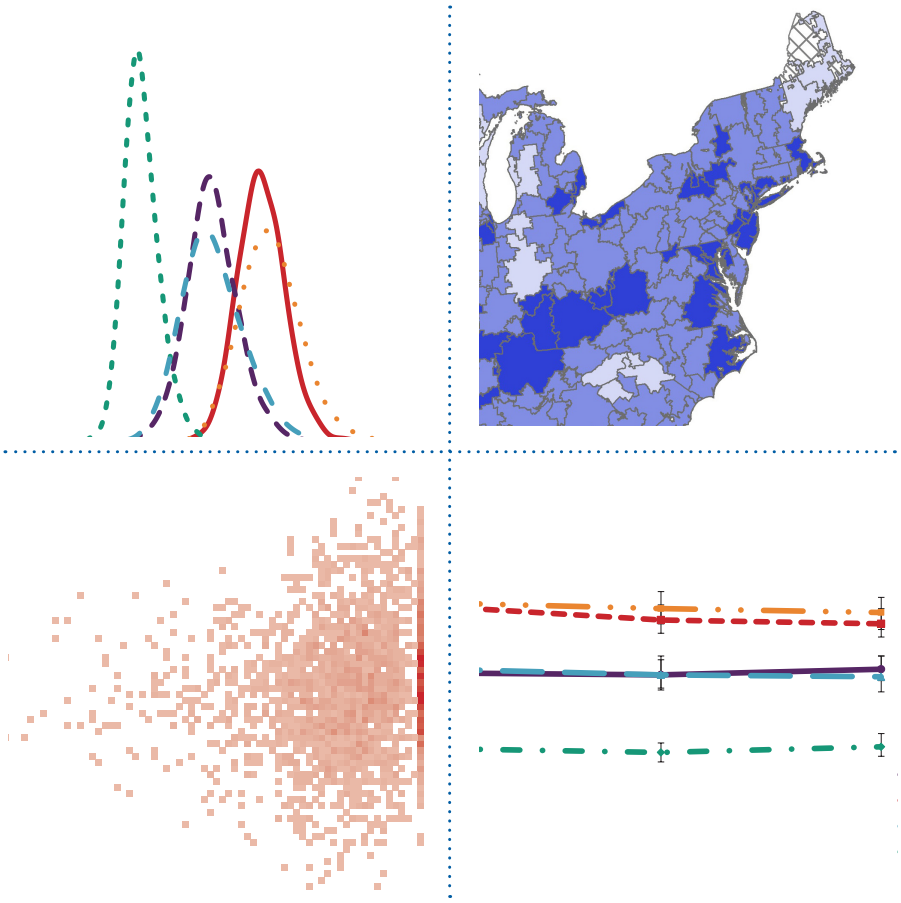
CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES

Medicare Hospital Quality Chartbook

Performance Report on Outcome Measures

SEPTEMBER 2014



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SURVEILLANCE

Executive Summary

The 2014 edition of the *Medicare Hospital Quality Chartbook* provides a comprehensive overview of national performance on the Centers for Medicare and Medicaid Services' (CMS's) hospital mortality, complication, and unplanned readmission measures, and investigates select hospital practices that may impact their performance on the measures. The first section of the *Medicare Hospital Quality Chartbook*, "Quality," examines performance of the nation's hospitals over time, across hospitals, and by region. The second section, "Surveillance," investigates performance among hospitals with diverse patient populations (i.e., high proportions of Medicaid or African-American patients), and examines utilization of different types of post-discharge care.

In 2014, CMS will publically release individual hospital performance on 13 quality measures as part of the Hospital Inpatient Quality Reporting (IQR) program. We have included all of these measures in this year's *Medicare Hospital Quality Chartbook*, as well as newly developed mortality and readmission measures following isolated coronary artery bypass graft (CABG) surgery, which are not currently publicly reported:

Condition-specific measures:

- Acute myocardial infarction (AMI) mortality and readmission
- Heart failure mortality and readmission
- Pneumonia mortality and readmission
- Chronic obstructive pulmonary disease (COPD) mortality and readmission
- Ischemic stroke mortality and readmission

Procedure-specific measures:

- Primary elective total hip and/or knee arthroplasty complication and readmission
- Isolated CABG surgery mortality and readmission

Hospital-wide measures:

- Hospital-wide readmission

In the 2014 *Medicare Hospital Quality Chartbook*, data from July 2010 through June 2013 are used for the condition-specific mortality and readmission measure analyses, the hospital-wide readmission measure trends analyses, the hip/knee arthroplasty readmission measure analyses, and the CABG mortality and readmission measure analyses. The remaining hospital-wide readmission measure analyses use data from July 2012 through June 2013, and the hip/knee arthroplasty complication measure analyses use data from April 2010 through March 2013.

Quality

When examining hospital performance over time, analyses indicated a general pattern of decline in risk-standardized mortality rates (RSMRs), risk-standardized complication rates (RSCRs), and risk-standardized readmission rates (RSRRs). However, there were no discernable patterns in changes over time in RSMRs following admission for heart failure and COPD, and there was an increase in RSMRs following admission for CABG surgery.

There continues to be variation among hospitals in RSMRs, RSCRs, and RSRRs. The full range of hospital performance varies by measure, from 4.9 percentage points (hip/knee arthroplasty RSCRs) to 15.7 percentage points (pneumonia RSMRs).

Also, hospital quality continues to vary by geographic region. Only eight hospital referral regions (HRRs) achieved performance levels that were better than the national average on four or more of the condition-specific mortality measures, and only two performed better than the national average on four or more of the condition-specific readmission measures.

Surveillance

Mortality, complication, and readmission rates for hospitals serving the lowest proportions of Medicaid or African-American patients overlap with those rates for hospitals serving the highest proportions of these patients. Hospitals serving the lowest and highest proportions of Medicaid or African-American patients did not consistently have higher or lower RSMRs. However, for the complication and readmission measures, the median outcome rates were consistently lower for hospitals serving the lowest proportions of Medicaid or African-American patients compared with hospitals serving the highest proportions of these patients.

Across all readmission measure cohorts, analyses indicated increases in post-discharge observation stays and/or emergency department (ED) visits between July 2010 and June 2013. Specifically, post-discharge ED visits increased for all condition-specific, procedure-specific, and hospital-wide admissions. Post-discharge observation stays also increased for most condition-specific, procedure-specific, and hospital-wide admissions, except for admissions in the stroke and hip/knee arthroplasty cohorts. Hospital post-discharge observation stay utilization remained below 3% over this three-year period for all condition-specific, procedure-specific, and hospital-wide admissions (July 2012 to June 2013). There was either no or a very weak correlation between hospitals' use of observation stays in the 30 days following hospitalization and their RSRRs.

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What are Risk-Standardized Outcome Rates?

Measuring Key Hospital Outcomes

The hospital outcome measures in this report include the Centers for Medicare and Medicaid Services' (CMS's) risk-standardized mortality rates (RSMRs), risk-standardized readmission rates (RSRRs), and risk-standardized complication rates (RSCRs) for Medicare fee-for-service (FFS) patients aged 65 or older admitted to the hospital for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), ischemic stroke, coronary artery bypass graft (CABG) surgery, and elective total hip and/or knee arthroplasty (i.e., joint replacement). This report also includes the 30-day hospital-wide readmission measure for Medicare FFS patients aged 65 or older admitted to the hospital for all conditions. The AMI, heart failure, pneumonia, COPD, stroke, hip/knee, and hospital-wide measures are publicly reported by CMS on the Hospital Compare website, and the CABG measures are intended for public reporting on Hospital Compare in Fiscal Year (FY) 2016 and incorporation into the Hospital Inpatient Quality Reporting (IQR) program in FY 2017 [1].

Measured Outcomes

The mortality measures assess death from any cause within 30 days of a hospitalization, regardless of whether the patient dies while still in the hospital or after discharge from the hospital.

The readmission measures assess unplanned readmissions for any reason within 30 days of discharge from a hospital stay. Patients may have been readmitted to the same hospital or to a different hospital. In all readmission measures, planned readmissions are removed from the outcome.

The complication measure assesses the occurrence of significant medical and/or surgical complications within 7 to 90 days, depending on the complication, following hospitalization for total hip and/or knee arthroplasty.

Risk Adjustment

To ensure accurate assessment of each hospital, the measures use statistical models to adjust for key differences in patient risk factors that are clinically relevant and that have strong relationships with the outcome (e.g., age and patient comorbidities). For each patient, risk factors are obtained from Medicare claims extending 12 months prior to and including the index admission. The statistical models adjust for patient differences based on the clinical status of the patient at the time of admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior – not complications that arise during the course of the index admission – are included in risk adjustment.

Calculating the Risk-Adjusted Outcome

The mortality, readmission, and complication measures use hierarchical logistic regression to create RSMRs, RSRRs, and RSCRs for each hospital, respectively. These measures are designed to adjust for differences in case mix and to account for random variation so that they reflect each hospital's quality of care.

The RSMRs, RSRRs, and RSCRs are calculated as the ratio of the number of "predicted" outcomes (deaths, readmissions, or complications) over the number of "expected" outcomes, multiplied by the national mortality/readmission/complication rate. For each hospital, the numerator of the ratio is the number of deaths/readmissions/complications within the outcome ascertainment period (30 days for the mortality and readmission measures and 7-90 days for the complication measure, depending upon the complication) predicted on the basis of the hospital's performance with its observed case mix, and the denominator is the number of deaths/readmissions/complications expected on the basis of the nation's performance with that specific hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses, and conceptually allows for a comparison of a particular hospital's performance given its case mix to an average hospital's performance with the same case mix. Thus, a ratio less than 1.0 indicates a lower-than-expected mortality, readmission, or complication rate and better quality, whereas a ratio greater than 1.0 indicates a higher-than-expected mortality, readmission, or complication rate and worse quality.

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Quality

In the first section of the 2014 Centers for Medicare and Medicaid Services' (CMS's) *Medicare Hospital Quality Chartbook*, we present trends and distributions of hospital-level results and summarize geographic variation in performance on hospital outcome measures. This section of the *Medicare Hospital Quality Chartbook* is intended to capture the state of hospital quality across the nation for a wide variety of conditions and procedures by providing information about trends in outcomes and continued variation in quality.

For the condition-specific measures, we demonstrate decreased risk-standardized mortality rates (RSMRs) for acute myocardial infarction (AMI), pneumonia, and ischemic stroke between July 2010 and June 2013, while heart failure and chronic obstructive pulmonary disease (COPD) fluctuated over this three-year period. Unplanned risk-standardized readmission rates (RSRRs) decreased for all condition-specific measures over the three-year period, with AMI and heart failure showing the largest improvement.

In this same time period, hospitals showed continued variation in quality across all condition-specific measures, suggesting continued opportunity to reduce these rates across the country. The full range of variation in RSMRs among U.S. hospitals was narrowest following admission for COPD and widest following admission for pneumonia. The full range of variation in RSRRs was narrowest following admission for AMI and widest following admission for heart failure. Overall, the range of performance variation has narrowed over time following admissions for AMI, heart failure, and pneumonia, potentially suggesting greater consistency in quality across hospitals [2].

For the procedure-specific measures, RSMRs increased following isolated coronary artery bypass graft (CABG) surgery between July 2010 and June 2013. Risk-standardized complication rates (RSCRs) following primary elective hip/knee arthroplasty (total joint replacement) decreased between April 2010 and March 2013. Unplanned RSRRs following CABG surgery and hip/knee arthroplasty both decreased over this three-year period. The full range of hospital performance varied by measure from 4.9% (hip/knee arthroplasty RSCR) to 11.0% (CABG RSRR).

For the hospital-wide readmission measure, RSRRs decreased between July 2010 and June 2013. The distribution of RSRRs showed variation with regard to unplanned hospital-wide readmissions, suggesting continued opportunity to reduce these rates across the country.

In the geographic variation analyses, we identified two hospital referral regions (HRRs) that performed worse than the national rate on four or more of the condition-specific risk-standardized mortality measures, and eight HRRs that performed better than the national rate on four or more of these measures. Also, 16 HRRs performed worse than the national rate on four or more of the condition-specific risk-standardized readmission measures, and two HRRs performed better than the national rate on four or more of the measures.

Geographic variation was not investigated for the CABG measures. There was no HRR-level geographic variation on the hip/knee complication measure. We identified 10 HRRs that performed worse than the national rate on the hip/knee arthroplasty risk-standardized readmission measure, and two HRRs that performed better than the national rate on this measure.

With regard to the hospital-wide risk-standardized readmission measure, we identified 46 HRRs that performed worse than the national rate, while 37 HRRs performed better than the national rate.

