant neoplasm without specification of site
44	Neoplasms of unspecified nature or uncertain behavior
45	Maintenance chemotherapy; radiotherapy

Table 8. Primary or Secondary Discharge Diagnosis ICD-9 Codes for Metastatic Cancer, Not Included in Initial Cohort of Measure

AHRQ Diagnosis CCS	AHRQ Diagnosis CCS Description	ICD-9 Code Principal Discharge Diagnosis	Description of ICD-9 Code
43	Malignant neoplasm without specification of site	1990	Disseminated malignant neoplasm without specification of site
43	Malignant neoplasm without specification of site	20920	Malignant carcinoid tumor of unknown primary site
43	Malignant neoplasm without specification of site	20979	Secondary neuroendocrine tumor of other sites
43	Malignant neoplasm without specification of site	20975	Secondary Merkel cell carcinoma
43	Malignant neoplasm without specification of site	20970	Secondary neuroendocrine tumor, unspecified site
42	Secondary malignancies	1977	Malignant neoplasm of liver, secondary
42	Secondary malignancies	20973	Secondary neuroendocrine tumor of bone
42	Secondary malignancies	1968	Secondary and unspecified malignant neoplasm of lymph nodes of multiple sites
42	Secondary malignancies	1969	Secondary and unspecified malignant neoplasm of lymph nodes, site unspecified
42	Secondary malignancies	1978	Secondary malignant neoplasm of other digestive organs and spleen
42	Secondary malignancies	51181	Malignant pleural effusion
42	Secondary malignancies	1976	Secondary malignant neoplasm of retroperitoneum and peritoneum
42	Secondary malignancies	1984	Secondary malignant neoplasm of other parts of nervous system
42	Secondary malignancies	1973	Secondary malignant neoplasm of other respiratory organs
42	Secondary malignancies	1970	Secondary malignant neoplasm of lung
42	Secondary malignancies	1972	Secondary malignant neoplasm of pleura
42	Secondary malignancies	20972	Secondary neuroendocrine tumor of liver
42	Secondary malignancies	1983	Secondary malignant neoplasm of brain and spinal cord
42	Secondary malignancies	1985	Secondary malignant neoplasm of bone and bone marrow
42	Secondary malignancies	1961	Secondary and unspecified malignant neoplasm of intrathoracic lymph nodes
42	Secondary malignancies	1974	Secondary malignant neoplasm of small intestine including duodenum
42	Secondary malignancies	1962	Secondary and unspecified malignant neoplasm of intra-abdominal lymph nodes

AHRQ Diagnosis CCS	AHRQ Diagnosis CCS Description	ICD-9 Code Principal Discharge Diagnosis	Description of ICD-9 Code
42	Secondary malignancies	1971	Secondary malignant neoplasm of mediastinum
42	Secondary malignancies	19889	Secondary malignant neoplasm of other specified sites
42	Secondary malignancies	1975	Secondary malignant neoplasm of large intestine and rectum
42	Secondary malignancies	19881	Secondary malignant neoplasm of breast
42	Secondary malignancies	1980	Secondary malignant neoplasm of kidney
42	Secondary malignancies	1981	Secondary malignant neoplasm of other urinary organs
42	Secondary malignancies	19882	Secondary malignant neoplasm of genital organs
42	Secondary malignancies	20971	Secondary neuroendocrine tumor of distant lymph nodes
42	Secondary malignancies	1982	Secondary malignant neoplasm of skin
42	Secondary malignancies	20974	Secondary neuroendocrine tumor of peritoneum
42	Secondary malignancies	1987	Secondary malignant neoplasm of adrenal gland
42	Secondary malignancies	1963	Secondary and unspecified malignant neoplasm of lymph nodes of axilla and upper limb
42	Secondary malignancies	1966	Secondary and unspecified malignant neoplasm of intrapelvic lymph nodes
42	Secondary malignancies	1965	Secondary and unspecified malignant neoplasm of lymph nodes of inguinal region and lower limb
42	Secondary malignancies	1986	Secondary malignant neoplasm of ovary
42	Secondary malignancies	1960	Secondary and unspecified malignant neoplasm of lymph nodes of head, face, and neck

9. Appendix C – Procedure Categories Defining the Surgery Cohort

Table 9. Frequency and 30-day Unadjusted Mortality Rate of Surgical Procedures by AHRQ CCS

Defining Surgical Procedure AHRQ CCS	CCS Description	Frequency of Procedure	% of Total Procedures	30-Day Unadjusted Mortality Rate (%)
1	Incision and excision of CNS	10,168	0.81	11.95
2	Insertion; replacement; or removal of extracranial ventricular shunt	2,833	0.23	2.08
3	Laminectomy; excision intervertebral disc	22,478	1.79	0.62
9	Other OR therapeutic nervous system procedures	18,677	1.49	7.20
10	Thyroidectomy; partial or complete	1,678	0.13	1.13
12	Other therapeutic endocrine procedures	3,016	0.24	1.49
13	Corneal transplant	37	0.00	8.11
14	Glaucoma procedures	25	0.00	8.00
15	Lens and cataract procedures	159	0.01	2.52
16	Repair of retinal tear; detachment	10	0.00	0.00
17	Destruction of lesion of retina and choroid	44	0.00	0.00
20	Other intraocular therapeutic procedures	357	0.03	2.24
21	Other extraocular muscle and orbit therapeutic procedures	497	0.04	2.21
22	Tympanoplasty	5	0.00	0.00
23	Myringotomy	204	0.02	5.88
24	Mastoidectomy	46	0.00	4.35
26	Other therapeutic ear procedures	1,098	0.09	5.28
28	Plastic procedures on nose	1,120	0.09	3.84
30	Tonsillectomy and/or adenoidectomy	39	0.00	5.13
33	Other OR therapeutic procedures on nose; mouth and pharynx	2,846	0.23	2.32
36	Lobectomy or pneumonectomy	13,801	1.10	2.33
42	Other OR Rx procedures on respiratory system and mediastinum	9,186	0.73	7.58
43	Heart valve procedures	30,914	2.46	4.07
44	Coronary artery bypass graft (CABG)	33,394	2.66	2.20
49	Other OR heart procedures	39,153	3.12	12.74
51	Endarterectomy; vessel of head and neck	28,807	2.30	0.85
52	Aortic resection; replacement or anastomosis	16,145	1.29	4.48
53	Varicose vein stripping; lower limb	54	0.00	1.85
55	Peripheral vascular bypass	7,604	0.61	4.39
56	Other vascular bypass and shunt; not heart	1,562	0.12	12.87
59	Other OR procedures on vessels of head and neck	9,606	0.77	9.89

Defining Surgical Procedure AHRQ CCS	CCS Description	Frequency of Procedure	% of Total Procedures	30-Day Unadjusted Mortality Rate (%)
60	Embolectomy and endarterectomy of lower limbs	11,451	0.91	7.04
66	Procedures on spleen	1,964	0.16	6.72
67	Other therapeutic procedures; hemic and lymphatic system	26,200	2.09	3.08
72	Colostomy; temporary and permanent	6,904	0.55	15.98
73	Ileostomy and other enterostomy	5,955	0.47	19.82
74	Gastrectomy; partial and total	4,206	0.34	2.92
75	Small bowel resection	13,282	1.06	12.08
78	Colorectal resection	39,417	3.14	3.84
79	Local excision of large intestine lesion (not endoscopic)	162	0.01	2.47
80	Appendectomy	8,540	0.68	1.19
84	Cholecystectomy and common duct exploration	40,558	3.23	2.10
85	Inguinal and femoral hernia repair	6,718	0.54	2.80
86	Other hernia repair	14,452	1.15	2.01
89	Exploratory laparotomy	2,982	0.24	25.96
90	Excision; lysis peritoneal adhesions	18,210	1.45	4.04
94	Other OR upper GI therapeutic procedures	13,433	1.07	6.18
96	Other OR lower GI therapeutic procedures	13,067	1.04	4.52
99	Other OR gastrointestinal therapeutic procedures	16,075	1.28	5.98
101	Transurethral excision; drainage; or removal urinary obstruction	18,813	1.50	3.90
103	Nephrotomy and nephrostomy	6,107	0.49	8.02
104	Nephrectomy; partial or complete	8,202	0.65	1.11
105	Kidney transplant	1,076	0.09	1.12
106	Genitourinary incontinence procedures	173	0.01	0.00
112	Other OR therapeutic procedures of urinary tract	6,543	0.52	2.72
113	Transurethral resection of prostate (TURP)	6,274	0.50	1.45
114	Open prostatectomy	3,796	0.30	0.32
118	Other OR therapeutic procedures; male genital	1,489	0.12	2.96
119	Oophorectomy; unilateral and bilateral	4,937	0.39	0.36
120	Other operations on ovary	195	0.02	0.51
123	Other operations on fallopian tubes	274	0.02	0.73
124	Hysterectomy; abdominal and vaginal	817	0.07	0.24
125	Other excision of cervix and uterus	268	0.02	1.12
129	Repair of cystocele and rectocele; obliteration of vaginal vault	776	0.06	0.13
131	Other non-OR therapeutic procedures; female organs	401	0.03	8.48

Defining Surgical Procedure AHRQ CCS	CCS Description	Frequency of Procedure	% of Total Procedures	30-Day Unadjusted Mortality Rate (%)
132	Other OR therapeutic procedures; female organs	4,017	0.32	0.70
135	Forceps; vacuum; and breech delivery	2	0.00	0.00
142	Partial excision bone	37,321	2.97	1.33
143	Bunionectomy or repair of toe deformities	126	0.01	1.59
144	Treatment; facial fracture or dislocation	627	0.05	4.63
145	Treatment; fracture or dislocation of radius and ulna	7,340	0.58	2.15
146	Treatment; fracture or dislocation of hip and femur	93,421	7.44	5.32
147	Treatment; fracture or dislocation of lower extremity (other than hip or femur)	17,693	1.41	1.72
148	Other fracture and dislocation procedure	17,869	1.42	2.07
150	Division of joint capsule; ligament or cartilage	1,265	0.10	0.24
151	Excision of semilunar cartilage of knee	497	0.04	0.40
152	Arthroplasty knee	214,167	17.06	0.18
153	Hip replacement; total and partial	150,327	11.98	1.89
154	Arthroplasty other than hip or knee	27,746	2.21	0.27
157	Amputation of lower extremity	17,973	1.43	7.52
158	Spinal fusion	26,935	2.15	0.60
160	Other therapeutic procedures on muscles and tendons	33,900	2.70	3.42
161	Other OR therapeutic procedures on bone	17,529	1.40	2.57
162	Other OR therapeutic procedures on joints	16,277	1.30	2.30
164	Other OR therapeutic procedures on musculoskeletal system	2,228	0.18	4.22
166	Lumpectomy; quadrantectomy of breast	428	0.03	1.40
167	Mastectomy	1,847	0.15	0.76
172	Skin graft	3,815	0.30	2.54
175	Other OR therapeutic procedures on skin and breast	2,116	0.17	0.95
176	Organ transplantation (other than bone marrow, corneal or kidney)	349	0.03	4.01
Total		**1,255,095**	**100**	**3.28**

10. Appendix D – Condition Categories Assigned to the Non-Surgical Divisions

Table 10. AHRQ CCSs Assigned to the Non-Surgical Divisions and CCS Description

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Cancer		
Cancer	11	Cancer of head and neck
Cancer	12	Cancer of esophagus
Cancer	13	Cancer of stomach
Cancer	14	Cancer of colon
Cancer	15	Cancer of rectum and anus
Cancer	16	Cancer of liver and intrahepatic bile duct
Cancer	17	Cancer of pancreas
Cancer	18	Cancer of other GI organs; peritoneum
Cancer	19	Cancer of bronchus; lung
Cancer	20	Cancer; other respiratory and intrathoracic
Cancer	21	Cancer of bone and connective tissue
Cancer	22	Melanomas of skin
Cancer	23	Other non-epithelial cancer of skin
Cancer	24	Cancer of breast
Cancer	25	Cancer of uterus
Cancer	26	Cancer of cervix
Cancer	27	Cancer of ovary
Cancer	28	Cancer of other female genital organs
Cancer	29	Cancer of prostate
Cancer	30	Cancer of testis
Cancer	31	Cancer of other male genital organs
Cancer	32	Cancer of bladder
Cancer	33	Cancer of kidney and renal pelvis
Cancer	34	Cancer of other urinary organs
Cancer	35	Cancer of brain and nervous system
Cancer	36	Cancer of thyroid
Cancer	37	Hodgkin`s disease
Cancer	38	Non-Hodgkin`s lymphoma
Cancer	39	Leukemias
Cancer	40	Multiple myeloma
Cancer	41	Cancer; other and unspecified primary
Cancer	43	Malignant neoplasm without specification of site
Cancer	44	Neoplasms of unspecified nature or uncertain behavior
Cancer	45	Maintenance chemotherapy; radiotherapy
Cardiac		
Cardiac	96	Heart valve disorders