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Background

TRENDS | DISTRIBUTIONS | GEOGRAPHIC VARIATION

This section focuses on the trends, distributions, and geographic variation in hospital performance on the mortality and readmission measures from July 2010 through June 2013 for the following conditions:

- Acute myocardial infarction (AMI)
- Heart failure
- Pneumonia
- Chronic obstructive pulmonary disease (COPD)
- Ischemic stroke

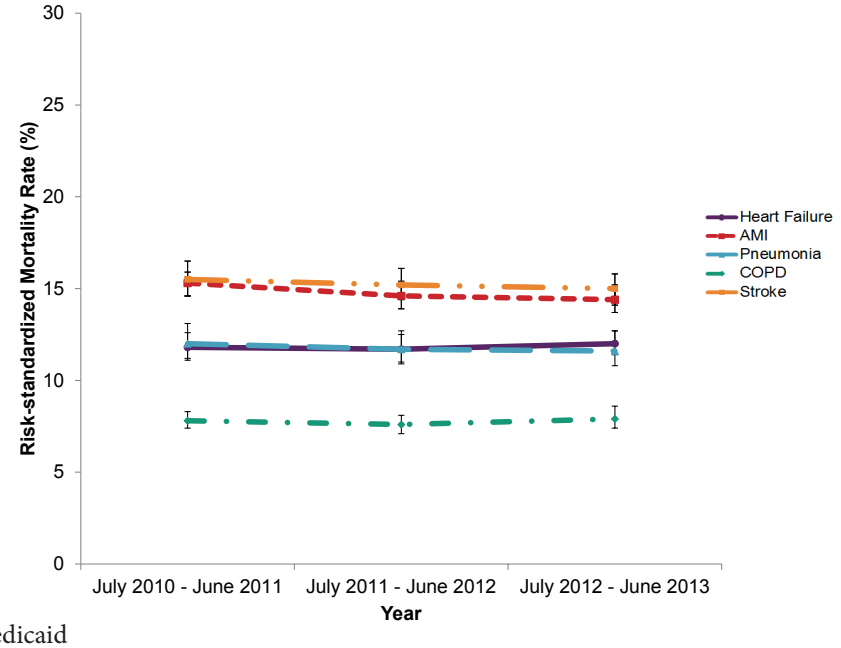
These measures are publicly reported annually as part of the Hospital Inpatient Quality Reporting (IQR) program on *Hospital Compare*.

The Centers for Medicare and Medicaid Services' (CMS's) hospital-level 30-day all-cause risk-standardized mortality measures have been publicly reported for AMI and heart failure since 2007 and for pneumonia since 2008. In 2011, Veteran's Health Administration (VA) hospitals were also included in the public reporting for the AMI, heart failure, and pneumonia mortality measures. In October 2013, CMS implemented these measures in the Hospital Value-Based Purchasing (HVBP) Program. Starting in December 2014, COPD and stroke mortality measures will be publicly reported.

CMS began publicly reporting the hospital-level 30-day all-cause risk-standardized readmission measures for AMI, heart failure, and pneumonia in 2009. In parallel with the mortality measures, starting in 2011, VA hospitals have also been included in public reporting for these three measures. Starting in 2012, these measures were included in the Hospital Readmissions Reduction Program (HRRP). Beginning in December 2014, COPD and stroke readmission measures will be publicly reported. In Fiscal Year (FY) 2015, the COPD readmission measure will be included in the HRRP [1].

▶ Are mortality rates changing over time?

FIGURE I.A.1. *Trends in the median hospital's RSMR for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*



The Centers for Medicare and Medicaid Services (CMS) began publicly reporting hospital-level 30-day risk-standardized mortality rates (RSMRs) following admissions for acute myocardial infarction (AMI) and heart failure in 2007; for pneumonia in 2008; and for chronic obstructive pulmonary disease (COPD) and ischemic stroke in 2014 as part of the Hospital Inpatient Quality Reporting (IQR) program.

Figure I.A.1 and Table I.A.1 display trends in the median hospital's RSMR between July 2010 and June 2013. The median hospital's RSMR for AMI decreased by 0.9 percentage points from July 2010 to June 2013. Over the three-year period, the median hospital's RSMR for heart failure fluctuated; the median hospital's RSMR for pneumonia decreased by 0.4 percentage points; the median hospital's RSMR for COPD fluctuated; and the median hospital's RSMR for stroke decreased by 0.5 percentage points.

TABLE I.A.1. *Median hospital's RSMRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

	Median (Range) of Hospital's RSMR (%)		
	July 2010 – June 2011	July 2011 – June 2012	July 2012 – June 2013
AMI RSMR	15.3 (12.2, 18.8)	14.6 (10.9, 20.2)	14.4 (10.6, 20.1)
Heart Failure RSMR	11.8 (7.8, 16.9)	11.7 (7.6, 16.8)	12.0 (8.3, 17.1)
Pneumonia RSMR	12.0 (7.0, 20.4)	11.7 (7.2, 18.7)	11.6 (7.3, 20.2)
COPD RSMR	7.8 (5.5, 12.1)	7.6 (5.5, 11.2)	7.9 (5.2, 12.4)
Stroke RSMR	15.5 (11.2, 22.4)	15.2 (10.5, 21.1)	15.0 (10.8, 20.6)

Source Data and Population: Condition-Specific Mortality Measure Cohort data – July 2010 – June 2013 (Appendix I).

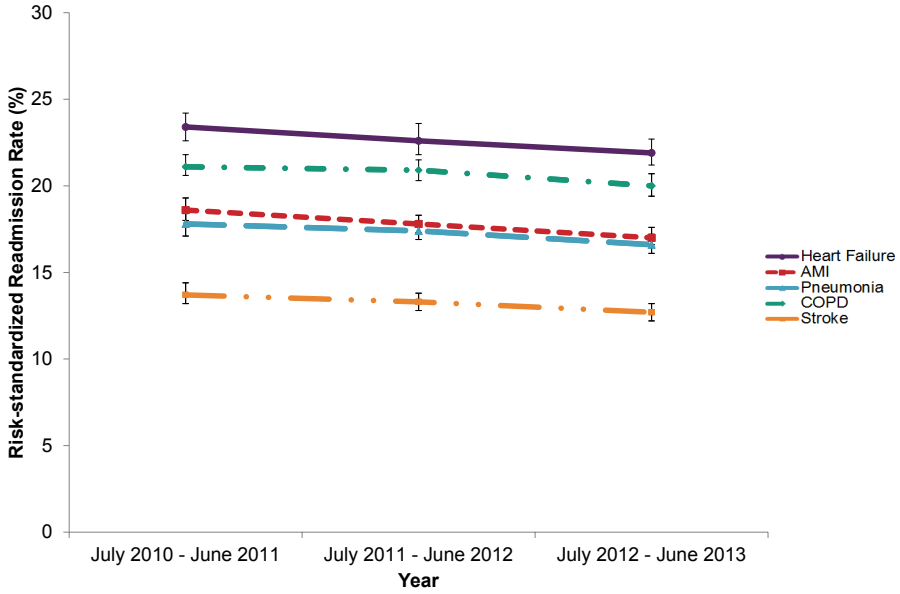
Notes: 1) Veterans Health Administration (VA) hospitals are included in this analysis, except in the stroke and COPD measures. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For AMI, the total number of hospitals was 1,781 in 10/11; 1,746 in 11/12; and 1,750 in 12/13. 5) For heart failure, the total number of hospitals was 2,916 in 10/11; 2,813 in 11/12; and 2,785 in 12/13. 6) For pneumonia, the total number of hospitals was 3,524 in 10/11; 3,358 in 11/12; and 3,383 in 12/13. 7) For COPD, the total number of hospitals was 2,789 in 10/11; 2,701 in 11/12; and 2,728 in 12/13. 8) For stroke, the total number of hospitals was 1,871 in 10/11; 1,864 in 11/12; and 1,822 in 12/13. 8) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

Hospital RSMRs following admissions for AMI, pneumonia, and stroke declined by 0.9, 0.4, and 0.5 percentage points, respectively, between July 2010 and June 2013. Over this three-year period, there was no clear pattern of change in the RSMRs following admissions for heart failure and COPD.

▶ Are unplanned readmission rates changing over time?

FIGURE I.A.2. *Trends in the median hospital's RSRR for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*



The Centers for Medicare and Medicaid Services (CMS) began publicly reporting hospital-level 30-day risk-standardized readmission rates (RSRRs) after admissions for acute myocardial infarction (AMI), heart failure, and pneumonia in 2009, and chronic obstructive pulmonary disorder (COPD) and ischemic stroke in 2014 as part of the Hospital Inpatient Quality Reporting (IQR) program.

Figure I.A.2 and Table I.A.2 display trends in the median hospital's RSRRs between July 2010 and June 2013. The median hospital's RSRRs decreased over the three year period for all measures, with RSRRs following hospitalization for AMI and heart failure experiencing the largest overall reductions of 1.6 and 1.5 percentage points, respectively. RSRRs following hospitalization for pneumonia decreased by 1.2 percentage points; RSRRs following hospitalization for COPD decreased by 1.1 percentage points; and RSRRs after hospitalization for stroke decreased by 1.0 percentage point over the three years.

TABLE I.A.2. *Median hospital's RSRRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

	Median (Range) Hospital's RSRR (%)		
	July 2010 – June 2011	July 2011 – June 2012	July 2012 – June 2013
AMI RSRR	18.6 (15.2, 22.6)	17.8 (14.6, 20.7)	17.0 (14.1, 20.6)
Heart Failure RSRR	23.4 (18.7, 30.2)	22.6 (17.6, 29.3)	21.9 (17.0, 28.2)
Pneumonia RSRR	17.8 (14.7, 24.8)	17.4 (14.9, 21.7)	16.6 (13.9, 22.3)
COPD RSRR	21.1 (16.9, 25.7)	20.9 (17.8, 26.0)	20.0 (16.2, 25.1)
Stroke RSRR	13.7 (11.2, 17.4)	13.3 (10.9, 16.6)	12.7 (10.1, 16.2)

Source Data and Population: Condition-Specific Readmission Measure Cohort data – July 2010 – June 2013 (Appendix I).

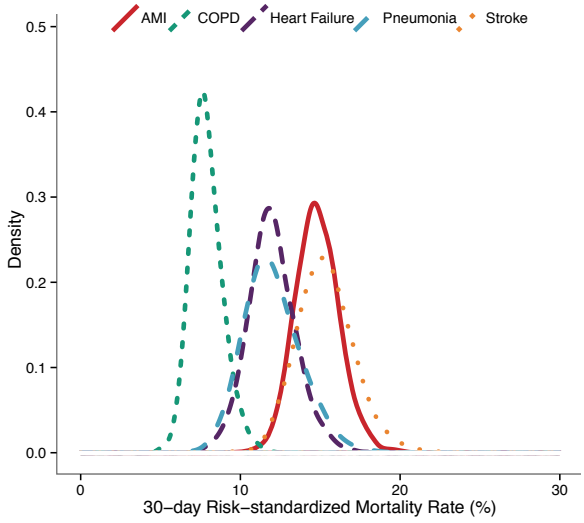
Notes: 1) Veterans Health Administration (VA) hospitals are included in this analysis, except in the COPD and stroke analyses. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For AMI, the total number of hospitals was 1,632 in 10/11, 1,627 in 11/12, and 1,637 in 12/13. 5) For heart failure, the total number of hospitals was 3,120 in 10/11, 3,018 in 11/12, and 2,963 in 12/13. 6) For pneumonia, the total number of hospitals was 3,611 in 10/11, 3,449 in 11/12, and 3,454 in 12/13. 7) For COPD, the total number of hospitals was 3,000 in 10/11, 2,890 in 11/12, and 2,875 in 12/13. 8) For stroke, the total number of hospitals was 1,842 in 10/11, 1,821 in 11/12, and 1,777 in 12/13. 9) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

Hospital RSRRs following admissions for AMI, heart failure, pneumonia, COPD, and stroke declined by 1.6, 1.5, 1.2, 1.1, and 1.0 percentage points, respectively, between July 2010 and June 2013.

To what extent do mortality rates vary across hospitals?

FIGURE I.A.3. *Distribution of hospital RSMRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*



Variation in 30-day risk-standardized mortality rates (RSMRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. Quality improvement efforts seek to lower the overall rate of mortality and decrease variation between hospitals. To examine the variation in RSMRs from July 2010 to June 2013 following admission for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and ischemic stroke among U.S. hospitals, we report the distribution of RSMRs in Figure I.A.3 and Table I.A.3.

AMI, heart failure, pneumonia, COPD and stroke RSMRs were distributed over interquartile ranges (IQRs) of 1.8, 1.9, 2.3, 1.3, and 2.3 percentage points, respectively. Therefore, the conditions differ in the degree of performance variation, with pneumonia and stroke showing the widest IQRs of RSMRs and COPD showing the narrowest IQR.

Compared with publicly reported data presented in the 2013 *Medicare Hospital Quality Chartbook* from July 2009 through June 2012, the IQRs of RSMRs decreased from 1.9 to 1.8 percentage points for AMI, from 2.0 to 1.9 percentage points for heart failure, and from 2.4 to 2.3 percentage points for pneumonia [2]. These results potentially indicate greater consistency in performance among hospitals, yet the full range of RSMRs suggests continued opportunity for reducing mortality across the country.

Approximately half of U.S. hospitals have AMI, heart failure, pneumonia, COPD, and stroke RSMRs within a 1.8, 1.9, 2.3, 1.3, and 2.3 percentage point range around the median hospital's RSMR, respectively, with ranges from 9.0 percentage points for COPD to 15.7 percentage points for pneumonia.

TABLE I.A.3. *Distribution of hospital RSMRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

	Distribution of RSMRs (%)				
	AMI	Heart Failure	Pneumonia	COPD	Stroke
Maximum	20.2	18.1	22.1	13.8	23.8
90%	16.5	13.9	14.4	9.2	17.6
75%	15.7	12.9	13.1	8.5	16.4
Median (50%)	14.8	11.9	11.8	7.8	15.2
25%	13.9	11.0	10.8	7.2	14.1
10%	13.1	10.2	9.8	6.7	13.2
Minimum	9.4	6.0	6.4	4.8	8.6

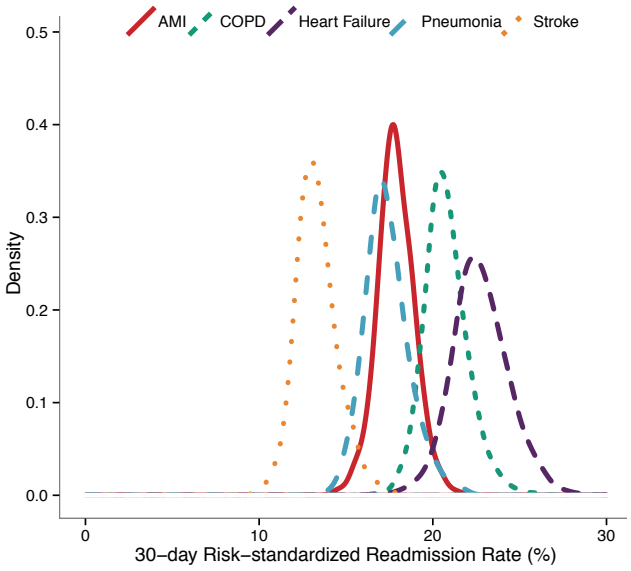
Source Data and Population: Condition-Specific Mortality Measure Cohort data – July 2010 – June 2013 (Appendix I)

Notes: 1) Veterans Health Administration (VA) hospitals are included in these analyses, except for in the COPD and stroke analyses. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The number of hospitals included in the analyses was 2,619 for AMI; 3,980 for heart failure; 4,432 for pneumonia; 3,827 for COPD; and 2,918 for stroke. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

To what extent do unplanned readmission rates vary across hospitals?

FIGURE I.A.4. *Distribution of hospital RSRRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*



Variation in 30-day risk-standardized readmission rates (RSRRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. Quality improvement efforts seek to lower the overall rate of readmission and decrease variation in quality between hospitals. To examine the variation in RSRRs following admission for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disorder (COPD), and ischemic stroke among U.S. hospitals, we report the distribution of RSRRs in Figure I.A.4 and Table I.A.4.

AMI, heart failure, pneumonia, COPD, and stroke RSRRs were distributed over interquartile ranges (IQRs) of 1.4, 2.0, 1.6, 1.6, and 1.5 percentage points, respectively. Therefore, the conditions differ in the degree of performance variation, with heart failure showing the widest IQR of RSRRs and AMI showing the narrowest IQR.

Compared with publicly reported data presented in the 2013 *Medicare Hospital Quality Chartbook* from July 2009 through June 2012, the IQRs of RSRRs decreased from 1.5 to 1.4 percentage points for AMI, from 2.3 to 2.0 percentage points for heart failure, and from 1.7 to 1.6 percentage points for pneumonia. These results potentially indicate greater consistency in performance among hospitals, yet the full range of RSRRs suggests continued opportunity for reducing readmissions across the country.

Approximately half of U.S. hospitals have AMI, heart failure, pneumonia, COPD, and stroke RSRRs within a 1.4, 2.0, 1.6, 1.6, and 1.5 percentage point range around the median hospital's RSRR, respectively, with ranges from 7.5 percentage points for AMI to 14.6 percentage points for heart failure.

TABLE I.A.4. *Distribution of hospital RSRRs for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

	Distribution of RSRRs (%)				
	AMI	Heart Failure	Pneumonia	COPD	Stroke
Maximum	21.7	31.2	24.7	28.0	18.5
90%	19.2	24.8	19.1	22.4	14.9
75%	18.6	23.7	18.1	21.5	14.0
Median (50%)	17.8	22.6	17.2	20.6	13.2
25%	17.2	21.7	16.5	19.9	12.5
10%	16.6	20.8	15.8	19.3	11.9
Minimum	14.2	16.6	13.4	16.3	9.4

Source Data and Population: Condition-Specific Readmission Measure Cohort data – July 2010-June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are included in these analyses, except for the COPD and stroke analyses. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The number of hospitals included in the analyses was 2,355 for AMI; 4,068 for heart failure; 4,433 for pneumonia; 3,905 for COPD; and 2,846 for stroke. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Does overall hospital performance on the AMI, heart failure, pneumonia, COPD, and stroke mortality measures differ by geographic location?

FIGURE I.A.5. *Combined classification of hospital referral regions (HRRs) by RSMR for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

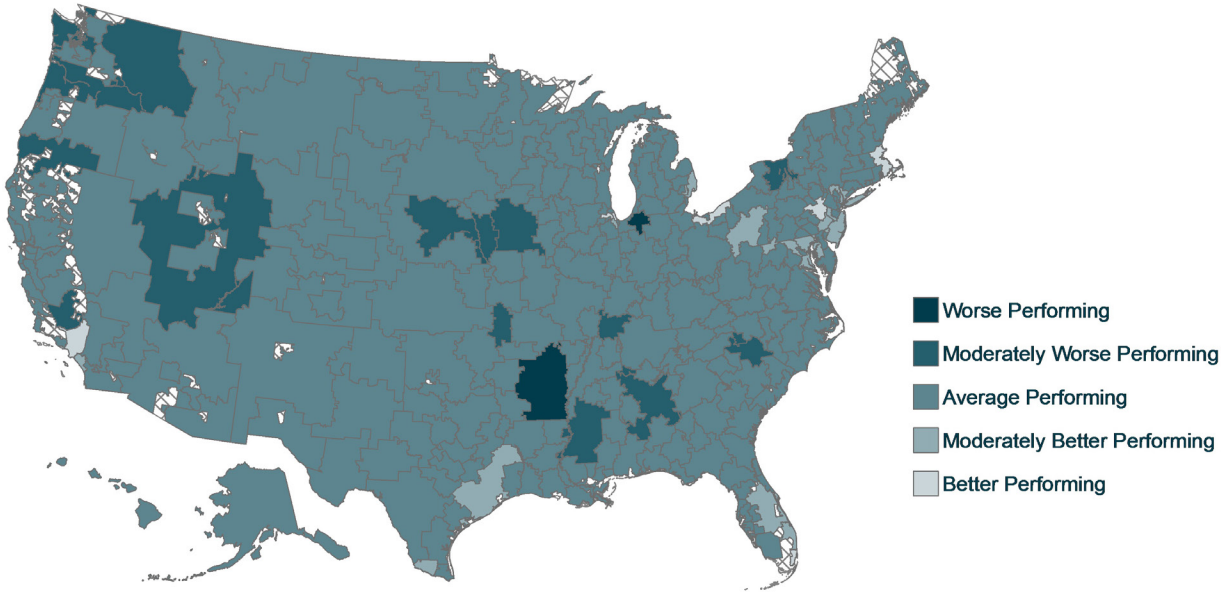


Figure I.A.5 displays combined geographic variation in the 30-day risk-standardized mortality rates (RSMRs) following hospitalization for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and ischemic stroke from July 2010 to June 2013. Geographic areas are divided by hospital referral region (HRR). The darkest areas represent the HRRs that performed worse than the national rate on at least four of the five condition-specific risk-standardized mortality measures, and the lightest areas represent the HRRs that performed better than the national rate on at least four of the five measures. Performance categories were determined for each of the condition-specific risk-standardized mortality measures using a scoring system that assigned three points for performing significantly better than the national mortality rate, two points for performing similarly to the national mortality rate, and one point for performing significantly worse than the national mortality rate. The scores were combined to get a total score for each HRR. For more information on the definition of HRRs and the combined map score calculation methodology, please see Appendix V.

We identified two HRRs (1%) that performed worse than the national rate on four or more of the condition-specific risk-standardized mortality measures, and eight HRRs (3%) that performed better than the national rate on four or more of the measures. These results are listed in Table I.A.5.

TABLE I.A.5. *Worse- and better-performing HRRs on the combined AMI, heart failure, pneumonia, COPD, and stroke mortality measures, July 2010 – June 2013.*

WORSE-PERFORMING HRRs	BETTER-PERFORMING HRRs
Little Rock, AR	Los Angeles, CA
South Bend, IN	Miami, FL
	Chicago, IL
	Melrose Park, IL
	Boston, MA
	Manhattan, NY
	Cleveland, OH
	Allentown, PA

Source Data and Population: Condition-Specific Mortality Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are included in this analysis, except for in the COPD and stroke analyses. 2) For more information about the definition of HRR and the map methodology, see Appendix V.

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▶ Does overall hospital performance on the AMI, heart failure, pneumonia, COPD, and stroke unplanned readmission measures differ by geographic location?

FIGURE I.A.6. *Combined classification of hospital referral regions (HRRs) by RSRR for AMI, heart failure, pneumonia, COPD, and stroke, July 2010 – June 2013.*

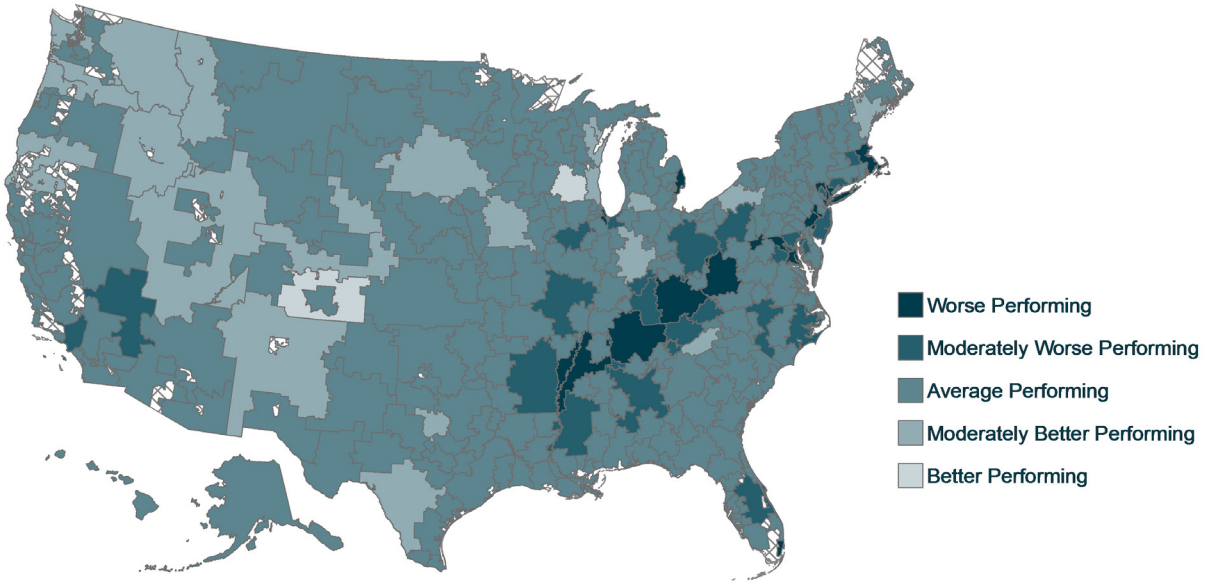

Figure I.A.6 displays combined geographic variation in the 30-day risk-standardized readmission rates (RSRRs) following hospitalization for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and ischemic stroke from July 2010 to June 2013. Geographic areas are divided by hospital referral region (HRR). The darkest areas represent the HRRs that performed worse than the national rate on at least four of the five condition-specific risk-standardized readmission measures, and the lightest areas represent the HRRs that performed better than the national rate on at least four of the five measures. Performance categories were determined for each of the condition-specific risk-standardized readmission measures using a scoring system that assigned three points for performing significantly better than the national readmission rate, two points for performing similarly to the national readmission rate, and one point for performing significantly worse than the national readmission rate. The scores were combined to get a total score for each HRR. For more information on the definition of HRRs and the combined map score calculation methodology, please see Appendix V.

We identified 16 HRRs (5%) that performed worse than the national rate on four or more of the condition-specific risk-standardized readmission measures, and two HRRs (1%) that performed better than the national rate on four or more of the measures. These results are listed in Table I.A.6.

TABLE I.A.6. *Worse- and better-performing HRRs on the combined AMI, heart failure, pneumonia, COPD, and stroke readmission measures, July 2010 – June 2013.*

WORSE-PERFORMING HRRs	BETTER-PERFORMING HRRs
Washington, DC	Colorado Springs, CO
Miami, FL	Madison, WI
Blue Island, IL	
Chicago, IL	
Lexington, KY	
Boston, MA	
Detroit, MI	
Hackensack, NJ	
Newark, NJ	
East Long Island, NY	
Manhattan, NY	
White Plains, NY	
Philadelphia, PA	
Memphis, TN	
Nashville, TN	
Charleston, WV	

Source Data and Population: Condition-Specific Readmission Measure Cohort data – July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are included in these analyses, except for the COPD and stroke analyses. 2) The AMI, heart failure, pneumonia, COPD, and stroke readmission measures are included on the map. 3) For more information about the definition of HRR and the map methodology, see Appendix V.

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Background

TRENDS | DISTRIBUTIONS | GEOGRAPHIC VARIATION

This section focuses on the trends, distributions, and geographic variation of the mortality, complication and readmission measures for the following procedures:

- Isolated coronary artery bypass graft (CABG) surgery
- Primary elective total hip and/or knee arthroplasty

Specifically, this section examines trends and distributions of the CABG mortality and readmission measures, trends and distributions of the hip/knee arthroplasty complication and readmission measures, and geographic variation in readmission following hip/knee arthroplasty.