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Cardiac	97	Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease)
Cardiac	100	Acute myocardial infarction
Cardiac	101	Coronary atherosclerosis and other heart disease
Cardiac	102	Nonspecific chest pain
Cardiac	103	Pulmonary heart disease
Cardiac	104	Other and ill-defined heart disease
Cardiac	105	Conduction disorders
Cardiac	106	Cardiac dysrhythmias
Cardiac	107	Cardiac arrest and ventricular fibrillation
Cardiac	108	Congestive heart failure; nonhypertensive
Cardiac	213	Cardiac and circulatory congenital anomalies
Cardiac	245	Syncope
Cardiac	249	Shock
Gastrointestinal		
Gastrointestinal	6	Hepatitis
Gastrointestinal	120	Hemorrhoids
Gastrointestinal	138	Esophageal disorders
Gastrointestinal	139	Gastroduodenal ulcer (except hemorrhage)
Gastrointestinal	140	Gastritis and duodenitis
Gastrointestinal	141	Other disorders of stomach and duodenum
Gastrointestinal	142	Appendicitis and other appendiceal conditions
Gastrointestinal	143	Abdominal hernia
Gastrointestinal	144	Regional enteritis and ulcerative colitis
Gastrointestinal	145	Intestinal obstruction without hernia
Gastrointestinal	146	Diverticulosis and diverticulitis
Gastrointestinal	147	Anal and rectal conditions
Gastrointestinal	148	Peritonitis and intestinal abscess
Gastrointestinal	149	Biliary tract disease
Gastrointestinal	150	Liver disease; alcohol related
Gastrointestinal	151	Other liver diseases
Gastrointestinal	152	Pancreatic disorders (not diabetes)
Gastrointestinal	153	Gastrointestinal hemorrhage
Gastrointestinal	154	Noninfectious gastroenteritis
Gastrointestinal	155	Other gastrointestinal disorders
Gastrointestinal	214	Digestive congenital anomalies
Gastrointestinal	250	Nausea and vomiting
Gastrointestinal	251	Abdominal pain
Infectious Diseases		

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Infectious Disease	1	Tuberculosis
Infectious Disease	2	Septicemia (except in labor)
Infectious Disease	3	Bacterial infection; unspecified site
Infectious Disease	4	Mycoses
Infectious Disease	5	HIV infection
Infectious Disease	7	Viral infection
Infectious Disease	8	Other infections; including parasitic
Infectious Disease	9	Sexually transmitted infections (not HIV or hepatitis)
Infectious Disease	76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
Infectious Disease	77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
Infectious Disease	135	Intestinal infection
Infectious Disease	159	Urinary tract infections
Infectious Disease	197	Skin and subcutaneous tissue infections
Infectious Disease	201	Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease)
Infectious Disease	246	Fever of unknown origin
Other Conditions		
Other Conditions	237	Complication of device; implant or graft
Other Conditions	238	Complications of surgical procedures or medical care
Other Conditions	198	Other inflammatory condition of skin
Other Conditions	199	Chronic ulcer of skin
Other Conditions	200	Other skin disorders
Other Conditions	48	Thyroid disorders
Other Conditions	49	Diabetes mellitus without complication
Other Conditions	50	Diabetes mellitus with complications
Other Conditions	51	Other endocrine disorders
Other Conditions	53	Disorders of lipid metabolism
Other Conditions	58	Other nutritional; endocrine; and metabolic disorders
Other Conditions	206	Osteoporosis
Other Conditions	92	Otitis media and related conditions
Other Conditions	94	Other ear and sense organ disorders
Other Conditions	124	Acute and chronic tonsillitis
Other Conditions	134	Other upper respiratory disease
Other Conditions	136	Disorders of teeth and jaw
Other Conditions	137	Diseases of mouth; excluding dental
Other Conditions	46	Benign neoplasm of uterus
Other Conditions	160	Calculus of urinary tract

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Other Conditions	161	Other diseases of kidney and ureters
Other Conditions	162	Other diseases of bladder and urethra
Other Conditions	163	Genitourinary symptoms and ill-defined conditions
Other Conditions	164	Hyperplasia of prostate
Other Conditions	165	Inflammatory conditions of male genital organs
Other Conditions	166	Other male genital disorders
Other Conditions	167	Nonmalignant breast conditions
Other Conditions	168	Inflammatory diseases of female pelvic organs
Other Conditions	169	Endometriosis
Other Conditions	170	Prolapse of female genital organs
Other Conditions	171	Menstrual disorders
Other Conditions	172	Ovarian cyst
Other Conditions	173	Menopausal disorders
Other Conditions	174	Female infertility
Other Conditions	175	Other female genital disorders
Other Conditions	215	Genitourinary congenital anomalies
Other Conditions	59	Deficiency and other anemia
Other Conditions	60	Acute posthemorrhagic anemia
Other Conditions	61	Sickle cell anemia
Other Conditions	62	Coagulation and hemorrhagic disorders
Other Conditions	63	Diseases of white blood cells
Other Conditions	64	Other hematologic conditions
Other Conditions	247	Lymphadenitis
Other Conditions	54	Gout and other crystal arthropathies
Other Conditions	57	Immunity disorders
Other Conditions	202	Rheumatoid arthritis and related disease
Other Conditions	210	Systemic lupus erythematosus and connective tissue disorders
Other Conditions	211	Other connective tissue disease
Other Conditions	253	Allergic reactions
Other Conditions	84	Headache; including migraine
Other Conditions	93	Conditions associated with dizziness or vertigo
Other Conditions	10	Immunizations and screening for infectious disease
Other Conditions	47	Other and unspecified benign neoplasm
Other Conditions	52	Nutritional deficiencies
Other Conditions	217	Other congenital anomalies
Other Conditions	252	Malaise and fatigue
Other Conditions	255	Administrative/social admission
Other Conditions	256	Medical examination/evaluation

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Other Conditions	257	Other aftercare
Other Conditions	258	Other screening for suspected conditions (not mental disorders or infectious disease)
Other Conditions	259	Residual codes; unclassified
Other Conditions	86	Cataract
Other Conditions	87	Retinal detachments; defects; vascular occlusion; and retinopathy
Other Conditions	88	Glaucoma
Other Conditions	89	Blindness and vision defects
Other Conditions	90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitteddisease)
Other Conditions	91	Other eye disorders
Other Conditions	653	Delirium, dementia, and amnestic and other cognitive disorders
Other Conditions	241	Poisoning by psychotropic agents
Other Conditions	242	Poisoning by other medications and drugs
Other Conditions	243	Poisoning by nonmedicinal substances
Other Conditions	660	Alcohol-related disorders
Other Conditions	661	Substance-related disorders
Other Conditions	663	Screening and history of mental health and substance abuse codes
Other Conditions	114	Peripheral and visceral atherosclerosis
Other Conditions	115	Aortic; peripheral; and visceral artery aneurysms
Other Conditions	116	Aortic and peripheral arterial embolism or thrombosis
Other Conditions	117	Other circulatory disease
Other Conditions	118	Phlebitis; thrombophlebitis and thromboembolism
Other Conditions	119	Varicose veins of lower extremity
Other Conditions	121	Other diseases of veins and lymphatics
Other Conditions	248	Gangrene
Neurology		
Neurology	78	Other CNS infection and poliomyelitis
Neurology	79	Parkinson`s disease
Neurology	80	Multiple sclerosis
Neurology	81	Other hereditary and degenerative nervous system conditions
Neurology	82	Paralysis
Neurology	83	Epilepsy; convulsions
Neurology	85	Coma; stupor; and brain damage
Neurology	95	Other nervous system disorders
Neurology	109	Acute cerebrovascular disease
Neurology	110	Occlusion or stenosis of precerebral arteries
Neurology	111	Other and ill-defined cerebrovascular disease
Neurology	112	Transient cerebral ischemia

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Neurology	113	Late effects of cerebrovascular disease
Neurology	216	Nervous system congenital anomalies
	Orthopedics	
Orthopedics	235	Open wounds of head; neck; and trunk
Orthopedics	236	Open wounds of extremities
Orthopedics	239	Superficial injury; contusion
Orthopedics	244	Other injuries and conditions due to external causes
Orthopedics	203	Osteoarthritis
Orthopedics	204	Other non-traumatic joint disorders
Orthopedics	205	Spondylosis; intervertebral disc disorders; other back problems
Orthopedics	207	Pathological fracture
Orthopedics	208	Acquired foot deformities
Orthopedics	209	Other acquired deformities
Orthopedics	212	Other bone disease and musculoskeletal deformities
Orthopedics	225	Joint disorders and dislocations; trauma-related
Orthopedics	226	Fracture of neck of femur (hip)
Orthopedics	228	Skull and face fractures
Orthopedics	229	Fracture of upper limb
Orthopedics	230	Fracture of lower limb
Orthopedics	231	Other fractures
Orthopedics	232	Sprains and strains
	Pulmonary	
Pulmonary	56	Cystic fibrosis
Pulmonary	122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)
Pulmonary	123	Influenza
Pulmonary	125	Acute bronchitis
Pulmonary	126	Other upper respiratory infections
Pulmonary	127	Chronic obstructive pulmonary disease and bronchiectasis
Pulmonary	128	Asthma
Pulmonary	129	Aspiration pneumonitis; food/vomitus
Pulmonary	130	Pleurisy; pneumothorax; pulmonary collapse
Pulmonary	131	Respiratory failure; insufficiency; arrest (adult)
Pulmonary	132	Lung disease due to external agents
Pulmonary	133	Other lower respiratory disease
	Renal	
Renal	55	Fluid and electrolyte disorders
Renal	98	Essential hypertension

Non-Surgical Division	AHRQ Diagnosis CCS	Description
Renal	99	Hypertension with complications and secondary hypertension
Renal	156	Nephritis; nephrosis; renal sclerosis
Renal	157	Acute and unspecified renal failure
Renal	158	Chronic kidney disease

11. Appendix E – Complications

CCs are considered complications of care if found only during the index admission, if ICD-9 code within CC is not indicated as present on admission.

Table 11. Complications of Care by CC if Not Indicated as Present on Admission

Description	Variable	Variables Not Used in Risk Adjustment if Occurred Only During Index Admission (indicated by "X")
Age, years	N/A	--
Pneumonia	CC 114 Aspiration and Specified Bacterial Pneumonias	X
	CC 115 Pneumococcal Pneumonia, Empyema, Lung Abscess	X
	CC 116 Viral and Unspecified Pneumonia, Pleurisy	--
Dialysis or Severe Chronic Kidney Disease	CC 134 Dialysis Status	X
	CC 136 Chronic Kidney Disease, Stage 5	--
	CC 137 Chronic Kidney Disease, Severe (Stage 4)	--
Acute or Unspecified Renal Failure	CC 135 Acute Renal Failure	X
	CC 140 Unspecified Renal Failure	X
Poisonings and Allergic and Inflammatory Reactions	CC 175 Poisonings and Allergic and Inflammatory Reactions	X
Minor Symptoms, Signs, Findings	CC 179 Minor Symptoms, Signs, Findings	--
Protein-Calorie Malnutrition	CC 21 Protein-Calorie Malnutrition	--

Description	Variable	Variables Not Used in Risk Adjustment if Occurred Only During Index Admission (indicated by "X")
Disorders of Fluid/Electrolyte/Acid-Base Balance	CC 24 Disorders of Fluid/Electrolyte/Acid-Base Balance	X
Disorders of Lipoid Metabolism	CC 25 Disorders of Lipoid Metabolism	--
Liver Failure	CC 27 End-Stage Liver Disease	--
	CC 30 Acute Liver Failure/Disease	X
Other Gastrointestinal Disorders	CC 34 Chronic Pancreatitis	--
	CC 35 Inflammatory Bowel Disease	--
	CC 37 Appendicitis	--
	CC 38 Other Gastrointestinal Disorders	--
Other Musculoskeletal and Connective Tissue Disorders	CC 44 Congenital/Developmental Skeletal and Connective Tissue Disorders	--
	CC 45 Other Musculoskeletal and Connective Tissue Disorders	--
Hematologic or Immunity Disorders	CC 46 Severe Hematological Disorders	--
	CC 47 Disorders of Immunity	--
	CC 48 Coagulation Defects and Other Specified Hematological Disorders	X
Dementia and Other Nonpsychotic Organic Brain Syndromes	CC 51 Dementia With Complications	--
	CC 52 Dementia Without Complications	--
	CC 53 Nonpsychotic Organic Brain Syndromes/Conditions	--

Description	Variable	Variables Not Used in Risk Adjustment if Occurred Only During Index Admission (indicated by "X")
Other Infectious Diseases	CC 7 Other Infectious Diseases	X
Metastatic & Severe Cancers	CC 8 Metastatic Cancer and Acute Leukemia	--
	CC 9 Lung and Other Severe Cancers	--
Coma/Brain Compression/Anoxic Injury and Severe Head Injury	CC 80 Coma, Brain Compression/Anoxic	X
	CC 166 Severe Head Injury	X
Respiratory Failure, Respirator Dependence, Shock	CC 82 Respirator Dependence/Tracheostomy Status	X
	CC 83 Respiratory Arrest	X
	CC 84 Cardio-Respiratory Failure and Shock	X
Congestive Heart Failure	CC 85 Congestive Heart Failure	X
Hypertension and Hypertensive Heart Disease	CC 94 Hypertensive Heart Disease	--
	CC 95 Hypertension	--

12. Appendix F – Candidate Comorbid Risk Variables

Table 12. Candidate Risk Variables

Risk Adjustment Variable	CC
Age	N/A
Transfer from Outside ED	N/A
Opportunistic/Chronic Infections	CC 1, 3-6, 39
Lymphoma & Other Cancers	CC 10
TIA and Other Cerebrovascular Disease	CC 101, 102
Vascular Disease with Complications	CC 106, 107
Vascular Disease	CC 108
Other Circulatory Disease	CC 109
Other Cancers & Heart or Respiratory Tumors	CC 11-13
Fibrosis of Lung and Other Chronic Lung Disorders	CC 110, 112
Chronic Obstructive Pulmonary Disease	CC 111
Asthma	CC 113
Pneumonia	CC 114-116
Pleural Effusion/Pneumothorax	CC 117
Other Respiratory Disorders	CC 118
Eye Infections and Retinal Disorders	CC 120-122, 124, 125
Glaucoma	CC 126
Other Eye Disorders	CC 128
Other ENT and Mouth Disorders	CC 129, 131
Hearing Loss	CC 130
Transplant Status	CC 132, 186, 187
Dialysis or Severe Chronic Kidney Disease	CC 134, 136, 137
Acute or Unspecified Renal Failure	CC 135, 140
Mild to Moderate Chronic Kidney Disease	CC 138, 139
Other Benign Tumors	CC 14-16
Other Renal or Urinary Tract Disorders	CC 141, 145
Urinary Obstruction and Retention	CC 142
Urinary Incontinence	CC 143
Urinary Tract Infection	CC 144
Female Genital Disorders	CC 147, 148
Male Genital Disorders	CC 149
Pressure Ulcer	CC 157-160
Burns, Non-pressure Ulcers	CC 161-163
Cellulitis, Local Skin Infection	CC 164
Other Dermatological Disorders	CC 165

Risk Adjustment Variable	CC
Other Head Injuries or Concussion	CC 167, 168
Amputation Status and Major Fractures Including Vertebral, Hip, and Other	CC 169-171, 173, 189, 190
Diabetes	CC 17-19
Other Injuries	CC 172, 174
Poisonings and Allergic and Inflammatory Reactions	CC 175
Complications of Care	CC 176, 177
Major Symptoms, Abnormalities	CC 178
Minor Symptoms, Signs, Findings	CC 179
Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	CC 2
Protein-Calorie Malnutrition	CC 21
Morbid Obesity	CC 22
Other Significant Endocrine and Metabolic Disorders	CC 23
Disorders of Fluid/Electrolyte/Acid-Base Balance	CC 24
Disorders of Lipoid Metabolism	CC 25
Other Endocrine/Metabolic/Nutritional Disorders	CC 26
Liver Failure	CC 27, 30
Cirrhosis & Chronic Hepatitis	CC 28, 29
Other Liver & Biliary Disease	CC 31, 32
Intestinal Obstruction/Perforation, Peptic Ulcer, Hemorrhage, and Other Specified GI Disorders	CC 33, 36
Other GI Disorders	CC 34, 35, 37, 38
Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	CC 40
Disorders of the Vertebrae and Spinal Discs	CC 41
Osteoarthritis of Hip or Knee	CC 42
Osteoporosis and Other Bone/Cartilage Disorders	CC 43
Other Musculoskeletal and Connective Tissue Disorders	CC 44, 45
Hematologic or Immunity Disorders	CC 46-48
Iron Deficiency and Other/Unspecified Anemias and Blood Disease	CC 49
Delirium and Encephalopathy	CC 50
Dementia and Other Nonpsychotic Organic Brain Syndromes	CC 51-53
Drug/Alcohol Dependence or Psychosis	CC 54, 55
Drug/Alcohol Abuse, Without Dependence	CC 56
Psychosis: Schizophrenia, Reactive, and Unspecified	CC 57, 59

Risk Adjustment Variable	CC
Major Depressive, Bipolar, and Paranoid Disorders	CC 58
Other Psychiatric Disorders	CC 60, 63
Depression	CC 61
Anxiety Disorders	CC 62
Other Developmental Disorders	CC 64-68
Other Infectious Diseases	CC 7
Paralytic Syndromes	CC 70-72, 103, 104
Neuromuscular Disorders	CC 73-76, CC78
Seizure Disorders and Convulsions	CC 79
Metastatic & Severe Cancers	CC 8, 9
Coma/Brain Compression/Anoxic Injury and Severe Head Injury	CC 80, 166
Polyneuropathy, Mononeuropathy, and Other Neurological Conditions/Injuries	CC 81
Respiratory Failure, Respirator Dependence, Shock	CC 82-84
Congestive Heart Failure	CC 85
Acute Myocardial Infarction	CC 86
Angina and Unstable Angina	CC 87, 88
Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease	CC 89
Other and Unspecified Heart Disease	CC 90, 92, 93, 98
Valvular and Rheumatic Heart Disease	CC 91
Hypertension and hypertensive heart disease	CC 94, 95
Heart Rhythm and Conduction Disorders	CC 96, 97
Cerebral Hemorrhage, Stroke, Late Effects of Stroke	CC 99, 100, 105

Note: Descriptions of the Condition Categories can be found at http://www.cms.hhs.gov/Reports/downloads/pope_2000_2.pdf

13. Appendix G – Patient-Level Modeling

Please note that these are patient-level models and do not represent hospital-level results.

Table 13. Non-Surgical Cancer Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	76.6 (7.64)	1.03 (1.03-1.04)
Pneumonia (CC 114-116)	18.03	1.34 (1.25-1.44)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	3.84	1.03 (0.90-1.18)
Acute or Unspecified Renal Failure (135, 140)	21.88	1.41 (1.31-1.50)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	11.07	0.84 (0.76-0.93)
Minor Symptoms, Signs, Findings (CC 179)	57.59	1.91 (1.79-2.03)
Protein-Calorie Malnutrition (CC 21)	16.63	1.52 (1.42-1.63)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	41.78	1.39 (1.31-1.48)
Disorders of Lipoid Metabolism (CC 25)	47.35	0.90 (0.85-0.95)
Liver Failure (CC 27, 30)	2.83	2.28 (1.98-2.63)
Other GI Disorders (CC 34, 35, 37, 38)	56.72	0.74 (0.69-0.78)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	32.14	0.90 (0.85-0.96)
Hematologic or Immunity Disorders (CC 46-48)	29.96	1.23 (1.15-1.32)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	11.38	1.21 (1.12-1.32)
Other Infectious Diseases (CC 7)	13.39	0.93 (0.86-1.01)
Metastatic & Severe Cancers (CC 8, 9)	17.85	1.55 (1.44-1.67)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	4.60	1.32 (1.11-1.56)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	9.25	1.84 (1.69-2.00)
Congestive Heart Failure (CC 85)	18.62	1.20 (1.12-1.28)
Hypertension and hypertensive heart disease (CC 94, 95)	61.18	0.86 (0.81-0.91)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Maintenance chemotherapy; radiotherapy (CCS 45)	11.51	Reference Group
Cancer of bronchus; lung (CCS 19)	15.83	4.68 (4.00-5.47)
Leukemias (CCS 39)	9.63	8.26 (7.06-9.66)
Neoplasms of unspecified nature or uncertain behavior (CCS 44)	9.37	2.49 (2.09-2.96)
Non-Hodgkin`s lymphoma (CCS 38)	7.67	5.11 (4.33-6.04)
Multiple myeloma (CCS 40)	6.02	2.56 (2.12-3.08)
Cancer of pancreas (CCS 17)	5.63	4.54 (3.80-5.43)
Cancer of brain and nervous system (CCS 35)	4.23	3.75 (3.00-4.68)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Cancer of liver and intrahepatic bile duct (CCS 16)	4.22	7.00 (5.82-8.43)
Cancer of colon (CCS 14)	3.57	3.34 (2.71-4.12)
Cancer of stomach (CCS 13)	2.76	3.06 (2.44-3.83)
Cancer of other GI organs; peritoneum (CCS 18)	2.38	3.83 (3.06-4.81)
Cancer of head and neck (CCS 11)	2.27	3.34 (2.64-4.22)
Cancer of rectum and anus (CCS 15)	2.22	1.89 (1.43-2.51)
Cancer of esophagus (CCS 12)	1.95	3.87 (3.04-4.91)
Cancer of ovary (CCS 27)	1.19	5.85 (4.49-7.62)
Cancer of kidney and renal pelvis (CCS 33)	1.13	3.10 (2.28-4.22)
Cancer of bladder (CCS 32)	1.12	4.02 (3.02-5.34)
Low frequency CCS combined	0.91	2.72 (1.91-3.87)
Cancer of prostate (CCS 29)	0.90	2.31 (1.60-3.32)
Cancer of uterus (CCS 25)	0.87	3.93 (2.81-5.50)
Cancer of bone and connective tissue (CCS 21)	0.72	2.91 (1.98-4.28)
Cancer of breast (CCS 24)	0.72	2.63 (1.77-3.90)
Malignant neoplasm without specification of site (CCS 43)	0.68	8.35 (6.14-11.38)
Cancer; other and unspecified primary (CCS 41)	0.64	5.31 (3.75-7.51)
Other non-epithelial cancer of skin (CCS 23)	0.61	1.92 (1.21-3.07)
Cancer of thyroid (CCS 36)	0.47	2.86 (1.63-5.01)
Cancer; other respiratory and intrathoracic (CCS 20)	0.45	2.98 (1.82-4.89)
Cancer of cervix (CCS 26)	0.34	1.71 (0.87-3.37)

Table 14. Non-Surgical Cardiac Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	78.6 (7.95)	1.06 (1.05-1.06)
Pneumonia (CC 114-116)	15.41	1.34 (1.31-1.37)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	7.83	1.35 (1.31-1.39)
Acute or Unspecified Renal Failure (135, 140)	21.41	1.50 (1.47-1.53)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	5.43	0.87 (0.84-0.90)
Minor Symptoms, Signs, Findings (CC 179)	42.14	2.18 (2.14-2.23)
Protein-Calorie Malnutrition (CC 21)	4.85	1.70 (1.64-1.75)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	32.74	1.37 (1.34-1.40)
Disorders of Lipoid Metabolism (CC 25)	64.90	0.72 (0.71-0.74)
Liver Failure (CC 27, 30)	0.95	2.47 (2.32-2.64)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Other GI Disorders (CC 34, 35, 37, 38)	40.90	0.86 (0.84-0.88)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	33.22	0.87 (0.85-0.89)
Hematologic or Immunity Disorders (CC 46-48)	8.96	1.16 (1.13-1.19)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	14.60	1.58 (1.55-1.62)
Other Infectious Diseases (CC 7)	9.30	0.91 (0.89-0.94)
Metastatic & Severe Cancers (CC 8, 9)	1.97	2.25 (2.14-2.37)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.67	5.88 (5.48-6.31)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	16.39	2.07 (2.02-2.12)
Congestive Heart Failure (CC 85)	52.39	1.35 (1.31-1.38)
Hypertension and hypertensive heart disease (CC 94, 95)	62.90	0.74 (0.73-0.76)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease) (CCS 97)	0.82	Reference Group
Congestive heart failure; nonhypertensive (CCS 108)	29.60	0.92 (0.83-1.03)
Cardiac dysrhythmias (CCS 106)	24.95	0.57 (0.51-0.64)
Acute myocardial infarction (CCS 100)	16.79	1.94 (1.74-2.17)
Coronary atherosclerosis and other heart disease (CCS 101)	7.80	0.45 (0.39-0.51)
Nonspecific chest pain (CCS 102)	5.77	0.20 (0.18-0.24)
Pulmonary heart disease (CCS 103)	5.16	0.99 (0.89-1.12)
Syncope (CCS 245)	4.98	0.22 (0.19-0.25)
Conduction disorders (CCS 105)	2.66	0.51 (0.44-0.58)
Heart valve disorders (CCS 96)	0.71	1.45 (1.26-1.67)
Cardiac arrest and ventricular fibrillation (CCS 107)	0.33	4.09 (3.51-4.75)
Other and ill-defined heart disease (CCS 104)	0.32	0.54 (0.41-0.71)
Shock (CCS 249)	0.05	5.65 (4.37-7.29)
Cardiac and circulatory congenital anomalies (CCS 213)	0.05	0.33 (0.15-0.71)

Table 15. Non-Surgical Gastrointestinal Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015).