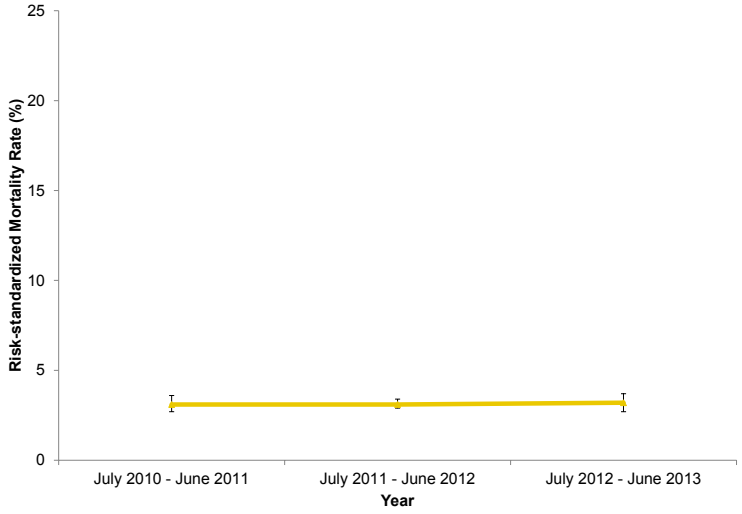
The analyses for the CABG measures use data from July 2010 through June 2013. The analyses for the hip/knee complication measure use 2014 publicly reported data from April 2010 through March 2013; analyses for the hip/knee readmission measure use 2014 publicly reported data from July 2010 through June 2013.

Isolated CABG is a common procedure associated with considerable morbidity, mortality, and health care spending. Both mortality and readmission rates following isolated CABG vary across hospitals. In 2007, there were 114,028 hospitalizations for CABG surgery among Medicare FFS patients in the U.S [3, 4]. The data reported in the 2014 *Medicare Hospital Quality Chartbook* for the CABG mortality and readmission measures summarize the results shared with hospitals this year (2014) as part of a national "dry run." The dry run is a period in which hospitals have the opportunity to become familiar with the measures and their results in advance of public reporting. The Centers for Medicare and Medicaid Services (CMS) plans to publicly report the hospital-level 30-day all-cause risk-standardized mortality and readmission measures following CABG surgery on *Hospital Compare* beginning in Fiscal Year (FY) 2016. These measures will be included as a part of the Hospital Inpatient Quality Reporting (IQR) program in FY 2017. The CABG readmission measure will also be included in the Hospital Readmissions Reduction Program (HRRP) in FY 2017 [1].

Hip and knee replacements are common surgeries performed on more than 600,000 Medicare fee-for-service (FFS) beneficiaries each year. The hip/knee arthroplasty complication measure identifies the following complications following an elective hip/knee replacement: acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia during hospitalization or within 7 days of admission; surgical site bleeding, pulmonary embolism or death during hospitalization or within 30 days of admission; or mechanical complications, periprosthetic joint infection, or wound infection during hospitalization or within 90 days of admission. CMS began publicly reporting the hospital-level risk-standardized complication measure and the hospital-level 30-day all-cause risk-standardized readmission measure following primary elective hip/knee arthroplasty on *Hospital Compare* in 2013. In FY 2015, the hip/knee arthroplasty readmission measure will be included in HRRP, and in FY 2019 the hip/knee arthroplasty complication measure will be included in the Hospital Value-Based Purchasing (HVBP) Program [1].

Are mortality rates after isolated CABG surgery changing over time?

FIGURE I.B.1. *Trend in the median hospital's RSMR for isolated CABG, July 2010 – June 2013.*



Coronary artery bypass graft (CABG) surgery is a common procedure associated with considerable morbidity, mortality, and health care spending [3, 4]. The Centers for Medicare and Medicaid Services (CMS) plans to publicly report hospital-level 30-day risk-standardized mortality rates (RSMRs) following isolated CABG surgery on *Hospital Compare* in Fiscal Year (FY) 2016 and in the Hospital Inpatient Quality Reporting (IQR) program in FY 2017 [1]. "Isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement.

Figure I.B.1 and Table I.B.1 display trends in the median hospital's 30-day RSMR following CABG surgery between July 2010 and June 2013. The median hospital's RSMR increased by 0.1 percentage points from July 2010 to June 2013.

TABLE I.B.1. *Median hospital's RSMRs for isolated CABG, July 2010 – June 2013.*

	Median (Range) of Hospital's RSMR (%)		
	July 2010 – June 2011	July 2011 – June 2012	July 2012 – June 2013
CABG RSMR	3.1 (1.8, 6.2)	3.1 (2.2, 4.7)	3.2 (1.8, 8.7)

Source Data and Population: CABG Mortality Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) The total number of hospitals was 726 in 10/11; 689 in 11/12; and 664 in 12/13. 5) For more information about figures, see Appendix VI.

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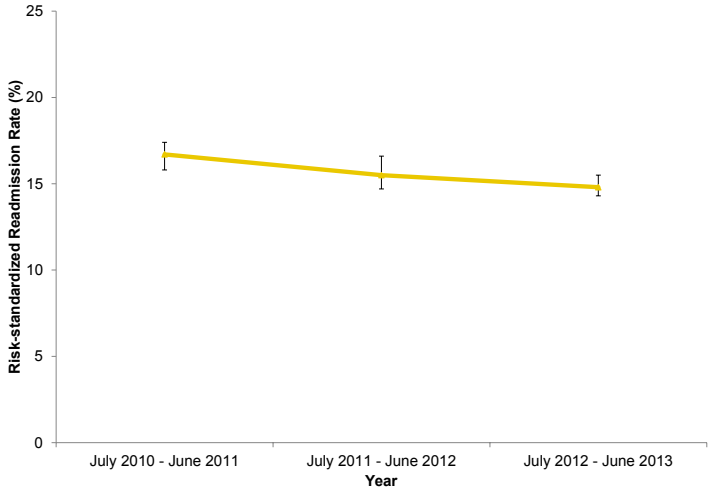
RSMRs following CABG surgery increased from 3.1% in July 2010 to 3.2% in June 2013.

▶ Are unplanned readmission rates after isolated CABG surgery changing over time?

FIGURE I.B.2. *Trend in the median hospital's RSRR for isolated CABG, July 2010 – June 2013.*



Coronary artery bypass graft (CABG) surgery is a common procedure associated with considerable morbidity, mortality, and health care spending [3, 4]. According to a 2007 report by the Medicare Payment Advisory Committee (MedPAC), among the seven conditions associated with the most costly potentially preventable readmissions in the U.S., CABG ranked as having the highest potentially preventable readmission rate within 15 days following discharge (13.5%) and the second highest average Medicare payment per readmission ($8,136) [5]. The Centers for Medicare and Medicaid Services (CMS) plans to publicly report hospital-level 30-day risk-standardized readmission rates (RSRRs) following isolated CABG surgery on *Hospital Compare* beginning in Fiscal Year (FY) 2016 and in the Hospital Inpatient Quality Reporting (IQR) program in FY 2017. "Isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement.

Figure I.B.2 and Table I.B.2 display trends in the median hospital's 30-day RSRR following CABG surgery between July 2010 and June 2013. The median hospital's RSRR decreased by 1.9 percentage points from July 2010 to June 2013.

TABLE I.B.2. *Median hospital's RSRRs for isolated CABG, July 2010 – June 2013.*

	Median (Range) Hospital's RSRR (%)		
	July 2010 – June 2011	July 2011 – June 2012	July 2012 – June 2013
CABG RSRR	16.7 (13.5, 20.6)	15.5 (12.4, 20.3)	14.8 (12.0, 18.5)

Source Data and Population: CABG Readmission Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) The total number of hospitals was 707 in 10/11; 674 in 11/12; and 649 in 12/13.5) For more information about figures, see Appendix VI.

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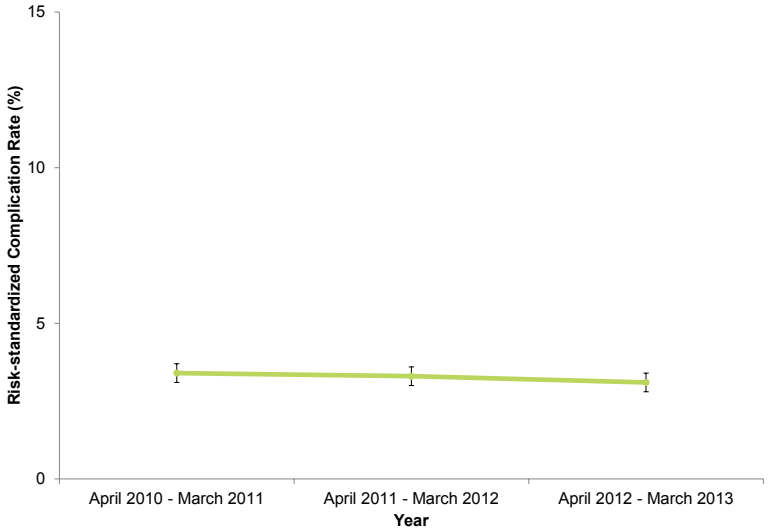
Hospital RSRRs following CABG surgery decreased from 16.7% in July 2010 to 14.8% in June 2013.

▶ Are complication rates after elective total hip and/or knee arthroplasty changing over time?

FIGURE I.B.3. *Trend in the median hospital's RSCR for hip/knee arthroplasty, April 2010 – March 2013.*



Total hip and/or knee arthroplasty, also known as hip and/or knee replacements, are common elective surgeries performed on more than 600,000 Medicare fee-for-service beneficiaries each year [6, 7]. The hip/knee arthroplasty complication measure identifies the following complications following an elective hip/knee replacement: acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia during hospitalization or within 7 days of admission; surgical site bleeding, pulmonary embolism or death during hospitalization or within 30 days of admission; or mechanical complications, periprosthetic joint infection, or wound infection during hospitalization or within 90 days of admission. The Centers for Medicare and Medicaid Services (CMS) began publicly reporting the hospital-level risk-standardized complication rates (RSCRs) following admission for primary elective hip/knee arthroplasty on *Hospital Compare* in 2013.

Figure I.B.3 and Table I.B.3 display trends in the median hospital's RSCR after hip/knee arthroplasty between April 2010 and March 2013. The median hospital's RSCR following hip/knee arthroplasty decreased by 0.3 percentage points from April 2010 to March 2013.

TABLE I.B.3. *Median hospital's RSCRs for hip/knee arthroplasty, April 2010 – March 2013.*

	Median (Range) Hospital's RSCR (%)		
	April 2010 – March 2011	April 2011 – March 2012	April 2012 – March 2013
Hip/Knee Arthroplasty RSCR	3.4 (1.9, 7.2)	3.3 (1.8, 5.5)	3.1 (1.8, 5.4)

Source Data and Population: Hip/Knee Arthroplasty Complication Measure Cohort data, April 2010 – March 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) The total number of hospitals was 2,179 in 10/11; 2,140 in 11/12; and 2,149 in 12/13 for this analysis. 5) For more information about figures, see Appendix VI.

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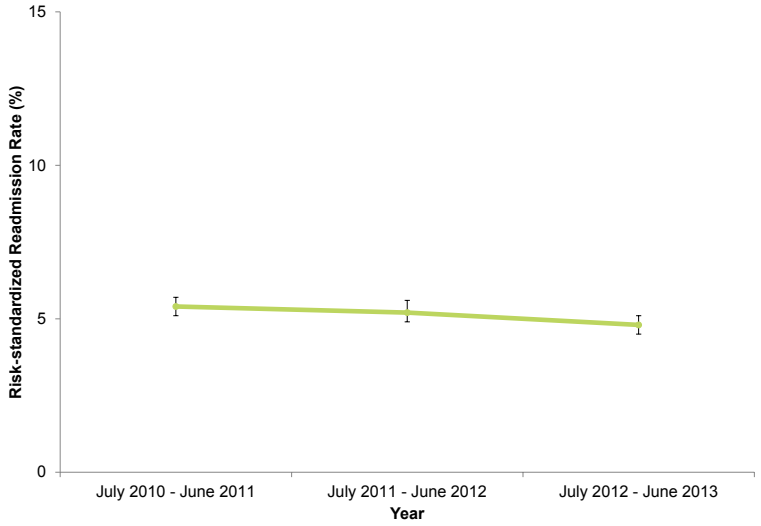
Hospital RSCRs following hip/knee arthroplasty decreased from 3.4% in April 2010 to 3.1% in March 2013.

▶ Are unplanned readmission rates after elective total hip and/or knee arthroplasty changing over time?

FIGURE I.B.4. *Trend in the median hospital's RSRR for hip/knee arthroplasty, July 2010 – June 2013.*



Total hip and/or knee arthroplasty, also known as hip and/or knee replacements, are common elective surgeries performed on more than 600,000 Medicare fee-for-service beneficiaries each year [6, 7]. The Centers for Medicare and Medicaid Services (CMS) began publicly reporting the hospital-level 30-day risk-standardized readmission rates (RSRRs) following admission for primary elective hip/knee arthroplasty on *Hospital Compare* in 2013.

Figure I.B.4 and Table I.B.4 display trends in the median hospital's RSRR after hip/knee arthroplasty between July 2010 and June 2013. The median hospital's RSRR following hip/knee arthroplasty decreased by 0.6 percentage points over the three year period.

TABLE I.B.4. *Median hospital's RSRRs for hip/knee arthroplasty, July 2010 – June 2013.*

	Median (Range) Hospital's RSRR (%)		
	July 2010 – June 2011	July 2011 – June 2012	July 2012 – June 2013
Hip/Knee RSRR	5.4 (3.7, 8.1)	5.2 (3.6, 7.6)	4.8 (2.9, 7.3)

Source Data and Population: Hip/knee arthroplasty Readmission Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) The total number of hospitals was 2,173 in 10/11; 2,153 in 11/12; and 2,151 in 12/13 in this analysis. 5) For more information about figures, see Appendix VI.