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	78.1 (7.9)	1.06 (1.06-1.06)
Pneumonia (CC 114-116)	9.23	1.47 (1.41-1.53)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	5.57	1.37 (1.29-1.44)
Acute or Unspecified Renal Failure (135, 140)	20.87	1.55 (1.49-1.60)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	5.34	0.90 (0.85-0.95)
Minor Symptoms, Signs, Findings (CC 179)	42.57	2.31 (2.23-2.40)
Protein-Calorie Malnutrition (CC 21)	8.33	1.94 (1.87-2.02)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	42.29	1.38 (1.33-1.43)
Disorders of Lipoid Metabolism (CC 25)	53.09	0.79 (0.77-0.82)
Liver Failure (CC 27, 30)	4.37	2.18 (2.04-2.32)
Other GI Disorders (CC 34, 35, 37, 38)	71.40	0.61 (0.59-0.64)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	34.47	0.85 (0.83-0.88)
Hematologic or Immunity Disorders (CC 46-48)	11.22	1.24 (1.19-1.29)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	15.13	1.72 (1.66-1.79)
Other Infectious Diseases (CC 7)	12.51	0.83 (0.80-0.87)
Metastatic & Severe Cancers (CC 8, 9)	3.37	2.92 (2.76-3.09)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.28	2.54 (2.14-3.00)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	6.25	1.58 (1.50-1.66)
Congestive Heart Failure (CC 85)	21.35	1.42 (1.37-1.47)
Hypertension and hypertensive heart disease (CC 94, 95)	64.82	0.79 (0.76-0.81)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Hepatitis (CCS 6)	0.50	Reference Group
Gastrointestinal hemorrhage (CCS 153)	23.17	0.55 (0.48-0.64)
Diverticulosis and diverticulitis (CCS 146)	14.99	0.22 (0.19-0.26)
Intestinal obstruction without hernia (CCS 145)	14.75	0.49 (0.42-0.56)
Pancreatic disorders (not diabetes) (CCS 152)	6.16	0.46 (0.39-0.53)
Other gastrointestinal disorders (CCS 155)	6.03	0.45 (0.39-0.53)
Noninfectious gastroenteritis (CCS 154)	5.40	0.21 (0.18-0.25)
Biliary tract disease (CCS 149)	5.19	0.41 (0.35-0.48)
Esophageal disorders (CCS 138)	3.64	0.32 (0.27-0.38)
Other liver diseases (CCS 151)	3.54	1.19 (1.03-1.37)
Gastritis and duodenitis (CCS 140)	3.35	0.30 (0.25-0.36)
Abdominal pain (CCS 251)	2.79	0.33 (0.27-0.39)
Other disorders of stomach and duodenum (CCS 141)	2.56	0.35 (0.30-0.42)
Hemorrhoids (CCS 120)	1.64	0.25 (0.20-0.31)
Regional enteritis and ulcerative colitis (CCS 144)	1.34	0.38 (0.30-0.47)
Abdominal hernia (CCS 143)	1.24	0.67 (0.56-0.81)
Gastroduodenal ulcer (except hemorrhage) (CCS 139)	1.11	0.42 (0.34-0.53)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Nausea and vomiting (CCS 250)	1.08	0.24 (0.19-0.30)
Anal and rectal conditions (CCS 147)	0.67	0.34 (0.26-0.43)
Peritonitis and intestinal abscess (CCS 148)	0.54	0.92 (0.75-1.13)
Appendicitis and other appendiceal conditions (CCS 142)	0.27	0.23 (0.14-0.39)
Digestive congenital anomalies (CCS 214)	0.04	0.10 (0.02-0.42)

Table 16. Non-Surgical Infectious Disease Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	79.4 (8.06)	1.05 (1.04-1.05)
Pneumonia (CC 114-116)	34.02	1.29 (1.26-1.31)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	6.90	1.49 (1.44-1.53)
Acute or Unspecified Renal Failure (135, 140)	36.42	1.60 (1.57-1.63)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	6.86	0.96 (0.93-0.99)
Minor Symptoms, Signs, Findings (CC 179)	54.16	2.25 (2.21-2.30)
Protein-Calorie Malnutrition (CC 21)	13.81	1.64 (1.61-1.67)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	58.49	1.38 (1.35-1.40)
Disorders of Lipoid Metabolism (CC 25)	51.15	0.80 (0.79-0.81)
Liver Failure (CC 27, 30)	2.37	2.70 (2.59-2.81)
Other GI Disorders (CC 34, 35, 37, 38)	49.54	0.79 (0.77-0.80)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	38.22	0.86 (0.85-0.88)
Hematologic or Immunity Disorders (CC 46-48)	14.37	1.27 (1.24-1.29)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	30.67	1.60 (1.57-1.63)
Other Infectious Diseases (CC 7)	33.65	0.74 (0.72-0.75)
Metastatic & Severe Cancers (CC 8, 9)	3.64	2.21 (2.13-2.29)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	1.16	2.72 (2.57-2.88)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	20.89	2.35 (2.31-2.40)
Congestive Heart Failure (CC 85)	29.86	1.28 (1.26-1.30)
Hypertension and hypertensive heart disease (CC 94, 95)	60.68	0.86 (0.84-0.87)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Sexually transmitted infections (not HIV or hepatitis) (CCS 9)	0.03	Reference Group
Septicemia (except in labor) (CCS 2)	54.31	8.30 (2.61-26.41)
Urinary tract infections (CCS 159)	22.29	2.56 (0.80-8.15)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Skin and subcutaneous tissue infections (CCS 197)	12.56	1.79 (0.56-5.71)
Intestinal infection (CCS 135)	6.36	2.19 (0.69-6.96)
Viral infection (CCS 7)	1.27	1.81 (0.57-5.81)
Fever of unknown origin (CCS 246)	0.98	1.63 (0.51-5.23)
Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease) (CCS 201)	0.68	3.25 (1.01-10.45)
Mycoses (CCS 4)	0.56	5.70 (1.78-18.21)
Other infections; including parasitic (CCS 8)	0.29	1.84 (0.56-6.07)
Meningitis (except that caused by tuberculosis or sexually transmitted disease) (CCS 76)	0.23	5.74 (1.77-18.62)
Encephalitis (except that caused by tuberculosis or sexually transmitted disease) (CCS 77)	0.20	8.14 (2.52-26.32)
Bacterial infection; unspecified site (CCS 3)	0.11	5.71 (1.74-18.73)
HIV infection (CCS 5)	0.08	6.64 (2.01-21.87)
Tuberculosis (CCS 1)	0.05	4.87 (1.44-16.52)

Table 17. Non-Surgical Neurology Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	78.8 (7.95)	1.07 (1.07-1.07)
Pneumonia (CC 114-116)	9.28	1.61 (1.55-1.68)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	4.05	1.41 (1.33-1.51)
Acute or Unspecified Renal Failure (135, 140)	14.73	1.17 (1.12-1.21)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	4.33	0.85 (0.80-0.90)
Minor Symptoms, Signs, Findings (CC 179)	49.60	2.90 (2.81-2.99)
Protein-Calorie Malnutrition (CC 21)	5.66	1.41 (1.34-1.48)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	31.07	1.10 (1.07-1.14)
Disorders of Lipoid Metabolism (CC 25)	61.18	0.68 (0.66-0.70)
Liver Failure (CC 27, 30)	0.52	2.01 (1.74-2.33)
Other GI Disorders (CC 34, 35, 37, 38)	35.83	0.79 (0.77-0.81)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	39.05	0.76 (0.74-0.78)
Hematologic or Immunity Disorders (CC 46-48)	7.16	1.12 (1.07-1.17)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	27.85	1.50 (1.45-1.54)
Other Infectious Diseases (CC 7)	10.31	0.90 (0.86-0.93)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Metastatic & Severe Cancers (CC 8, 9)	1.65	2.35 (2.16-2.55)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	5.63	5.75 (5.52-5.99)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	7.63	3.67 (3.53-3.82)
Congestive Heart Failure (CC 85)	20.01	1.29 (1.25-1.33)
Hypertension and hypertensive heart disease (CC 94, 95)	72.34	0.85 (0.82-0.87)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other nervous system disorders (CCS 95)	14.13	Reference Group
Acute cerebrovascular disease (CCS 109)	56.12	2.87 (2.75-3.00)
Transient cerebral ischemia (CCS 112)	14.07	0.21 (0.19-0.24)
Epilepsy; convulsions (CCS 83)	7.97	0.63 (0.58-0.68)
Other hereditary and degenerative nervous system conditions (CCS 81)	1.98	0.99 (0.88-1.12)
Occlusion or stenosis of precerebral arteries (CCS 110)	1.15	0.38 (0.29-0.49)
Late effects of cerebrovascular disease (CCS 113)	1.11	0.64 (0.54-0.76)
Parkinson`s disease (CCS 79)	1.09	1.08 (0.92-1.27)
Other and ill-defined cerebrovascular disease (CCS 111)	0.95	0.50 (0.39-0.65)
Coma; stupor; and brain damage (CCS 85)	0.74	1.15 (0.98-1.35)
Multiple sclerosis (CCS 80)	0.32	0.62 (0.37-1.04)
Paralysis (CCS 82)	0.21	0.62 (0.40-0.96)
Other CNS infection and poliomyelitis (CCS 78)	0.15	1.97 (1.41-2.74)
Low frequency CCS combined	0.01	0.77 (0.09-6.50)

Table 18. Non-Surgical Orthopedics Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	81.2 (7.91)	1.05 (1.05-1.06)
Pneumonia (CC 114-116)	8.83	1.68 (1.57-1.80)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	4.19	1.78 (1.62-1.96)
Acute or Unspecified Renal Failure (135, 140)	13.47	1.41 (1.32-1.50)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	4.45	0.83 (0.74-0.92)
Minor Symptoms, Signs, Findings (CC 179)	45.04	2.12 (2.01-2.24)
Protein-Calorie Malnutrition (CC 21)	5.83	1.72 (1.59-1.85)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	31.55	1.14 (1.08-1.20)
Disorders of Lipoid Metabolism (CC 25)	48.77	0.83 (0.79-0.87)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Liver Failure (CC 27, 30)	0.62	2.37 (1.92-2.92)
Other GI Disorders (CC 34, 35, 37, 38)	44.32	0.79 (0.75-0.83)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	43.69	0.80 (0.76-0.85)
Hematologic or Immunity Disorders (CC 46-48)	7.80	1.26 (1.16-1.36)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	24.48	1.81 (1.72-1.91)
Other Infectious Diseases (CC 7)	11.53	0.72 (0.66-0.77)
Metastatic & Severe Cancers (CC 8, 9)	1.84	2.75 (2.42-3.13)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.42	6.63 (5.43-8.10)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	6.09	2.01 (1.86-2.18)
Congestive Heart Failure (CC 85)	20.22	1.66 (1.57-1.76)
Hypertension and hypertensive heart disease (CC 94, 95)	65.15	0.75 (0.71-0.79)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other injuries and conditions due to external causes (CCS 244)	5.69	Reference Group
Other fractures (CCS 231)	36.98	0.94 (0.85-1.03)
Spondylosis; intervertebral disc disorders; other back problems (CCS 205)	14.44	0.49 (0.43-0.56)
Fracture of upper limb (CCS 229)	6.85	0.75 (0.66-0.86)
Fracture of lower limb (CCS 230)	5.91	0.96 (0.84-1.10)
Superficial injury; contusion (CCS 239)	5.77	0.48 (0.41-0.56)
Pathological fracture (CCS 207)	5.19	0.98 (0.86-1.12)
Fracture of neck of femur (hip) (CCS 226)	4.60	4.11 (3.68-4.58)
Other non-traumatic joint disorders (CCS 204)	3.60	0.47 (0.38-0.57)
Osteoarthritis (CCS 203)	2.44	0.32 (0.24-0.43)
Skull and face fractures (CCS 228)	2.13	0.72 (0.59-0.89)
Sprains and strains (CCS 232)	1.96	0.42 (0.32-0.55)
Open wounds of head; neck; and trunk (CCS 235)	1.56	0.55 (0.43-0.71)
Other bone disease and musculoskeletal deformities (CCS 212)	1.20	0.45 (0.32-0.63)
Open wounds of extremities (CCS 236)	1.06	0.38 (0.26-0.55)
Joint disorders and dislocations; trauma-related (CCS 225)	0.38	0.97 (0.63-1.51)
Other acquired deformities (CCS 209)	0.20	0.60 (0.29-1.24)
Low frequency CCS combined (CCS N/A)	0.03	<0.001 (<0.001->999.999)