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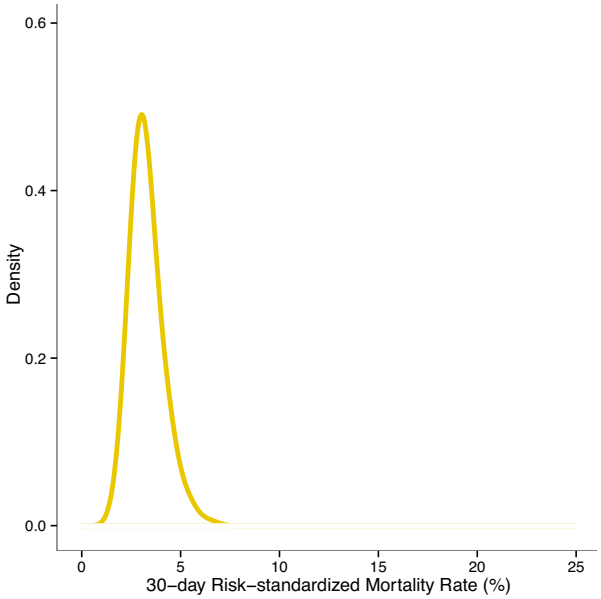
Hospital RSRRs following hip/knee arthroplasty decreased from 5.4% in July 2010 to 4.8% in June 2013.

To what extent do mortality rates after isolated CABG surgery vary across hospitals?

FIGURE I.B.5. *Distribution of hospital RSMRs for isolated CABG, July 2010 – June 2013.*



Variation in 30-day risk-standardized mortality rates (RSMRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. Quality improvement efforts seek to lower the overall rate of mortality and decrease variation in quality between hospitals. To examine the variation in RSMRs following isolated coronary artery bypass graft (CABG) surgery ("isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement), we report the distribution of RSMRs among U.S. hospitals from July 2010 to June 2013 in Figure I.B.5 and Table I.B.5.

CABG RSMRs were distributed over an interquartile range (IQR) of 1.0 percentage point between July 2010 and June 2013. Specifically, the median 30-day RSMR for this time frame was 3.2% with an IQR of 2.7% to 3.7%. Although the overall rate is low, the range of RSMRs suggests continued opportunity for improvement.

Source Data and Population: CABG Mortality Measure Cohort data, July 2010 – June 2013 (Appendix I)

Notes: 1) Veterans Health Administration (VA) hospitals are not included in these analyses. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The number of hospitals included in this analysis was 1,081. 4) For more information about figures, see Appendix VI.

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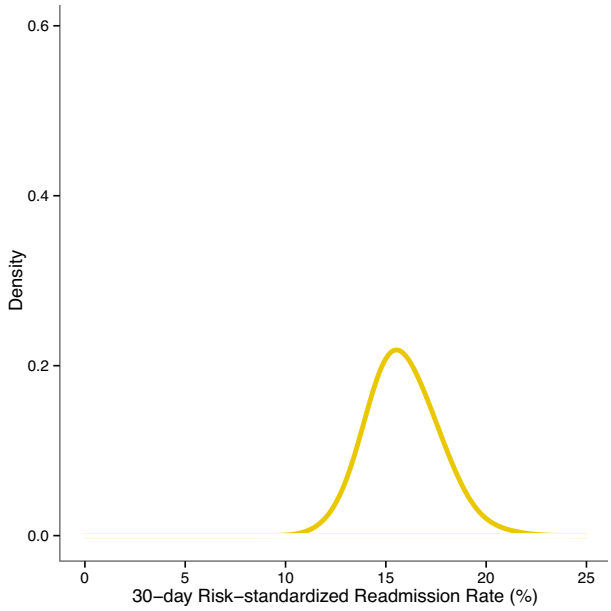
Approximately half of U.S. hospitals have CABG RSMRs within a 1.0 percentage point range around the median hospital's RSMR, with the full spectrum of RSMRs ranging from 1.5% to 6.7%.

TABLE I.B.5. *Distribution of hospital RSMRs for isolated CABG, July 2010 – June 2013.*

	Distribution of CABG RSMRs (%)
Maximum	6.7
90%	4.4
75%	3.7
Median (50%)	3.2
25%	2.7
10%	2.4
Minimum	1.5

▶ To what extent do unplanned readmission rates following isolated CABG surgery vary across hospitals?

FIGURE I.B.6. *Distribution of hospital RSRRs for isolated CABG, July 2010 – June 2013.*



Variation in 30-day risk-standardized readmission rates (RSRRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. Quality improvement efforts seek to lower the overall rate of readmission and decrease variation in quality between hospitals. To examine the variation in RSRRs following isolated coronary artery bypass graft (CABG) surgery ("isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement) among U.S. hospitals from July 2010 to June 2013, we report the distribution of RSRRs in Figure I.B.6 and Table I.B.6.

CABG RSRRs were distributed over an interquartile range (IQR) of 2.2 percentage points between July 2010 and June 2013. Specifically, the median 30-day RSRR for this time frame was 15.7% with an IQR of 14.7%-16.9%. The range of RSRRs suggests opportunity for reducing readmissions across the country.

Approximately half of U.S. hospitals have CABG RSRRs within a 2.2 percentage point range around the median hospital's RSRR, with the full spectrum of RSRRs ranging from 11.2% to 22.2%.

TABLE I.B.6. *Distribution of hospital RSRRs for isolated CABG, July 2010 – June 2013.*

	Distribution of CABG RSRRs (%)
Maximum	22.2
90%	18.0
75%	16.9
Median (50%)	15.7
25%	14.7
10%	13.9
Minimum	11.2

Source Data and Population: CABG Readmission Measure Cohort data, July 2010-June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in these analyses. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The number of hospitals included in the analyses was 1,074. 4) For more information about figures, see Appendix VI.

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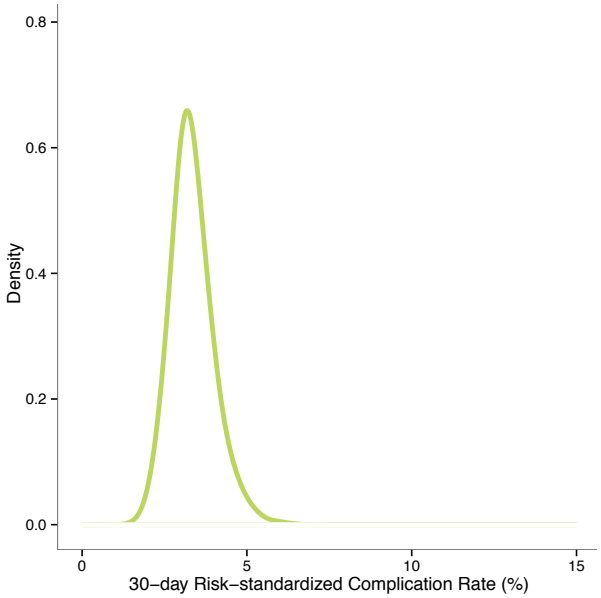
To what extent do elective total hip and/or knee arthroplasty complication rates vary across hospitals?

FIGURE I.B.7. *Distribution of hospital RSCRs for hip/knee arthroplasty, April 2010 – March 2013.*



Variation in risk-standardized complication rates (RSCRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. To examine the variation in RSCRs following total hip and/or knee arthroplasty among U.S. hospitals from April 2010 to March 2013, we report the distribution of RSCRs in Figure I.B.7 and Table I.B.7.

Total hip and/or knee arthroplasty RSCRs were distributed over an interquartile range (IQR) of 0.8 percentage points between April 2010 and March 2013. Specifically, the median RSCR for this timeframe was 3.3% with an IQR of 2.9%-3.7%.

Compared with publicly reported data presented in the 2013 *Medicare Hospital Quality Chartbook* from July 2009 through March 2012, the IQR of hip/knee arthroplasty RSCRs decreased from 0.9 to 0.8 percentage points. These results potentially indicate greater consistency in performance among hospitals, yet the full range of RSCRs suggests continued opportunity for reducing readmissions across the country.

Source Data and Population: Hip/Knee Arthroplasty Complication Measure Cohort data, April 2010 – March 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three year period are not shown; however, these hospitals are included in the calculation. 3) The number of hospitals included in the analysis was 2,832. 4) For more information about figures, see Appendix VI.

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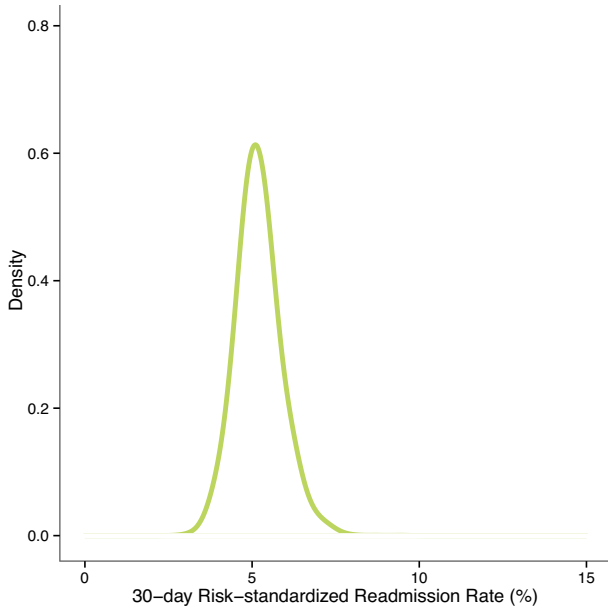
Approximately half of U.S. hospitals have hip/knee arthroplasty RSCRs within a 0.8 percentage point range around the median hospital's RSCR, with the full spectrum of RSCRs ranging from 1.5% to 6.4%.

TABLE I.B.7. *Distribution of hospital RSCRs for hip/knee arthroplasty, April 2010 – March 2013.*

	Distribution of hip/knee arthroplasty RSCRs (%)
Maximum	6.4
90%	4.1
75%	3.7
Median (50%)	3.3
25%	2.9
10%	2.6
Minimum	1.5

▶ To what extent do unplanned readmission rates after elective total hip and/or knee arthroplasty vary across hospitals?

FIGURE I.B.8. *Distribution of hospital RSRRs for hip/knee arthroplasty, July 2010 – June 2013.*



Variation in 30-day risk-standardized readmission rates (RSRRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. To examine the variation in RSRRs following total hip and/or knee arthroplasty among U.S. hospitals from July 2010 to June 2013, we report the distribution of RSRRs in Figure I.B.8 and Table I.B.8.

Total hip and/or knee arthroplasty RSRRs were distributed over an interquartile range (IQR) of 0.8 percentage points between July 2010 and June 2013. Specifically, the median RSRR for this time frame was 5.1% with an IQR of 4.8%-5.6%.

Compared with publicly reported data presented in the 2013 *Medicare Hospital Quality Chartbook* from July 2009 through June 2012, the IQR of hip/knee arthroplasty RSRRs decreased from 0.9 to 0.8 percentage points. These results potentially indicate greater consistency in performance among hospitals, yet the full range of RSRRs suggests continued opportunity for reducing readmissions across the country.

Approximately half of U.S. hospitals have hip/knee arthroplasty RSRRs within a 0.8 percentage point range around the median hospital's RSRR, with the full spectrum of RSRRs ranging from 2.8% to 9.4%.

TABLE I.B.8. *Distribution of hospital RSRRs for hip/knee arthroplasty, July 2010 – June 2013.*

	Distribution of hip/knee arthroplasty RSRRs (%)
Maximum	9.4
90%	6.1
75%	5.6
Median (50%)	5.1
25%	4.8
10%	4.4
Minimum	2.8

Source Data and Population: Hip/Knee Arthroplasty Readmission Measure Cohort data, July 2010-June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in these analyses. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The number of hospitals included in the analyses was 2,833. 4) For more information about figures, see Appendix VI.

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Does hospital performance on the elective total hip and/or knee arthroplasty unplanned readmission measure differ by geographic location?

FIGURE I.B.9. *Classification of hospital referral regions (HRRs) by RSRR for hip/knee arthroplasty, July 2010 – June 2013.*

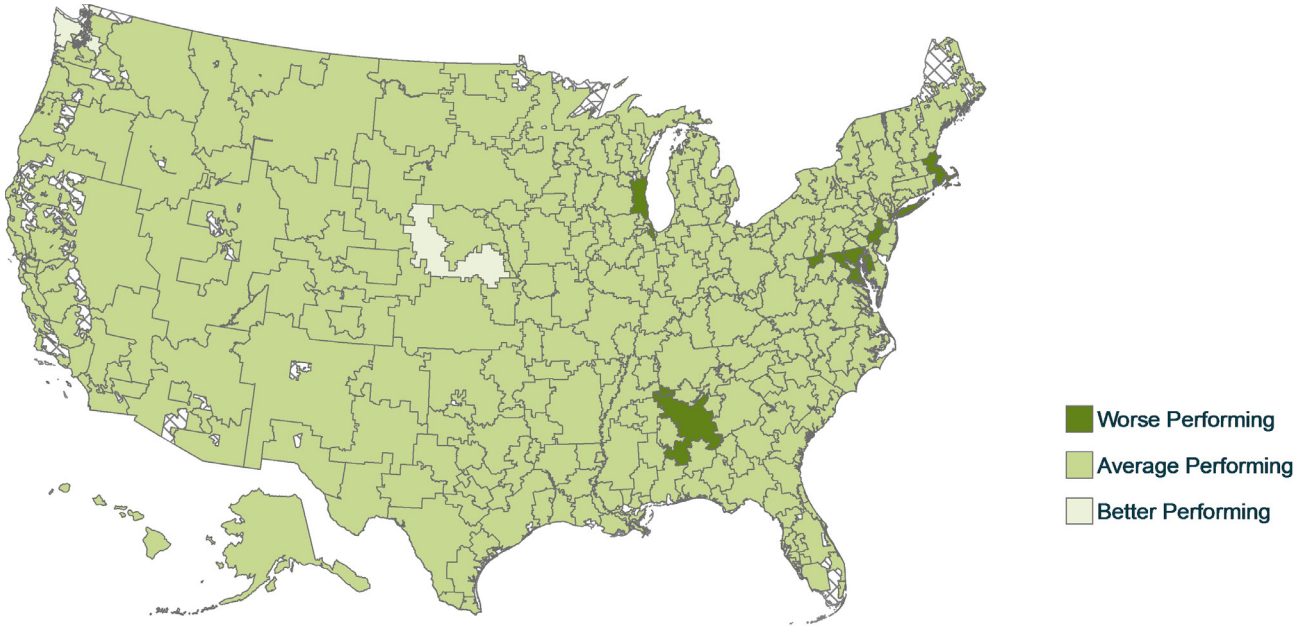

Figure I.B.9 displays geographic variation in the 30-day risk-standardized readmission rate (RSRR) following hospitalization for elective total hip and/or knee arthroplasty from July 2010 to June 2013. Geographic areas are divided by hospital referral region (HRR). The darkest areas represent the HRRs that performed worse than the national rate on the hip/knee arthroplasty risk-standardized readmission measure, and the lightest areas represent the HRRs that performed better than the national rate on the hip/knee arthroplasty readmission measure. The remaining HRRs in medium-green have hip/knee arthroplasty RSRRs similar to the national rate.

We identified 10 HRRs (3%) that performed worse than the national rate on the hip/knee arthroplasty risk-standardized readmission measure, and two HRRs (1%) that performed better than the national rate on the hip/knee arthroplasty readmission measure. These results are listed in Table I.B.9. The median RSRR for the worse-performing HRRs was 5.5%, while the median for the better-performing HRRs was 4.5%.

TABLE I.B.9. *Worse- and better-performing HRRs on the hip/knee arthroplasty readmission measure, July 2010 – June 2013.*

WORSE-PERFORMING HRRs	BETTER-PERFORMING HRRS
Birmingham, AL	Lincoln, NE
Washington, DC	Seattle, WA
Blue Island, IL	
Chicago, IL	
Baltimore, MD	
Boston, MA	
Newark, NJ	
East Long Island, NY	
Philadelphia, PA	
Milwaukee, WI	

Source Data and Population: Hip/Knee Arthroplasty Readmission Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) For more information about the definition of HRR and the map methodology, see Appendix V.

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Background

TRENDS | DISTRIBUTIONS | GEOGRAPHIC VARIATION

This section focuses on the trends, distributions, and geographic variation of the readmission measure from July 2010 – June 2013 for the following cohort:

- Hospital-wide readmission

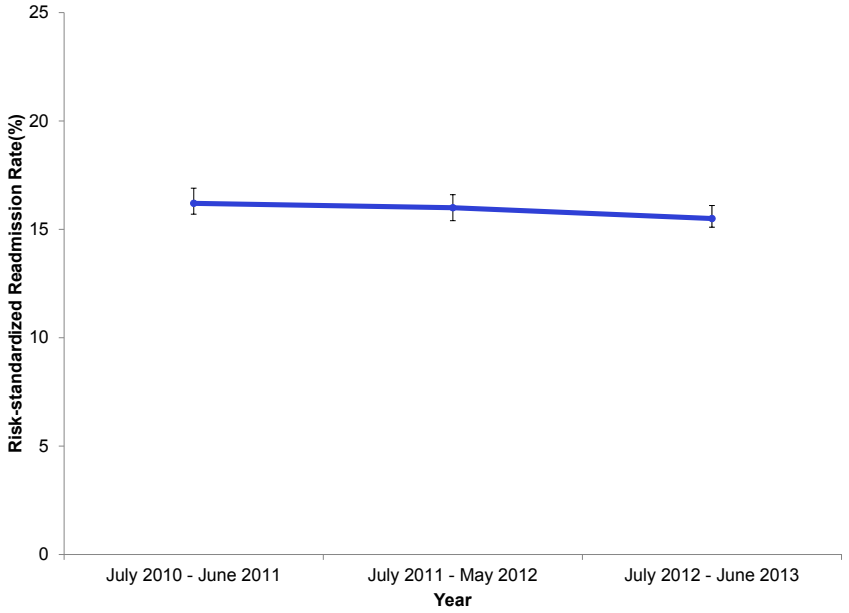
Studies have shown that hospital readmissions for a wide range of conditions within 30 days of discharge are related to quality of inpatient or transitional care and can be reduced through hospital-level interventions [8]. The hospital-wide readmission measure assesses unplanned readmission within 30 days of discharge, and includes more than 90% of Medicare fee-for-service (FFS) patients admitted for any condition or procedure [8].

The hospital-wide risk-standardized readmission rate (RSRR) is a summary score derived from the results of each of the following specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology [8]. Combining the results into a summary score improves model performance and patient-level discrimination, and may increase the utility of the measure by illuminating differences in performance across specialty areas within hospitals, allowing hospitals to better target quality improvement efforts.

CMS began publicly reporting the hospital-wide readmission measure on *Hospital Compare* in 2013 as part of the Hospital Inpatient Quality Reporting (IQR) program. One year of data is used in public reporting of this measure.

▶ Is the rate of hospital-wide unplanned readmission changing over time?

FIGURE I.C.1. *Trend in the median hospital's RSRR for hospital-wide readmission, July 2010 – June 2013.*



The Centers for Medicare and Medicaid Services (CMS) began publicly reporting the hospital-wide readmission measure, which assesses unplanned all-cause 30-day readmissions, in 2013 as part of the Hospital Inpatient Quality Reporting (IQR) program. Unlike the other IQR program outcome measures, the hospital-wide readmission measure uses only one year of admissions. The hospital-wide risk-standardized readmission rate (RSRR) is a summary score derived from the results of each of the following specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology [8].

Figure I.C.1 and Table I.C.1 display trends in the median hospital's hospital-wide RSRR between July 2010 and June 2013. The median hospital's RSRR decreased by 0.8 percentage points from July 2010 to June 2013.

TABLE I.C.1. *Median hospital's RSRRs for hospital-wide readmission, July 2010 – June 2013.*

	Median (Range) Hospital's RSRR (%)		
	July 2010 – June 2011	July 2011 – May 2012*	July 2012 – June 2013
Hospital-Wide RSRR	16.3 (11.9, 22.2)	16.0 (11.2, 23.6)	15.5 (11.0, 21.4)

*June 2012 was excluded from the analysis due to a data processing issue.

Source Data and Population: Hospital-Wide Readmission Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) The total number of hospitals was 4,683 in 10/11; 4,651 in 11/12; and 4,651 in 12/13. 5) For more information about figures, see Appendix VI.

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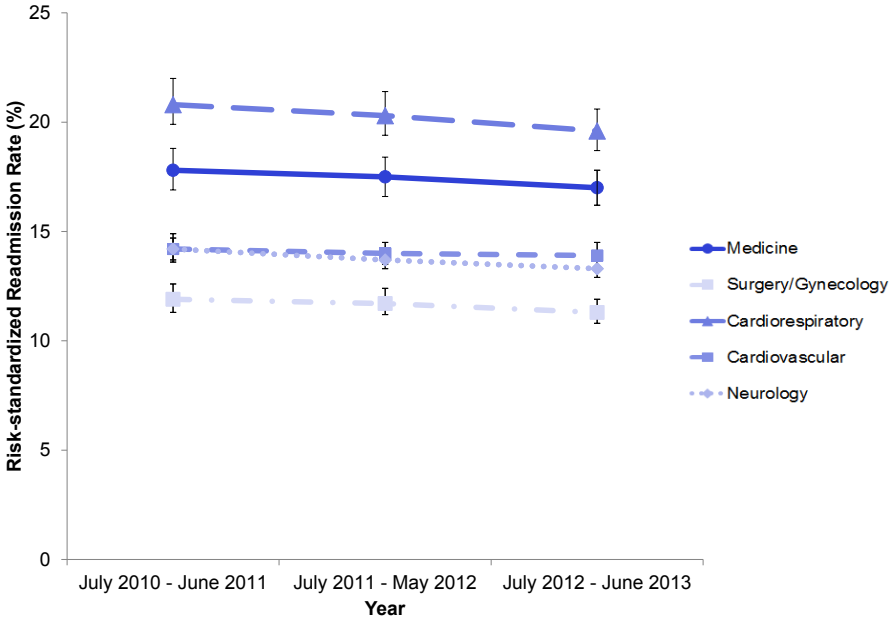
Hospital-wide unplanned RSRRs decreased from 16.3% in July 2010 to 15.5% in June 2013.

▶ Is the rate of unplanned readmission within each specialty cohort changing over time?

FIGURE I.C.2. *Trends in the median hospital's RSRR for specialty cohorts that comprise the hospital-wide readmission measure, July 2010 – June 2013.*



The hospital-wide unplanned 30-day risk-standardized readmission rate (RSRR) is a summary score derived from the results of each of the following specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology [8]. From July 2010 to June 2013, the median hospital's overall hospital-wide RSRR declined from 16.3% to 15.5%. Examining this decline by specialty cohort provides further insight into whether the decline was driven by improvements in a specific cohort, or reflected broad improvements across all specialty cohorts.

Figure I.C.2 and Table I.C.2 display the median hospital's 30-day RSRR for each specialty cohort that comprises the hospital-wide readmission measure from July 2010 to June 2013. The RSRRs for all specialty cohorts decreased over the three-year period. The cardiorespiratory and neurology cohorts demonstrated the largest overall reductions of 1.2 and 0.9 percentage points, respectively, over the three years. RSRRs for the medicine, surgery/gynecology, and cardiovascular cohorts decreased by 0.8, 0.6, and 0.3 percentage points, respectively.

Reductions in the overall hospital-wide RSRR were driven by decreases in RSRRs for all of the specialty cohorts that make up the measure.

TABLE I.C.2. *Median hospital's RSRRs by specialty cohort for hospital-wide readmission, July 2010 – June 2013.*

	Median (Range) Hospital's RSRR (%)		
	July 2010 – June 2011	July 2011 – May 2012*	July 2012 – June 2013
Medicine RSRR	17.8 (13.2, 29.9)	17.5 (12.6, 26.6)	17.0 (13.0, 25.6)
Surgery/Gynecology RSRR	11.9 (8.5, 16.8)	11.7 (8.2, 16.4)	11.3 (8.0, 15.9)
Cardiorespiratory RSRR	20.8 (15.7, 30.0)	20.3 (15.3, 28.0)	19.6 (14.9, 27.0)
Cardiovascular RSRR	14.2 (11.1, 17.9)	14.0 (11.1, 17.8)	13.9 (10.8, 18.3)
Neurology RSRR	14.2 (10.9, 20.4)	13.7 (10.8, 17.5)	13.3 (10.8, 18.0)

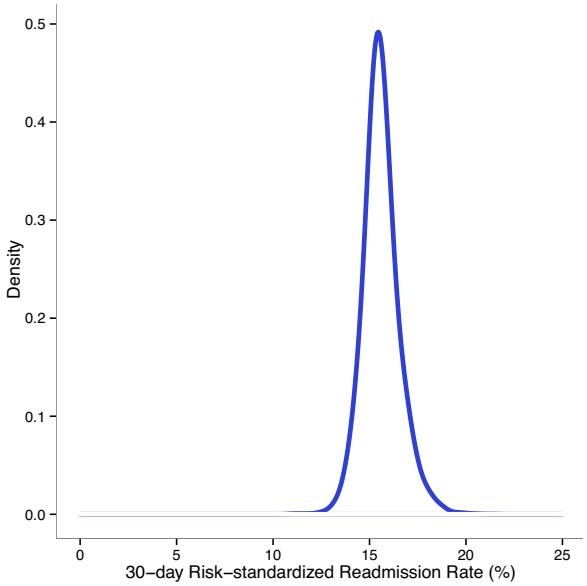
*June 2012 was excluded from the analysis due to a data processing issue.

Source Data and Population: Hospital-Wide Readmission Measure Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each year are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For the medicine cohort there were 4,473 hospitals in 10/11; 4,406 in 11/12; and 4,401 in 12/13. 5) For the surgery/gynecology cohort there were 3,345 hospitals in 10/11; 3,281 in 11/12; and 3,266 in 12/13. 6) For the cardiorespiratory cohort there were 4,283 hospitals in 10/11; 4,163 in 11/12; and 4,171 in 12/13. 7) For the cardiovascular cohort there were 3,162 hospitals in 10/11; 2,940 in 11/12; and 2,918 in 12/13. 8) For the neurology cohort there were 2,728 hospitals in 10/11; 2,583 in 11/12; and 2,569 in 12/13. 9) For more information about figures, see Appendix VI.

To what extent do hospital-wide unplanned readmission rates vary across hospitals?

FIGURE I.C.3. *Distribution of hospital RSRRs for hospital-wide readmission, July 2012 – June 2013.*



Variation in 30-day risk-standardized readmission rates (RSRRs) reflects differences in performance among U.S. hospitals, with wider distributions suggesting more variation in quality and narrower distributions suggesting less variation in quality. To examine the variation in hospital-wide RSRRs from July 2012 to June 2013, we report the distribution of RSRRs in Figure I.C.3 and Table I.C.3.

Hospital-wide RSRRs were distributed over an interquartile range (IQR) of 1.0 percentage point between July 2012 and June 2013. Specifically, the median one-year RSRR from July 2012 to June 2013 was 15.5% (IQR: 15.1%-16.1%).