Table 19. Non-Surgical Pulmonary Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	78.7 (7.99)	1.05 (1.05-1.05)
Pneumonia (CC 114-116)	26.63	1.15 (1.13-1.17)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	5.58	1.15 (1.11-1.19)
Acute or Unspecified Renal Failure (135, 140)	20.36	1.34 (1.31-1.37)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	7.10	0.86 (0.83-0.89)
Minor Symptoms, Signs, Findings (CC 179)	51.03	2.11 (2.06-2.15)
Protein-Calorie Malnutrition (CC 21)	10.02	1.72 (1.68-1.76)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	44.35	1.26 (1.24-1.29)
Disorders of Lipoid Metabolism (CC 25)	52.09	0.80 (0.79-0.82)
Liver Failure (CC 27, 30)	0.86	2.00 (1.86-2.15)
Other GI Disorders (CC 34, 35, 37, 38)	46.41	0.81 (0.80-0.83)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	33.97	0.84 (0.82-0.86)
Hematologic or Immunity Disorders (CC 46-48)	10.22	1.07 (1.04-1.10)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	20.08	1.50 (1.47-1.53)
Other Infectious Diseases (CC 7)	14.71	0.89 (0.87-0.92)
Metastatic & Severe Cancers (CC 8, 9)	4.10	2.57 (2.48-2.66)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	1.05	5.87 (5.53-6.24)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	27.87	1.76 (1.72-1.79)
Congestive Heart Failure (CC 85)	37.67	1.36 (1.34-1.39)
Hypertension and hypertensive heart disease (CC 94, 95)	62.60	0.83 (0.81-0.85)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other lower respiratory disease (CCS 133)	2.80	Reference Group
Pneumonia (except that caused by tuberculosis or sexually transmitted disease) (CCS 122)	36.02	0.69 (0.66-0.73)
Chronic obstructive pulmonary disease and bronchiectasis (CCS 127)	23.94	0.44 (0.41-0.46)
Respiratory failure; insufficiency; arrest (adult) (CCS 131)	12.88	2.05 (1.94-2.17)
Aspiration pneumonitis; food/vomitus (CCS 129)	7.27	1.64 (1.54-1.73)
Influenza (CCS 123)	5.85	0.36 (0.34-0.39)
Asthma (CCS 128)	5.34	0.24 (0.22-0.27)
Acute bronchitis (CCS 125)	2.51	0.16 (0.14-0.18)
Pleurisy; pneumothorax; pulmonary collapse (CCS 130)	2.46	0.83 (0.77-0.90)
Other upper respiratory infections (CCS 126)	0.75	0.17 (0.14-0.22)
Lung disease due to external agents (CCS 132)	0.17	0.86 (0.70-1.06)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Low frequency CCS combined	0.00	1.41 (0.31-6.39)

Table 20. Non-Surgical Renal Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	79.2 (8.03)	1.06 (1.06-1.06)
Pneumonia (CC 114-116)	13.45	1.47 (1.41-1.52)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	16.86	1.29 (1.24-1.34)
Acute or Unspecified Renal Failure (135, 140)	24.76	1.19 (1.15-1.23)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	7.39	0.94 (0.90-0.99)
Minor Symptoms, Signs, Findings (CC 179)	53.15	2.11 (2.04-2.19)
Protein-Calorie Malnutrition (CC 21)	11.25	1.93 (1.86-2.00)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	64.42	1.19 (1.15-1.24)
Disorders of Lipoid Metabolism (CC 25)	56.16	0.78 (0.76-0.81)
Liver Failure (CC 27, 30)	1.55	3.18 (2.93-3.45)
Other GI Disorders (CC 34, 35, 37, 38)	51.76	0.78 (0.75-0.80)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	40.31	0.83 (0.80-0.85)
Hematologic or Immunity Disorders (CC 46-48)	11.36	1.34 (1.28-1.39)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	25.58	1.73 (1.68-1.79)
Other Infectious Diseases (CC 7)	18.68	0.82 (0.79-0.85)
Metastatic & Severe Cancers (CC 8, 9)	3.32	2.78 (2.61-2.95)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.45	2.25 (1.93-2.63)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	10.24	1.61 (1.55-1.69)
Congestive Heart Failure (CC 85)	36.23	1.56 (1.51-1.61)
Hypertension and hypertensive heart disease (CC 94, 95)	45.83	0.84 (0.81-0.87)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Hypertension with complications and secondary hypertension (CCS 99)	17.34	Reference Group
Acute and unspecified renal failure (CCS 157)	47.10	1.75 (1.67-1.83)
Fluid and electrolyte disorders (CCS 55)	29.72	1.14 (1.08-1.20)
Essential hypertension (CCS 98)	3.53	0.21 (0.16-0.26)
Other diseases of kidney and ureters (CCS 161)	1.26	1.04 (0.88-1.23)
Chronic kidney disease (CCS 158)	0.75	1.99 (1.71-2.32)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Nephritis; nephrosis; renal sclerosis (CCS 156)	0.31	1.09 (0.80-1.49)

Table 21. Other Non-Surgical Conditions Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	77.7 (7.92)	1.05 (1.05-1.06)
Pneumonia (CC 114-116)	11.42	1.49 (1.44-1.54)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	8.57	1.48 (1.41-1.54)
Acute or Unspecified Renal Failure (135, 140)	24.24	1.25 (1.22-1.29)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	7.66	0.92 (0.88-0.96)
Minor Symptoms, Signs, Findings (CC 179)	48.19	2.10 (2.04-2.17)
Protein-Calorie Malnutrition (CC 21)	9.32	1.81 (1.75-1.87)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	43.40	1.35 (1.31-1.39)
Disorders of Lipoid Metabolism (CC 25)	55.23	0.80 (0.78-0.82)
Liver Failure (CC 27, 30)	1.91	2.45 (2.28-2.62)
Other GI Disorders (CC 34, 35, 37, 38)	48.95	0.80 (0.78-0.82)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	37.66	0.85 (0.82-0.87)
Hematologic or Immunity Disorders (CC 46-48)	12.82	1.32 (1.27-1.36)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	21.88	1.47 (1.42-1.51)
Other Infectious Diseases (CC 7)	18.41	0.89 (0.86-0.92)
Metastatic & Severe Cancers (CC 8, 9)	4.30	2.68 (2.56-2.82)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.77	2.75 (2.49-3.02)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	8.58	1.70 (1.64-1.77)
Congestive Heart Failure (CC 85)	25.32	1.42 (1.37-1.46)
Hypertension and hypertensive heart disease (CC 94, 95)	62.33	0.77 (0.74-0.79)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other ear and sense organ disorders (CCS 94)	0.11	Reference Group
Complication of device; implant or graft (CCS 237)	11.13	4.20 (1.86-9.48)
Complications of surgical procedures or medical care (CCS 238)	8.76	2.78 (1.23-6.29)
Diabetes mellitus with complications (CCS 50)	8.11	3.31 (1.46-7.47)
Deficiency and other anemia (CCS 59)	7.45	3.69 (1.63-8.35)
Other circulatory disease (CCS 117)	5.60	2.78 (1.23-6.30)
Phlebitis; thrombophlebitis and thromboembolism (CCS 118)	5.51	2.64 (1.17-5.98)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Delirium, dementia, and amnestic and other cognitive disorders (CCS 653)	4.91	5.65 (2.50-12.78)
Peripheral and visceral atherosclerosis (CCS 114)	4.65	6.31 (2.79-14.28)
Other connective tissue disease (CCS 211)	4.57	2.42 (1.07-5.47)
Residual codes; unclassified (CCS 259)	3.31	3.89 (1.72-8.81)
Conditions associated with dizziness or vertigo (CCS 93)	3.12	0.33 (0.14-0.79)
Other endocrine disorders (CCS 51)	2.34	3.24 (1.43-7.34)
Alcohol-related disorders (CCS 660)	2.19	5.12 (2.26-11.62)
Acute posthemorrhagic anemia (CCS 60)	2.06	3.35 (1.48-7.59)
Calculus of urinary tract (CCS 160)	2.03	1.23 (0.53-2.84)
Other nutritional; endocrine; and metabolic disorders (CCS 58)	1.89	6.61 (2.92-14.97)
Poisoning by other medications and drugs (CCS 242)	1.67	2.99 (1.31-6.80)
Malaise and fatigue (CCS 252)	1.47	2.90 (1.28-6.61)
Substance-related disorders (CCS 661)	1.32	2.86 (1.25-6.51)
Genitourinary symptoms and ill-defined conditions (CCS 163)	1.29	2.97 (1.30-6.76)
Aortic; peripheral; and visceral artery aneurysms (CCS 115)	1.27	24.11 (10.65-54.60)
Diseases of white blood cells (CCS 63)	1.25	4.64 (2.04-10.54)
Chronic ulcer of skin (CCS 199)	1.09	5.78 (2.54-13.12)
Other upper respiratory disease (CCS 134)	0.89	3.20 (1.40-7.32)
Gout and other crystal arthropathies (CCS 54)	0.78	0.90 (0.38-2.14)
Headache; including migraine (CCS 84)	0.77	0.63 (0.25-1.61)
Other and unspecified benign neoplasm (CCS 47)	0.73	2.90 (1.26-6.66)
Coagulation and hemorrhagic disorders (CCS 62)	0.72	6.22 (2.73-14.18)
Other diseases of veins and lymphatics (CCS 121)	0.69	2.53 (1.09-5.83)
Inflammatory conditions of male genital organs (CCS 165)	0.65	1.25 (0.52-3.01)
Aortic and peripheral arterial embolism or thrombosis (CCS 116)	0.64	10.69 (4.69-24.34)
Poisoning by psychotropic agents (CCS 241)	0.61	2.88 (1.25-6.67)
Allergic reactions (CCS 253)	0.52	2.08 (0.89-4.89)
Hyperplasia of prostate (CCS 164)	0.45	2.13 (0.91-5.00)
Diseases of mouth; excluding dental (CCS 137)	0.45	3.80 (1.65-8.78)
Thyroid disorders (CCS 48)	0.44	3.35 (1.45-7.74)
Nutritional deficiencies (CCS 52)	0.36	8.35 (3.65-19.07)
Other diseases of bladder and urethra (CCS 162)	0.36	3.46 (1.48-8.08)
Gangrene (CCS 248)	0.34	15.30 (6.71-34.91)
Rheumatoid arthritis and related disease (CCS 202)	0.28	2.96 (1.24-7.07)
Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease) (CCS 90)	0.25	2.31 (0.94-5.63)
Other inflammatory condition of skin (CCS 198)	0.24	4.45 (1.89-10.45)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Blindness and vision defects (CCS 89)	0.24	0.75 (0.26-2.15)
Diabetes mellitus without complication (CCS 49)	0.22	2.15 (0.88-5.26)
Disorders of teeth and jaw (CCS 136)	0.22	2.40 (0.98-5.91)
Poisoning by nonmedicinal substances (CCS 243)	0.21	3.68 (1.53-8.83)
Other eye disorders (CCS 91)	0.19	1.39 (0.51-3.79)
Retinal detachments; defects; vascular occlusion; and retinopathy (CCS 87)	0.15	0.83 (0.25-2.78)
Low frequency CCS combined	0.14	5.09 (2.13-12.17)
Nonmalignant breast conditions (CCS 167)	0.14	2.37 (0.88-6.35)
Other skin disorders (CCS 200)	0.13	1.43 (0.52-3.94)
Systemic lupus erythematosus and connective tissue disorders (CCS 210)	0.13	7.62 (3.21-18.12)
Other female genital disorders (CCS 175)	0.11	4.54 (1.86-11.08)
Otitis media and related conditions (CCS 92)	0.11	2.11 (0.77-5.74)
Other hematologic conditions (CCS 64)	0.09	4.52 (1.82-11.23)
Inflammatory diseases of female pelvic organs (CCS 168)	0.09	4.69 (1.86-11.85)
Other male genital disorders (CCS 166)	0.09	3.75 (1.46-9.62)
Menopausal disorders (CCS 173)	0.07	2.46 (0.90-6.77)
Varicose veins of lower extremity (CCS 119)	0.07	2.27 (0.79-6.52)
Other aftercare (CCS 257)	0.06	1.55 (0.46-5.23)
Lymphadenitis (CCS 247)	0.05	5.35 (1.95-14.74)
Other screening for suspected conditions (not mental disorders or infectious disease) (CCS 258)	0.04	1.08 (0.26-4.49)
Acute and chronic tonsillitis (CCS 124)	0.04	1.34 (0.26-6.83)
Sickle cell anemia (CCS 61)	0.03	2.03 (0.59-6.95)
Genitourinary congenital anomalies (CCS 215)	0.03	2.88 (0.79-10.52)
Other congenital anomalies (CCS 217)	0.03	1.65 (0.32-8.38)
Prolapse of female genital organs (CCS 170)	0.03	2.37 (0.57-9.88)