Compared with publicly reported data presented in the 2013 *Medicare Hospital Quality Chartbook* from January 2011 through December 2011, the IQR of hospital-wide RSRRs decreased from 1.3 to 1.0 percentage points. These results potentially indicate greater consistency in performance among hospitals, yet the full range of RSRRs suggests continued opportunity for reducing readmissions across the country.

TABLE I.C.3. *Distribution of hospital RSRRs for hospital-wide readmission, July 2012 – June 2013.*

	Hospital-Wide RSRR (%)
Maximum	21.4
90%	16.8
75%	16.1
Median (50%)	15.5
25%	15.1
10%	14.5
Minimum	11.0

Source Data and Population: Hospital-Wide Readmission Measure Cohort data, July 2012 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the one-year period are not shown; however, these hospitals are included in the calculation. 3) The number of hospitals included in the analysis was 4,651. 4) For more information about figures, see Appendix VI.

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Approximately half of U.S. hospitals have hospital-wide RSRRs within a 1.0 percentage point range around the median hospital's RSRR, with the full spectrum of RSRRs ranging from 11.0% to 21.4%.

Does overall performance on the hospital-wide unplanned readmission measure differ by geographic location?

FIGURE I.C.4. *Classification of hospital referral regions (HRRs) by RSRR for hospital-wide readmission, July 2012 – June 2013.*

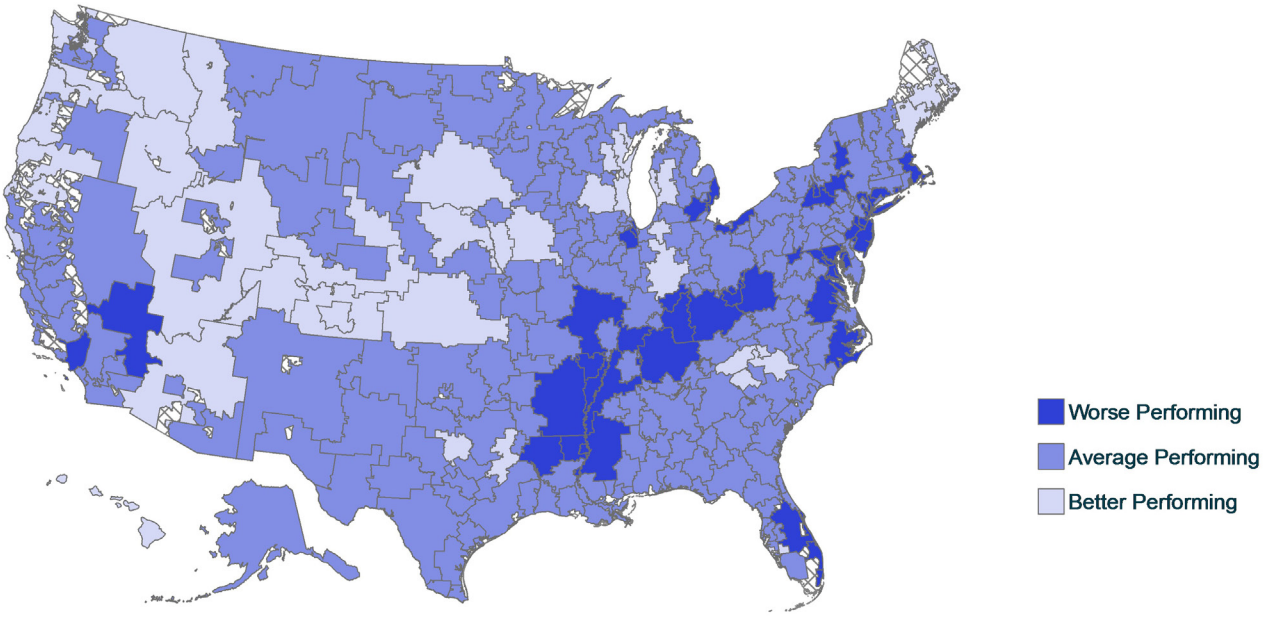

Figure I.C.4 displays geographic variation in the 30-day hospital-wide risk-standardized readmission rates (RSRRs) from July 2012 to June 2013. Geographic areas are divided by hospital referral region (HRR). The darkest areas represent the HRRs that performed worse than the national rate on the hospital-wide risk-standardized readmission measure, and the lightest areas represent the HRRs that performed better than the national rate on the hospital-wide risk-standardized readmission measure. The remaining HRRs in medium-blue have hospital-wide RSRRs that are similar to the national rate.

We identified 46 HRRs (15%) that performed worse than the national rate on the hospital-wide risk-standardized readmission measure, while 37 HRRs (12%) performed better than the national rate on the hospital-wide readmission measure. These results are listed in Table I.C.4. The median RSRR for the worse-performing HRRs was 16.0%, while the median RSRR for the better-performing HRRs was 14.9%.

TABLE I.C.4. *Worse- and better-performing HRRs on the hospital-wide readmission measure, July 2012 – June 2013.*

WORSE-PEFORMING HRRS		BETTER-PERFORMING HRRS	
Jonesboro, AR	St. Louis, MO	Phoenix, AZ	Asheville, NC
Little Rock, AR	Las Vegas, NV	Redding, CA	Charlotte, NC
Los Angeles, CA	Camden, NJ	Santa Rosa, CA	Hickory, NC
New Haven, CT	Hackensack, NJ	Colorado Springs, CO	Eugene, OR
Washington, DC	New Brunswick, NJ	Denver, CO	Medford, OR
Fort Lauderdale, FL	Newark, NJ	Grand Junction, CO	Portland, OR
Miami, FL	Paterson, NJ	Pueblo, CO	Greenville, SC
Orlando, FL	Binghamton, NY	Sarasota, FL	Sioux Falls, SD
Blue Island, IL	Bronx, NY	Honolulu, HI	Fort Worth, TX
Chicago, IL	Elmira, NY	Boise, ID	Tyler, TX
Joliet, IL	East Long Island, NY	Indianapolis, IN	Salt Lake City, UT
Lexington, KY	Manhattan, NY	South Bend, IN	Seattle, WA
Louisville, KY	White Plains, NY	Des Moines, IA	Spokane, WA
Paducah, KY	Greenville, NC	Wichita, KS	Appleton, WI
Monroe, LA	Cleveland, OH	Bangor, ME	Green Bay, WI
Shreveport, LA	Philadelphia, PA	Portland, ME	Madison, WI
Baltimore, MD	Sayre, PA	Grand Rapids, MI	Milwaukee, WI
Takoma Park, MD	Memphis, TN	Muskegon, MI	
Boston, MA	Nashville, TN	Missoula, MT	
Ann Arbor, MI	Richmond, VA	Omaha, NE	
Dearborn, MI	Charleston, WV		
Detroit, MI	Huntington, WV		
Royal Oak, MI			
Jackson, MS			

Source Data and Population: Hospital-Wide Readmission Measure Cohort data, July 2012 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) For more information about the definition of HRR and the map methodology, see Appendix V.

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Surveillance

In the second section of the 2014 Centers for Medicare and Medicaid Services' (CMS's) *Medicare Hospital Quality Chartbook*, we examine special measurement topics of national interest and respond to stakeholders' concerns related to the measures. Specifically, we focus on two important topics: 1) potential socioeconomic and race-based disparities in hospital performance on the measures and 2) monitoring return-to-hospital rates in the post-discharge period.

For the condition-specific risk-standardized mortality measures, hospitals serving the lowest and highest proportions of Medicaid or African-American patients did not consistently have higher or lower mortality rates. Specifically, compared with hospitals serving the highest proportions of Medicaid or African-American patients, hospitals serving the lowest proportions had higher median heart failure and pneumonia mortality rates. For the condition-specific risk-standardized readmission measures, hospitals serving the lowest proportions of Medicaid or African-American patients had readmission rates that were lower than hospitals serving the highest proportions of these patients.

Across condition-specific readmission measures, there was an increase in post-discharge observation stay use following hospitalizations for AMI, heart failure, pneumonia, and chronic obstructive pulmonary disease (COPD). However, increases in observation stay rates were smaller than the total decrease in observed readmission rates for each condition. There was no increase in post-discharge observation stay use following hospitalization for ischemic stroke. There was an increase in post-discharge ED visit rates following hospitalizations for AMI, heart failure, pneumonia, COPD, and stroke.

There were very weak but statistically significant inverse associations between observed post-discharge observation stay rates and risk-standardized readmission rates (RSRRs) for the AMI, heart failure, pneumonia, and COPD cohorts; there was no significant correlation between observed post-discharge observation stays and RSRRs following stroke hospitalization.

For the coronary artery bypass graft (CABG) surgery mortality and readmission measures, hospitals serving the lowest proportions of Medicaid or African-American patients had mortality rates that were lower than or equal to hospitals serving the highest proportions of these patients. Return-to-hospital rates were not examined in the CABG surgery readmission cohort. For the elective total hip/knee arthroplasty risk-standardized complication and readmission measures, hospitals with the lowest proportions of Medicaid or African-American patients had complication and readmission rates that were lower than hospitals with the highest proportions of these patients. There was no increase in post-discharge observation stay use following hip/knee arthroplasty, although there was an increase in post-discharge ED visits. There was no significant correlation between observed post-discharge observation stays and hip/knee arthroplasty RSRRs.

For the hospital-wide readmission measure, hospitals serving the lowest proportions of Medicaid or African-American patients had readmission rates that were lower than hospitals serving the highest proportions of these patients. From 2010 to 2013, there was an increase in both hospital-wide post-discharge observation stay rates and ED visit rates. There was no significant correlation between observed post-discharge observation stays and hospital-wide RSRRs.

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Background

DISPARITIES | OBSERVATION STAYS & EMERGENCY DEPARTMENT VISITS

This section focuses on potential socioeconomic and race-based disparities in hospital performance on the mortality and readmission measures, and monitors return-to-hospital rates in the 30-day post-discharge period from July 2010 through June 2013 for the following conditions:

- Acute myocardial infarction (AMI)
- Heart failure
- Pneumonia
- Chronic obstructive pulmonary disease (COPD)
- Ischemic stroke

The analyses in this section are used to examine potential consequences of publicly reporting hospital outcomes. Many stakeholders are concerned that hospitals caring for large numbers of Medicaid or African-American patients may not perform as well on hospital outcome measures [1]. To address this concern, we compare hospital performance of hospitals that care for the lowest proportions of Medicaid patients with hospitals that care for the highest proportions of Medicaid patients. Similarly, we compare performance of hospitals that care for the lowest and highest proportions of African-American patients.

Stakeholders are also concerned about the rising rates of post-discharge observation stays among Medicare fee-for-service (FFS) beneficiaries. Specifically, recent press reports and research have raised concerns that hospitals may be avoiding readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10]. To characterize hospital use of post-discharge observation stays, we analyze the hospital-level trends and distributions of post-discharge observation stays and ED visit rates within 30 days of an inpatient hospitalization for each condition. We also examine the correlation between hospital-level 30-day all cause risk-standardized readmission rates (RSRRs) and 30-day observation stay rates following an admission.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the AMI mortality measure?

FIGURE II.A.1. *Distribution of AMI RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

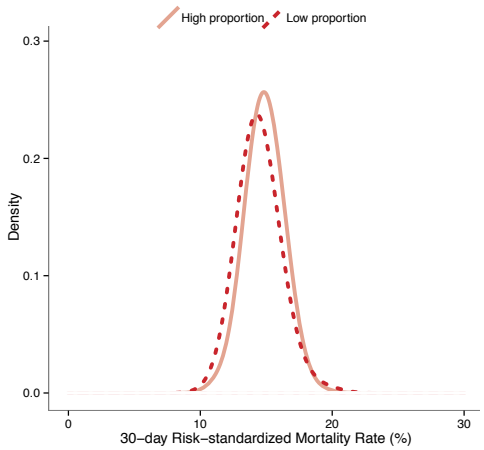
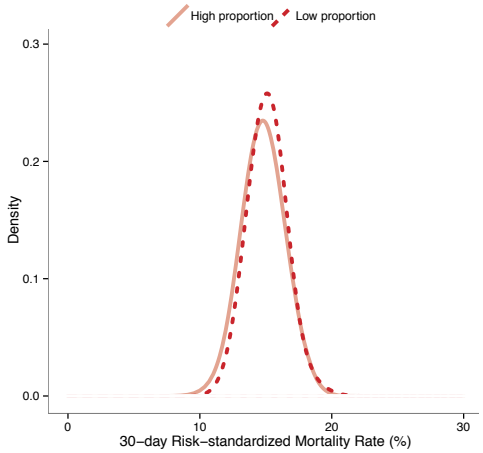


FIGURE II.A.2. *Distribution of AMI RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the acute myocardial infarction (AMI) mortality measure, we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 30% of a hospital's patients – top decile of all hospitals). We also compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 23% of a hospital's patients – top decile of all hospitals). Figures II.A.1 and II.A.2 and Tables II.A.1 and II.A.2 display the comparisons.

The RSMRs following AMI hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 14.3% [interquartile range (IQR): 13.6%-15.4%] and 14.9% (IQR: 14.0%-15.7%), respectively. The RSMRs following AMI hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 15.1% (IQR: 14.2%-15.9%) and 14.8% (IQR: 13.8%-15.7%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median AMI RSMR was 0.6 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSMR was 0.3 percentage points higher than among hospitals with the highest proportions.