Table 22. Cancer Surgery Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	74.4 (6.74)	1.06 (1.05-1.06)
Pneumonia (CC 114-116)	5.68	2.17 (1.92-2.45)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	1.88	1.67 (1.36-2.05)
Acute or Unspecified Renal Failure (135, 140)	6.52	1.25 (1.10-1.42)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	2.28	0.64 (0.52-0.81)
Minor Symptoms, Signs, Findings (CC 179)	28.86	1.99 (1.81-2.18)
Protein-Calorie Malnutrition (CC 21)	6.13	2.30 (2.06-2.58)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	13.23	1.42 (1.28-1.59)
Disorders of Lipoid Metabolism (CC 25)	48.06	0.95 (0.87-1.04)
Liver Failure (CC 27, 30)	0.57	2.74 (2.05-3.67)
Other GI Disorders (CC 34, 35, 37, 38)	44.31	0.79 (0.72-0.86)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	24.62	0.86 (0.78-0.95)
Hematologic or Immunity Disorders (CC 46-48)	4.99	1.41 (1.23-1.62)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	4.47	1.62 (1.41-1.87)
Other Infectious Diseases (CC 7)	4.26	0.89 (0.76-1.05)
Metastatic & Severe Cancers (CC 8, 9)	4.46	0.95 (0.81-1.13)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	1.74	1.24 (0.88-1.74)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	2.61	1.48 (1.25-1.76)
Congestive Heart Failure (CC 85)	9.09	1.76 (1.58-1.97)
Hypertension and hypertensive heart disease (CC 94, 95)	61.48	0.86 (0.78-0.94)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Neoplasms of unspecified nature or uncertain behavior (CCS 44)	3.52	Reference Group
Cancer of colon (CCS 14)	16.91	1.06 (0.82-1.38)
Cancer of prostate (CCS 29)	13.60	0.32 (0.22-0.47)
Cancer of bronchus; lung (CCS 19)	13.44	1.34 (1.02-1.75)
Cancer of kidney and renal pelvis (CCS 33)	8.91	0.80 (0.59-1.09)
Cancer of bladder (CCS 32)	6.36	1.21 (0.91-1.61)
Cancer of breast (CCS 24)	5.26	0.20 (0.12-0.34)
Cancer of rectum and anus (CCS 15)	4.51	1.17 (0.86-1.59)
Cancer of uterus (CCS 25)	4.45	0.47 (0.31-0.73)
Cancer of head and neck (CCS 11)	3.02	0.81 (0.56-1.17)
Cancer of brain and nervous system (CCS 35)	2.25	1.94 (1.31-2.86)
Non-Hodgkin`s lymphoma (CCS 38)	2.04	3.93 (2.95-5.23)
Cancer of stomach (CCS 13)	1.68	2.08 (1.49-2.90)
Cancer of other GI organs; peritoneum (CCS 18)	1.64	1.79 (1.26-2.56)
Cancer of pancreas (CCS 17)	1.63	1.81 (1.28-2.56)
Cancer of bone and connective tissue (CCS 21)	1.43	1.00 (0.64-1.59)
Cancer of ovary (CCS 27)	1.33	0.86 (0.52-1.43)
Cancer of other urinary organs (CCS 34)	1.22	0.69 (0.40-1.17)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Other non-epithelial cancer of skin (CCS 23)	1.10	0.31 (0.16-0.60)
Cancer of other female genital organs (CCS 28)	1.00	0.56 (0.29-1.08)
Cancer of liver and intrahepatic bile duct (CCS 16)	0.98	2.25 (1.51-3.34)
Cancer of thyroid (CCS 36)	0.77	0.81 (0.40-1.65)
Cancer of esophagus (CCS 12)	0.72	2.73 (1.84-4.07)
Cancer; other and unspecified primary (CCS 41)	0.40	1.07 (0.50-2.28)
Melanomas of skin (CCS 22)	0.37	0.60 (0.21-1.66)
Cancer of cervix (CCS 26)	0.30	0.97 (0.35-2.70)
Multiple myeloma (CCS 40)	0.27	2.72 (1.56-4.75)
Malignant neoplasm without specification of site (CCS 43)	0.26	2.69 (1.46-4.94)
Low frequency CCS combined	0.17	2.28 (1.22-4.27)
Leukemias (CCS 39)	0.17	8.33 (5.16-13.44)
Cancer; other respiratory and intrathoracic (CCS 20)	0.17	0.86 (0.30-2.49)
Cancer of other male genital organs (CCS 31)	0.13	0.78 (0.19-3.28)

Table 23. Cardiothoracic Surgery Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	75.1 (6.65)	1.05 (1.05-1.05)
Pneumonia (CC 114-116)	11.35	1.27 (1.19-1.36)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	4.37	1.51 (1.38-1.66)
Acute or Unspecified Renal Failure (135, 140)	11.04	1.21 (1.13-1.30)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	3.11	0.95 (0.83-1.07)
Minor Symptoms, Signs, Findings (CC 179)	36.46	1.59 (1.51-1.67)
Protein-Calorie Malnutrition (CC 21)	5.26	1.36 (1.25-1.48)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	18.29	1.36 (1.28-1.45)
Disorders of Lipoid Metabolism (CC 25)	71.81	0.70 (0.66-0.74)
Liver Failure (CC 27, 30)	1.00	2.36 (2.02-2.74)
Other GI Disorders (CC 34, 35, 37, 38)	39.69	0.75 (0.71-0.80)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	27.97	0.87 (0.82-0.93)
Hematologic or Immunity Disorders (CC 46-48)	9.57	1.15 (1.06-1.24)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	4.13	1.23 (1.11-1.36)
Other Infectious Diseases (CC 7)	5.28	0.70 (0.63-0.78)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Metastatic & Severe Cancers (CC 8, 9)	1.48	1.56 (1.32-1.84)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.59	3.24 (2.71-3.88)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	11.74	2.42 (2.28-2.58)
Congestive Heart Failure (CC 85)	41.35	1.38 (1.30-1.46)
Hypertension and hypertensive heart disease (CC 94, 95)	66.07	0.80 (0.76-0.84)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Hypertension with complications and secondary hypertension (CCS 99)	0.31	Reference Group
Heart valve disorders (CCS 96)	28.89	0.49 (0.36-0.67)
Coronary atherosclerosis and other heart disease (CCS 101)	26.46	0.53 (0.38-0.72)
Acute myocardial infarction (CCS 100)	15.30	2.12 (1.55-2.90)
Cardiac dysrhythmias (CCS 106)	9.21	0.34 (0.25-0.48)
Congestive heart failure; nonhypertensive (CCS 108)	2.54	0.98 (0.71-1.36)
Complication of device; implant or graft (CCS 237)	2.27	1.13 (0.81-1.59)
Other lower respiratory disease (CCS 133)	2.09	0.36 (0.23-0.54)
Pleurisy; pneumothorax; pulmonary collapse (CCS 130)	2.04	0.73 (0.51-1.03)
Low frequency CCS combined	1.83	1.25 (0.89-1.76)
Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease) (CCS 97)	1.65	0.68 (0.47-0.98)
Septicemia (except in labor) (CCS 2)	1.39	1.33 (0.95-1.87)
Aortic; peripheral; and visceral artery aneurysms (CCS 115)	1.19	2.71 (1.92-3.84)
Complications of surgical procedures or medical care (CCS 238)	1.03	0.64 (0.43-0.95)
Pneumonia (except that caused by tuberculosis or sexually transmitted disease) (CCS 122)	0.77	1.16 (0.79-1.69)
Other and unspecified benign neoplasm (CCS 47)	0.58	0.19 (0.08-0.43)
Cardiac and circulatory congenital anomalies (CCS 213)	0.55	0.56 (0.32-0.96)
Respiratory failure; insufficiency; arrest (adult) (CCS 131)	0.41	1.84 (1.24-2.71)
Chronic obstructive pulmonary disease and bronchiectasis (CCS 127)	0.33	0.98 (0.61-1.57)
Other upper respiratory disease (CCS 134)	0.25	0.34 (0.16-0.71)
Cardiac arrest and ventricular fibrillation (CCS 107)	0.18	3.07 (1.98-4.78)
Conduction disorders (CCS 105)	0.17	0.87 (0.47-1.60)
Acute cerebrovascular disease (CCS 109)	0.14	0.87 (0.44-1.69)
Other and ill-defined heart disease (CCS 104)	0.12	0.63 (0.31-1.29)
Acute and unspecified renal failure (CCS 157)	0.11	2.04 (1.20-3.48)
Pulmonary heart disease (CCS 103)	0.11	2.39 (1.38-4.16)
Abdominal hernia (CCS 143)	0.10	1.05 (0.45-2.44)

Table 24. General Surgery Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	75.1 (7.18)	1.06 (1.06-1.07)
Pneumonia (CC 114-116)	8.84	1.53 (1.44-1.61)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	4.08	1.51 (1.38-1.64)
Acute or Unspecified Renal Failure (135, 140)	14.50	1.42 (1.35-1.49)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	3.25	0.89 (0.81-0.97)
Minor Symptoms, Signs, Findings (CC 179)	34.19	2.05 (1.95-2.15)
Protein-Calorie Malnutrition (CC 21)	10.88	1.52 (1.44-1.60)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	29.16	1.37 (1.30-1.44)
Disorders of Lipoid Metabolism (CC 25)	49.52	0.83 (0.79-0.87)
Liver Failure (CC 27, 30)	1.53	2.49 (2.23-2.78)
Other GI Disorders (CC 34, 35, 37, 38)	60.39	0.77 (0.73-0.80)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	30.29	0.92 (0.88-0.97)
Hematologic or Immunity Disorders (CC 46-48)	7.35	1.25 (1.17-1.33)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	7.50	1.25 (1.18-1.33)
Other Infectious Diseases (CC 7)	9.56	0.77 (0.72-0.82)
Metastatic & Severe Cancers (CC 8, 9)	2.30	1.46 (1.32-1.63)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.27	2.23 (1.79-2.78)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	6.09	1.67 (1.56-1.78)
Congestive Heart Failure (CC 85)	14.60	1.52 (1.45-1.60)
Hypertension and hypertensive heart disease (CC 94, 95)	63.53	0.80 (0.76-0.84)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Hypertension with complications and secondary hypertension (CCS 99)	0.48	Reference Group
Biliary tract disease (CCS 149)	19.68	0.76 (0.52-1.13)
Abdominal hernia (CCS 143)	15.66	1.35 (0.91-1.99)
Intestinal obstruction without hernia (CCS 145)	8.59	2.76 (1.88-4.07)
Septicemia (except in labor) (CCS 2)	6.97	6.35 (4.32-9.34)
Diverticulosis and diverticulitis (CCS 146)	5.04	2.10 (1.41-3.12)
Appendicitis and other appendiceal conditions (CCS 142)	4.92	0.67 (0.43-1.03)
Other and unspecified benign neoplasm (CCS 47)	4.57	0.81 (0.52-1.25)
Other gastrointestinal disorders (CCS 155)	4.26	1.97 (1.33-2.93)
Spondylosis; intervertebral disc disorders; other back problems (CCS 205)	3.09	0.41 (0.24-0.70)
Complications of surgical procedures or medical care (CCS 238)	2.85	2.34 (1.56-3.49)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Pancreatic disorders (not diabetes) (CCS 152)	2.66	0.88 (0.57-1.36)
Other nutritional; endocrine; and metabolic disorders (CCS 58)	2.59	0.63 (0.36-1.09)
Complication of device; implant or graft (CCS 237)	2.08	2.23 (1.49-3.35)
Anal and rectal conditions (CCS 147)	1.96	0.97 (0.62-1.52)
Low frequency CCS combined	1.42	3.69 (2.46-5.53)
Peripheral and visceral atherosclerosis (CCS 114)	1.16	12.61 (8.50-18.71)
Gastroduodenal ulcer (except hemorrhage) (CCS 139)	1.15	5.36 (3.58-8.03)
Esophageal disorders (CCS 138)	0.94	1.49 (0.91-2.42)
Other acquired deformities (CCS 209)	0.72	0.47 (0.20-1.08)
Gastrointestinal hemorrhage (CCS 153)	0.70	5.09 (3.37-7.69)
Other female genital disorders (CCS 175)	0.48	1.71 (0.98-2.98)
Other diseases of bladder and urethra (CCS 162)	0.48	1.42 (0.81-2.47)
Other disorders of stomach and duodenum (CCS 141)	0.47	2.55 (1.60-4.06)
Prolapse of female genital organs (CCS 170)	0.44	0.64 (0.26-1.57)
Regional enteritis and ulcerative colitis (CCS 144)	0.42	1.63 (0.93-2.84)
Pneumonia (except that caused by tuberculosis or sexually transmitted disease) (CCS 122)	0.32	4.94 (3.18-7.67)
Acute and unspecified renal failure (CCS 157)	0.30	4.50 (2.88-7.01)
Other liver diseases (CCS 151)	0.26	2.44 (1.45-4.12)
Respiratory failure; insufficiency; arrest (adult) (CCS 131)	0.24	6.47 (4.12-10.15)
Peritonitis and intestinal abscess (CCS 148)	0.24	4.15 (2.53-6.81)
Cardiac dysrhythmias (CCS 106)	0.23	3.70 (2.25-6.08)
Other congenital anomalies (CCS 217)	0.23	0.65 (0.20-2.17)
Aortic; peripheral; and visceral artery aneurysms (CCS 115)	0.22	31.76 (20.52-49.14)
Diabetes mellitus with complications (CCS 50)	0.22	1.59 (0.85-2.96)
Congestive heart failure; nonhypertensive (CCS 108)	0.21	3.01 (1.87-4.83)
Chronic obstructive pulmonary disease and bronchiectasis (CCS 127)	0.19	5.40 (3.35-8.69)
Skin and subcutaneous tissue infections (CCS 197)	0.19	2.17 (1.15-4.09)
Occlusion or stenosis of precerebral arteries (CCS 110)	0.17	0.16 (0.02-1.16)
Other lower respiratory disease (CCS 133)	0.17	2.44 (1.32-4.53)
Acute cerebrovascular disease (CCS 109)	0.17	6.92 (4.30-11.13)
Aspiration pneumonitis; food/vomitus (CCS 129)	0.17	4.17 (2.58-6.72)
Acute myocardial infarction (CCS 100)	0.15	7.52 (4.62-12.24)
Other diseases of kidney and ureters (CCS 161)	0.14	0.63 (0.19-2.13)
Lymphadenitis (CCS 247)	0.14	1.23 (0.49-3.03)
Fluid and electrolyte disorders (CCS 55)	0.14	3.46 (2.00-5.98)
Urinary tract infections (CCS 159)	0.13	3.51 (2.00-6.17)
Other nervous system disorders (CCS 95)	0.12	3.88 (2.14-7.00)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Other injuries and conditions due to external causes (CCS 244)	0.12	2.02 (0.94-4.34)
Ovarian cyst (CCS 172)	0.12	0.66 (0.16-2.82)
Chronic kidney disease (CCS 158)	0.11	0.52 (0.16-1.74)
Abdominal pain (CCS 251)	0.11	5.40 (2.92-9.97)
Intestinal infection (CCS 135)	0.11	6.68 (3.95-11.29)
Digestive congenital anomalies (CCS 214)	0.11	1.60 (0.60-4.24)
Other fractures (CCS 231)	0.11	9.61 (5.70-16.21)
Deficiency and other anemia (CCS 59)	0.10	5.02 (2.78-9.05)
Benign neoplasm of uterus (CCS 46)	0.10	0.50 (0.07-3.68)
Other bone disease and musculoskeletal deformities (CCS 212)	0.09	0.41 (0.06-3.07)
Noninfectious gastroenteritis (CCS 154)	0.09	4.48 (2.31-8.68)
Coagulation and hemorrhagic disorders (CCS 62)	0.08	5.33 (2.65-10.72)
Nonmalignant breast conditions (CCS 167)	0.07	0.44 (0.06-3.27)
Other hematologic conditions (CCS 64)	0.07	6.25 (3.27-11.94)
Pleurisy; pneumothorax; pulmonary collapse (CCS 130)	0.07	3.41 (1.74-6.67)
Pulmonary heart disease (CCS 103)	0.07	5.07 (2.65-9.68)
Residual codes; unclassified (CCS 259)	0.07	2.24 (0.84-6.02)
Hyperplasia of prostate (CCS 164)	0.06	<0.001 (<0.001->999.99)
Chronic ulcer of skin (CCS 199)	0.06	4.77 (2.45-9.27)
Inflammatory diseases of female pelvic organs (CCS 168)	0.06	0.54 (0.07-4.05)
Coronary atherosclerosis and other heart disease (CCS 101)	0.06	6.46 (3.20-13.06)
Other circulatory disease (CCS 117)	0.06	6.24 (3.19-12.20)

Table 25. Neurosurgery Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	74.4 (6.46)	1.04 (1.03-1.05)
Pneumonia (CC 114-116)	6.85	1.25 (1.09-1.44)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	1.66	1.65 (1.26-2.16)
Acute or Unspecified Renal Failure (135, 140)	5.91	1.48 (1.26-1.74)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	3.02	0.91 (0.71-1.16)
Minor Symptoms, Signs, Findings (CC 179)	36.47	2.91 (2.61-3.24)
Protein-Calorie Malnutrition (CC 21)	4.73	0.94 (0.80-1.11)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	18.19	0.97 (0.87-1.09)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Disorders of Lipoid Metabolism (CC 25)	49.28	0.86 (0.78-0.95)
Liver Failure (CC 27, 30)	0.38	1.39 (0.83-2.31)
Other GI Disorders (CC 34, 35, 37, 38)	40.68	0.72 (0.65-0.80)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	34.98	0.82 (0.73-0.92)
Hematologic or Immunity Disorders (CC 46-48)	6.15	1.28 (1.10-1.50)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	25.76	1.88 (1.70-2.09)
Other Infectious Diseases (CC 7)	6.97	0.63 (0.53-0.76)
Metastatic & Severe Cancers (CC 8, 9)	1.26	1.16 (0.81-1.68)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	16.02	1.57 (1.40-1.75)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	9.01	3.31 (2.94-3.72)
Congestive Heart Failure (CC 85)	9.62	1.41 (1.23-1.61)
Hypertension and hypertensive heart disease (CC 94, 95)	67.59	0.96 (0.85-1.08)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other nervous system disorders (CCS 95)	4.78	Reference Group
Acute cerebrovascular disease (CCS 109)	22.61	6.77 (4.52-10.13)
Spondylosis; intervertebral disc disorders; other back problems (CCS 205)	21.06	0.33 (0.19-0.55)
Other hereditary and degenerative nervous system conditions (CCS 81)	11.11	0.58 (0.36-0.94)
Other and unspecified benign neoplasm (CCS 47)	10.15	0.75 (0.46-1.21)
Other fractures (CCS 231)	5.80	2.75 (1.77-4.28)
Low frequency CCS combined	4.90	5.05 (3.28-7.76)
Parkinson`s disease (CCS 79)	4.08	0.19 (0.06-0.63)
Complication of device; implant or graft (CCS 237)	3.59	0.92 (0.53-1.61)
Other acquired deformities (CCS 209)	3.53	0.45 (0.23-0.92)
Complications of surgical procedures or medical care (CCS 238)	2.52	1.03 (0.57-1.86)
Fracture of upper limb (CCS 229)	1.04	0.62 (0.21-1.82)
Other bone disease and musculoskeletal deformities (CCS 212)	0.86	0.65 (0.19-2.18)
Pathological fracture (CCS 207)	0.70	0.72 (0.24-2.14)
Septicemia (except in labor) (CCS 2)	0.68	7.78 (4.59-13.21)
Other CNS infection and poliomyelitis (CCS 78)	0.67	3.43 (1.81-6.49)
Other congenital anomalies (CCS 217)	0.66	0.96 (0.28-3.26)
Other connective tissue disease (CCS 211)	0.53	0.83 (0.19-3.57)
Nervous system congenital anomalies (CCS 216)	0.37	<0.001 (<0.001->999.99)
Other and ill-defined cerebrovascular disease (CCS 111)	0.37	1.48 (0.49-4.47)

Table 26. Orthopedic Surgery Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	75.6 (7.34)	1.06 (1.06-1.06)
Pneumonia (CC 114-116)	3.68	1.85 (1.75-1.96)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	2.06	2.02 (1.89-2.17)
Acute or Unspecified Renal Failure (135, 140)	5.43	1.15 (1.09-1.22)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	2.07	0.76 (0.70-0.84)
Minor Symptoms, Signs, Findings (CC 179)	26.14	1.96 (1.88-2.04)
Protein-Calorie Malnutrition (CC 21)	2.86	1.93 (1.83-2.04)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	13.83	1.10 (1.05-1.15)
Disorders of Lipoid Metabolism (CC 25)	51.04	0.89 (0.85-0.92)
Liver Failure (CC 27, 30)	0.27	2.17 (1.83-2.58)
Other GI Disorders (CC 34, 35, 37, 38)	42.40	0.83 (0.80-0.87)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	32.94	0.85 (0.82-0.89)
Hematologic or Immunity Disorders (CC 46-48)	4.47	1.22 (1.15-1.30)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	9.56	1.89 (1.81-1.97)
Other Infectious Diseases (CC 7)	6.71	0.84 (0.79-0.88)
Metastatic & Severe Cancers (CC 8, 9)	0.75	2.00 (1.77-2.25)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.11	1.62 (1.27-2.07)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	2.24	1.33 (1.24-1.43)
Congestive Heart Failure (CC 85)	10.04	1.99 (1.90-2.08)
Hypertension and hypertensive heart disease (CC 94, 95)	66.06	0.77 (0.74-0.80)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Other nervous system disorders (CCS 95)	0.07	Reference Group
Osteoarthritis (CCS 203)	47.53	0.12 (0.07-0.21)
Fracture of neck of femur (hip) (CCS 226)	17.08	1.19 (0.69-2.03)
Spondylosis; intervertebral disc disorders; other back problems (CCS 205)	11.00	0.36 (0.21-0.62)
Complication of device; implant or graft (CCS 237)	5.85	0.60 (0.35-1.03)
Fracture of lower limb (CCS 230)	4.00	0.99 (0.58-1.70)
Fracture of upper limb (CCS 229)	2.34	0.60 (0.34-1.04)
Other acquired deformities (CCS 209)	1.41	0.20 (0.10-0.39)
Diabetes mellitus with complications (CCS 50)	1.29	1.17 (0.67-2.02)
Pathological fracture (CCS 207)	1.20	0.85 (0.49-1.48)
Other fractures (CCS 231)	1.15	1.02 (0.59-1.77)
Other bone disease and musculoskeletal deformities (CCS 212)	1.05	0.40 (0.22-0.73)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Other non-traumatic joint disorders (CCS 204)	0.77	0.22 (0.11-0.46)
Septicemia (except in labor) (CCS 2)	0.70	3.03 (1.76-5.22)
Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease) (CCS 201)	0.70	0.82 (0.47-1.45)
Complications of surgical procedures or medical care (CCS 238)	0.47	1.32 (0.75-2.33)
Gangrene (CCS 248)	0.43	1.72 (0.99-2.99)
Other congenital anomalies (CCS 217)	0.40	0.19 (0.07-0.50)
Joint disorders and dislocations; trauma-related (CCS 225)	0.39	0.78 (0.42-1.45)
Low frequency CCS combined	0.38	1.55 (0.88-2.72)
Other connective tissue disease (CCS 211)	0.38	0.48 (0.24-0.96)
Peripheral and visceral atherosclerosis (CCS 114)	0.17	1.80 (1.01-3.21)
Sprains and strains (CCS 232)	0.12	0.08 (0.01-0.62)
Rheumatoid arthritis and related disease (CCS 202)	0.12	0.17 (0.04-0.77)
Skin and subcutaneous tissue infections (CCS 197)	0.10	1.10 (0.56-2.15)
Chronic ulcer of skin (CCS 199)	0.09	1.42 (0.76-2.66)
Other aftercare (CCS 257)	0.08	0.28 (0.08-0.98)
Cardiac dysrhythmias (CCS 106)	0.07	1.33 (0.68-2.60)
Other hereditary and degenerative nervous system conditions (CCS 81)	0.06	0.33 (0.11-1.02)
Acute and unspecified renal failure (CCS 157)	0.05	1.84 (0.96-3.54)
Acute cerebrovascular disease (CCS 109)	0.05	4.30 (2.30-8.03)
Congestive heart failure; nonhypertensive (CCS 108)	0.05	2.28 (1.22-4.24)
Pneumonia (except that caused by tuberculosis or sexually transmitted disease) (CCS 122)	0.04	2.44 (1.29-4.61)
Urinary tract infections (CCS 159)	0.04	0.69 (0.30-1.57)
Respiratory failure; insufficiency; arrest (adult) (CCS 131)	0.04	3.70 (1.94-7.06)
Acquired foot deformities (CCS 208)	0.03	<0.001 (<0.001->999.99)
Fluid and electrolyte disorders (CCS 55)	0.03	1.06 (0.48-2.34)
Other circulatory disease (CCS 117)	0.03	2.16 (1.03-4.52)
Aortic and peripheral arterial embolism or thrombosis (CCS 116)	0.03	3.03 (1.53-5.99)
Acute myocardial infarction (CCS 100)	0.03	2.00 (0.97-4.14)
Other CNS infection and poliomyelitis (CCS 78)	0.03	2.10 (0.88-5.03)
Chronic obstructive pulmonary disease and bronchiectasis (CCS 127)	0.03	1.92 (0.89-4.16)
Open wounds of extremities (CCS 236)	0.03	1.56 (0.57-4.24)
Syncope (CCS 245)	0.02	1.00 (0.37-2.70)
Gout and other crystal arthropathies (CCS 54)	0.02	0.22 (0.03-1.71)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Gastrointestinal hemorrhage (CCS 153)	0.02	2.33 (1.10-4.94)
Other injuries and conditions due to external causes (CCS 244)	0.02	1.35 (0.46-3.96)

Table 27. Other Surgical Procedures Division Patient-Level (Not Hospital-Level) Model Risk Factor Frequencies and Odds Ratios (July 2014 – June 2015)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Age, years (mean, standard deviation)	75.3 (6.94)	1.05 (1.05-1.05)
Pneumonia (CC 114-116)	6.26	1.50 (1.39-1.62)
Dialysis or Severe Chronic Kidney Disease (CC 134, 136, 137)	4.22	1.54 (1.40-1.69)
Acute or Unspecified Renal Failure (135, 140)	13.12	1.21 (1.12-1.29)
Poisonings and Allergic and Inflammatory Reactions (CC 175)	3.23	0.87 (0.77-0.97)
Minor Symptoms, Signs, Findings (CC 179)	29.04	2.39 (2.26-2.54)
Protein-Calorie Malnutrition (CC 21)	5.34	1.71 (1.58-1.84)
Disorders of Fluid/Electrolyte/Acid-Base Balance (CC 24)	20.00	1.45 (1.36-1.55)
Disorders of Lipoid Metabolism (CC 25)	57.58	0.76 (0.72-0.80)
Liver Failure (CC 27, 30)	0.74	2.74 (2.30-3.25)
Other GI Disorders (CC 34, 35, 37, 38)	38.62	0.76 (0.72-0.81)
Other Musculoskeletal and Connective Tissue Disorders (CC 44, 45)	35.60	0.83 (0.78-0.88)
Hematologic or Immunity Disorders (CC 46-48)	6.66	1.33 (1.22-1.43)
Dementia and Other Nonpsychotic Organic Brain Syndromes (CC 51-53)	8.03	1.33 (1.24-1.43)
Other Infectious Diseases (CC 7)	11.74	0.73 (0.68-0.79)
Metastatic & Severe Cancers (CC 8, 9)	1.40	1.46 (1.25-1.71)
Coma/Brain Compression/Anoxic Injury and Severe Head Injury (CC 80, 166)	0.62	2.92 (2.48-3.44)
Respiratory Failure, Respirator Dependence, Shock (CC 82-84)	5.27	1.66 (1.53-1.80)
Congestive Heart Failure (CC 85)	15.39	1.53 (1.44-1.63)
Hypertension and hypertensive heart disease (CC 94, 95)	65.77	0.78 (0.73-0.82)
Principal Discharge Diagnosis (Condition Specific) Indicator (AHRQ CCS)		
Hypertension with complications and secondary hypertension (CCS 99)	0.16	Reference Group
Occlusion or stenosis of precerebral arteries (CCS 110)	17.90	0.37 (0.21-0.64)
Aortic; peripheral; and visceral artery aneurysms (CCS 115)	10.23	2.11 (1.24-3.61)
Peripheral and visceral atherosclerosis (CCS 114)	6.16	1.12 (0.65-1.93)
Calculus of urinary tract (CCS 160)	4.45	0.37 (0.21-0.65)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Osteoarthritis (CCS 203)	4.17	0.13 (0.06-0.28)
Septicemia (except in labor) (CCS 2)	4.13	2.54 (1.49-4.33)
Hyperplasia of prostate (CCS 164)	4.11	0.33 (0.18-0.59)
Complication of device; implant or graft (CCS 237)	3.97	1.53 (0.89-2.64)
Prolapse of female genital organs (CCS 170)	3.77	0.04 (0.01-0.11)
Complications of surgical procedures or medical care (CCS 238)	3.32	0.92 (0.53-1.59)
Acute cerebrovascular disease (CCS 109)	3.24	4.94 (2.89-8.44)
Other and unspecified benign neoplasm (CCS 47)	2.34	0.27 (0.14-0.54)
Other connective tissue disease (CCS 211)	2.30	0.34 (0.18-0.65)
Aortic and peripheral arterial embolism or thrombosis (CCS 116)	1.57	3.00 (1.74-5.18)
Spondylosis; intervertebral disc disorders; other back problems (CCS 205)	1.53	0.25 (0.11-0.57)
Skin and subcutaneous tissue infections (CCS 197)	1.33	0.74 (0.40-1.34)
Urinary tract infections (CCS 159)	1.29	0.96 (0.54-1.69)
Low frequency CCS combined (CCS N/A)	1.27	1.92 (1.10-3.34)
Diabetes mellitus with complications (CCS 50)	1.25	1.15 (0.65-2.05)
Other diseases of kidney and ureters (CCS 161)	1.19	0.67 (0.36-1.26)
Acute and unspecified renal failure (CCS 157)	1.00	1.87 (1.08-3.25)
Genitourinary symptoms and ill-defined conditions (CCS 163)	0.98	0.79 (0.43-1.43)
Fracture of upper limb (CCS 229)	0.93	0.55 (0.28-1.08)
Chronic ulcer of skin (CCS 199)	0.91	1.47 (0.84-2.58)
Other and ill-defined cerebrovascular disease (CCS 111)	0.84	0.41 (0.19-0.89)
Other diseases of bladder and urethra (CCS 162)	0.82	0.84 (0.45-1.56)
Sprains and strains (CCS 232)	0.80	0.42 (0.19-0.94)
Gangrene (CCS 248)	0.74	2.42 (1.38-4.25)
Thyroid disorders (CCS 48)	0.67	0.19 (0.06-0.58)
Open wounds of extremities (CCS 236)	0.58	0.79 (0.40-1.55)
Skull and face fractures (CCS 228)	0.54	0.75 (0.39-1.46)
Other female genital disorders (CCS 175)	0.53	0.23 (0.08-0.71)
Other non-traumatic joint disorders (CCS 204)	0.53	0.07 (0.01-0.56)
Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease) (CCS 201)	0.46	1.45 (0.77-2.73)
Fracture of lower limb (CCS 230)	0.40	0.99 (0.48-2.03)
Other endocrine disorders (CCS 51)	0.37	0.47 (0.19-1.17)
Benign neoplasm of uterus (CCS 46)	0.34	<0.001 (<0.001->999.99)
Cardiac dysrhythmias (CCS 106)	0.32	1.76 (0.94-3.28)
Other male genital disorders (CCS 166)	0.32	0.52 (0.22-1.23)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Open wounds of head; neck; and trunk (CCS 235)	0.31	1.11 (0.56-2.20)
Other acquired deformities (CCS 209)	0.31	0.10 (0.01-0.80)
Congestive heart failure; nonhypertensive (CCS 108)	0.29	2.07 (1.15-3.73)
Acute myocardial infarction (CCS 100)	0.28	5.23 (2.91-9.38)
Other circulatory disease (CCS 117)	0.25	1.68 (0.86-3.29)
Other upper respiratory disease (CCS 134)	0.25	0.87 (0.39-1.91)
Respiratory failure; insufficiency; arrest (adult) (CCS 131)	0.24	3.09 (1.69-5.66)
Other nervous system disorders (CCS 95)	0.24	1.17 (0.55-2.46)
Ovarian cyst (CCS 172)	0.22	<0.001 (<0.001->999.99)
Pneumonia (except that caused by tuberculosis or sexually transmitted disease) (CCS 122)	0.20	1.58 (0.84-2.99)
Diseases of mouth; excluding dental (CCS 137)	0.20	0.27 (0.08-0.95)
Acquired foot deformities (CCS 208)	0.20	0.19 (0.02-1.45)
Joint disorders and dislocations; trauma-related (CCS 225)	0.20	0.48 (0.14-1.70)
Other aftercare (CCS 257)	0.19	0.12 (0.02-0.96)
Other fractures (CCS 231)	0.19	2.87 (1.52-5.45)
Coronary atherosclerosis and other heart disease (CCS 101)	0.19	2.27 (1.09-4.74)
Disorders of teeth and jaw (CCS 136)	0.19	0.60 (0.21-1.71)
Fracture of neck of femur (hip) (CCS 226)	0.19	1.41 (0.70-2.84)
Menopausal disorders (CCS 173)	0.18	0.27 (0.06-1.21)
Other bone disease and musculoskeletal deformities (CCS 212)	0.18	0.49 (0.14-1.72)
Other injuries and conditions due to external causes (CCS 244)	0.18	1.44 (0.69-3.01)
Superficial injury; contusion (CCS 239)	0.18	0.67 (0.29-1.56)
Esophageal disorders (CCS 138)	0.17	0.67 (0.25-1.79)
Other diseases of veins and lymphatics (CCS 121)	0.16	0.99 (0.44-2.25)
Inflammatory diseases of female pelvic organs (CCS 168)	0.16	0.35 (0.10-1.23)
Transient cerebral ischemia (CCS 112)	0.16	0.71 (0.25-2.00)
Inflammatory conditions of male genital organs (CCS 165)	0.15	0.50 (0.16-1.54)
Fluid and electrolyte disorders (CCS 55)	0.15	1.28 (0.62-2.68)
Abdominal hernia (CCS 143)	0.15	0.46 (0.13-1.64)
Other liver diseases (CCS 151)	0.14	2.90 (1.52-5.54)
Residual codes; unclassified (CCS 259)	0.14	0.95 (0.35-2.55)
Phlebitis; thrombophlebitis and thromboembolism (CCS 118)	0.11	2.59 (1.27-5.28)
Chronic obstructive pulmonary disease and bronchiectasis (CCS 127)	0.11	1.02 (0.46-2.29)
Gastrointestinal hemorrhage (CCS 153)	0.11	3.46 (1.80-6.66)
Nonmalignant breast conditions (CCS 167)	0.11	<0.001 (<0.001->999.99)

Risk Variable	% Hospitalizations with Risk Variable	OR (95% CI)
Syncope (CCS 245)	0.11	1.03 (0.42-2.53)
Heart valve disorders (CCS 96)	0.11	1.81 (0.85-3.83)
Genitourinary congenital anomalies (CCS 215)	0.11	0.90 (0.29-2.80)
Other upper respiratory infections (CCS 126)	0.10	0.25 (0.03-1.93)
Other congenital anomalies (CCS 217)	0.09	0.42 (0.05-3.28)
Pulmonary heart disease (CCS 103)	0.08	3.79 (1.82-7.89)
Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease) (CCS 90)	0.07	1.09 (0.35-3.41)
Other skin disorders (CCS 200)	0.07	<0.001 (<0.001->999.99)
Other nutritional; endocrine; and metabolic disorders (CCS 58)	0.07	1.36 (0.46-4.00)
Other gastrointestinal disorders (CCS 155)	0.07	2.36 (1.00-5.57)
Aspiration pneumonitis; food/vomitus (CCS 129)	0.07	3.53 (1.74-7.15)
Acute and chronic tonsillitis (CCS 124)	0.07	0.43 (0.06-3.36)
Intestinal obstruction without hernia (CCS 145)	0.06	0.67 (0.21-2.12)
Cardiac and circulatory congenital anomalies (CCS 213)	0.06	0.29 (0.04-2.31)
Deficiency and other anemia (CCS 59)	0.06	1.47 (0.61-3.51)
Other eye disorders (CCS 91)	0.06	0.60 (0.13-2.70)
Acute post-hemorrhagic anemia (CCS 60)	0.06	1.22 (0.49-3.08)
Pathological fracture (CCS 207)	0.06	0.48 (0.11-2.22)
Other ear and sense organ disorders (CCS 94)	0.06	<0.001 (<0.001->999.99)
Otitis media and related conditions (CCS 92)	0.06	0.67 (0.15-3.04)