TABLE II.A.1. *Distribution of AMI RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	AMI RSMR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=250	Highest proportion (≥30%) Medicaid patients; n=250
Maximum	20.2	19.4
90%	16.2	16.5
75%	15.4	15.7
Median (50%)	14.3	14.9
25%	13.6	14.0
10%	12.7	13.3
Minimum	10.5	11.1

TABLE II.A.2. *Distribution of AMI RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	AMI RSMR (%)	
	No (0%) African-American patients; n=253	Highest proportion (≥23%) African-American patients; n=252
Maximum	19.5	18.3
90%	16.6	16.6
75%	15.9	15.7
Median (50%)	15.1	14.8
25%	14.2	13.8
10%	13.5	13.2
Minimum	11.7	10.4

Source Data and Population: AMI Mortality Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of African-American patients is calculated among all Medicare FFS patients. 4) The proportion of Medicaid patients is calculated among all hospital patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the AMI readmission measure?

FIGURE II.A.3. *Distribution of AMI RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

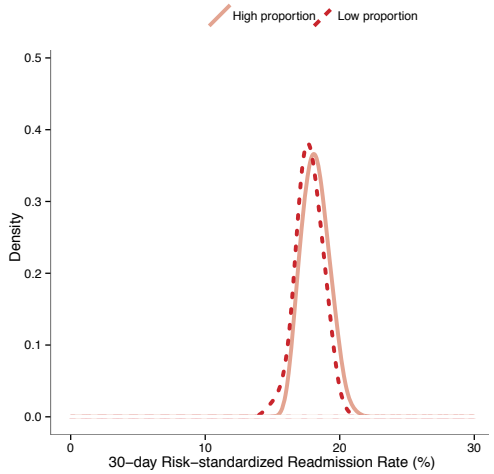
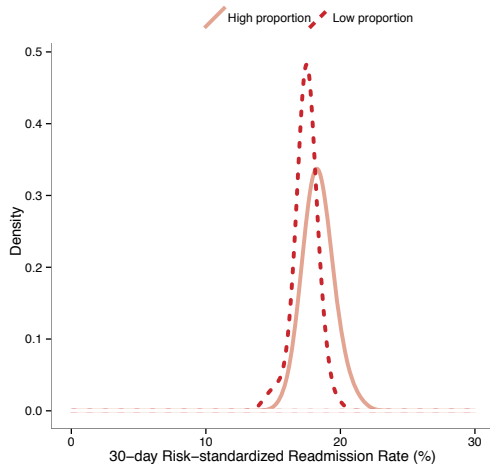


FIGURE II.A.4. *Distribution of AMI RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the acute myocardial infarction (AMI) readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 30% of a hospital's patients – top decile of all hospitals). We also compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 23% of a hospital's patients – top decile of all hospitals). Figures II.A.3 and II.A.4 and Tables II.A.3 and II.A.4 display the comparisons.

The RSRRs following AMI hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 17.8% [interquartile range (IQR): 17.1%-18.4%] and 18.2% (IQR: 17.5%-18.8%), respectively. The RSRRs following AMI hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 17.5% (IQR: 17.1-17.9) and 18.3% (IQR: 17.7-18.9), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median AMI RSRR was 0.4 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 0.8 percentage points lower than among hospitals with the highest proportions.

TABLE II.A.3. *Distribution of AMI RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	AMI RSRR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=227	Highest proportion (≥30%) Medicaid patients; n=228
Maximum	20.3	21.1
90%	19.0	19.5
75%	18.4	18.8
Median (50%)	17.8	18.2
25%	17.1	17.5
10%	16.6	17.0
Minimum	14.6	16.3

TABLE II.A.4. *Distribution of AMI RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	AMI RSRR (%)	
	No (0%) African-American patients; n=229	Highest proportion (≥23%) African-American patients; n=229
Maximum	19.9	21.5
90%	18.4	19.8
75%	17.9	18.9
Median (50%)	17.5	18.3
25%	17.1	17.7
10%	16.4	17.1
Minimum	14.4	15.8

Source Data and Population: AMI Readmission Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of African-American patients is calculated among all Medicare FFS patients. 4) The proportion of Medicaid patients is calculated among all hospital patients. 5) For more information about figures, see Appendix VI. 6) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile.

Prepared for CMS by YNHHSC/CORE.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the heart failure mortality measure?

FIGURE II.A.5. *Distribution of heart failure RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

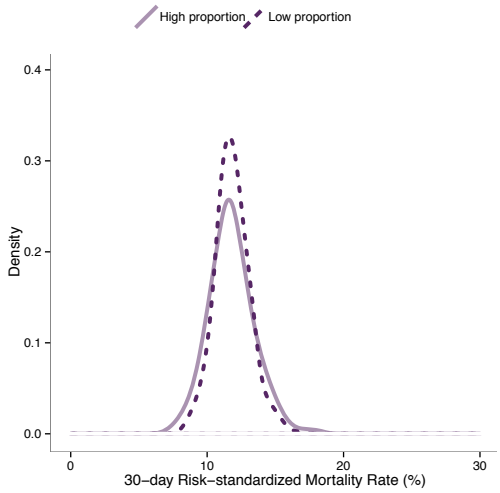
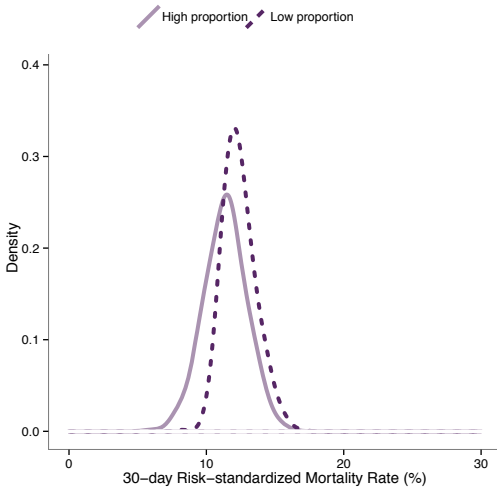


FIGURE II.A.6. *Distribution of heart failure RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the heart failure mortality measure, we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 29% of a hospital's patients – top decile of all hospitals). We also compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 23% of a hospital's patients – top decile of all hospitals). Figures II.A.5 and II.A.6 and Tables II.A.5 and II.A.6 display the comparisons.

The RSMRs following heart failure hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 11.8% [interquartile range (IQR): 11.0%-12.6%] and 11.7% (IQR: 10.7%-12.7%), respectively. The RSMRs following heart failure hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 12.2% (IQR: 11.5%-13.1%) and 11.4% (IQR: 10.4%-12.3%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median heart failure RSMR was 0.1 percentage points higher than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSMR was 0.8 percentage points higher than among hospitals with the highest proportions.

TABLE II.A.5. *Distribution of heart failure RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Heart Failure RSMR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=381	Highest proportion (≥29%) Medicaid patients; n=380
Maximum	16.6	18.1
90%	13.4	14.0
75%	12.6	12.7
Median (50%)	11.8	11.7
25%	11.0	10.7
10%	10.3	9.8
Minimum	8.5	7.3

TABLE II.A.6. *Distribution of heart failure RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	Heart Failure RSMR (%)	
	No (0%) African-American patients*; n=556	Highest proportion (≥23%) African-American patients; n=384
Maximum	16.8	16.0
90%	14.1	13.4
75%	13.1	12.3
Median (50%)	12.2	11.4
25%	11.5	10.4
10%	11.0	9.5
Minimum	8.2	6.0

*14% of hospitals had no (0%) African-American patients.

Source Data and Population: Heart Failure Mortality Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association data to calculate the overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the heart failure readmission measure?

FIGURE II.A.7. *Distribution of heart failure RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

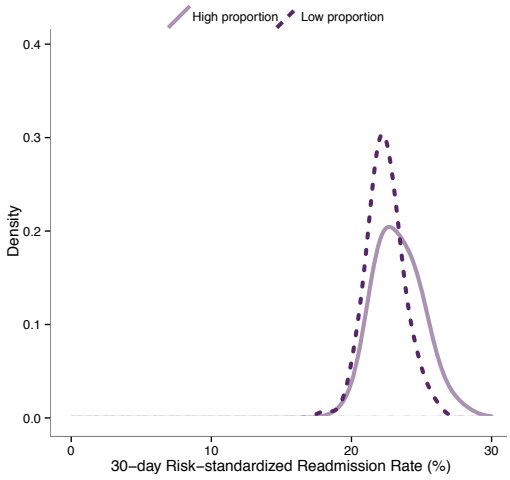
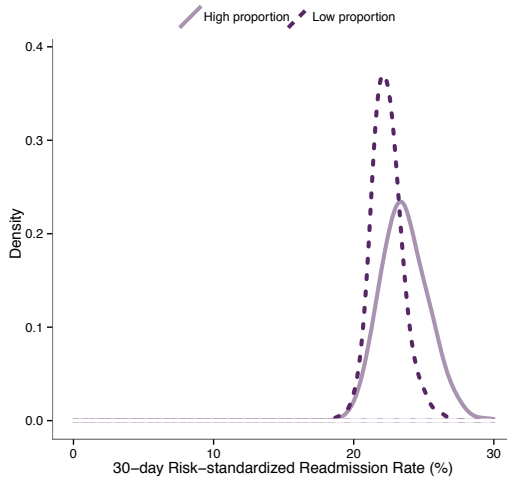


FIGURE II.A.8. *Distribution of heart failure RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the heart failure readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 29% of a hospital's patients – top decile of all hospitals). We also compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 23% of a hospital's patients – top decile of all hospitals). Figures II.A.7 and II.A.8 and Tables II.A.7 and II.A.8 display the comparisons.

The RSRRs following heart failure hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 22.3% [interquartile range (IQR): 21.6%-23.2%] and 23.3% (IQR: 22.0%-24.5%), respectively. The RSRRs following heart failure hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 22.3% (IQR: 21.7-23.0) and 23.5% (IQR: 22.4-24.7), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median heart failure RSRR was 1.0 percentage point lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 1.2 percentage points lower than among hospitals with the highest proportions.

TABLE II.A.7. *Distribution of heart failure RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Heart Failure RSRR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=391	Highest proportion (≥29%) Medicaid patients; n=392
Maximum	26.5	29.7
90%	24.2	25.7
75%	23.2	24.5
Median (50%)	22.3	23.3
25%	21.6	22.0
10%	20.7	21.2
Minimum	17.6	18.5

TABLE II.A.8. *Distribution of heart failure RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	Heart Failure RSRR (%)	
	No (0%) African-American patients*; n=607	Highest proportion (≥23%) African-American patients; n=394
Maximum	26.7	29.7
90%	23.8	25.8
75%	23.0	24.7
Median (50%)	22.3	23.5
25%	21.7	22.4
10%	21.1	21.6
Minimum	18.8	19.5

*15% of hospitals had 0% African-American patients.

Source Data and Population: Heart Failure Readmission Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) For more information about figures, see Appendix VI. 6) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the pneumonia mortality measure?

FIGURE II.A.9. *Distribution of pneumonia RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

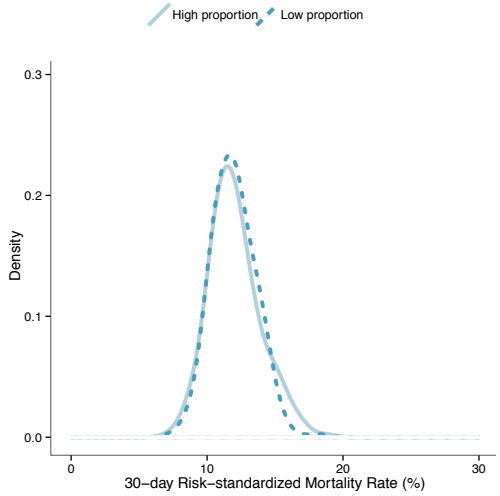
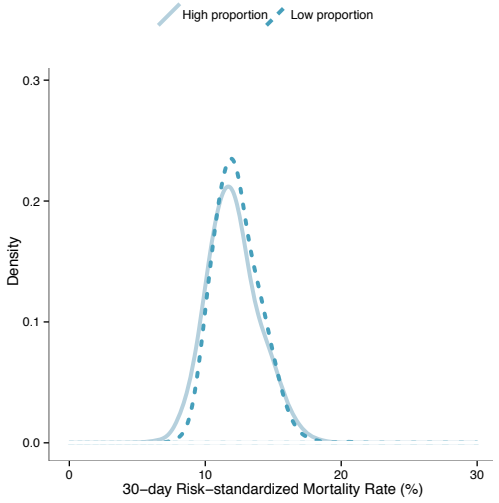


FIGURE II.A.10. *Distribution of pneumonia RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the pneumonia mortality measure, we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 28% of a hospital's patients – top decile of all hospitals).We also compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 22% of a hospital's patients – top decile of all hospitals). Figures II.A.9 and II.A.10 and Tables II.A.9 and II.A.10 display the comparisons.

The RSMRs following pneumonia hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 11.9% [interquartile range (IQR): 10.8%-13.0%] and 11.8% (IQR: 10.7%-13.0%), respectively. The RSMRs following pneumonia hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 12.2% (IQR: 11.1%-13.4%) and 11.9% (IQR: 10.8%-13.1%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median pneumonia RSMR was 0.1 percentage points higher than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSMR was 0.3 percentage points higher than among hospitals with the highest proportions.

TABLE II.A.9. *Distribution of pneumonia RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Pneumonia RSMR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=425	Highest proportion (≥28%) Medicaid patients; n=426
Maximum	18.5	19.0
90%	14.1	14.8
75%	13.0	13.0
Median (50%)	11.9	11.8
25%	10.8	10.7
10%	10.0	9.9
Minimum	7.4	7.3

TABLE II.A.10. *Distribution of pneumonia RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	Pneumonia RSMR (%)	
	No (0%) African-American patients*; n=844	Highest proportion (≥22%) African-American patients; n=429
Maximum	20.4	18.3
90%	14.7	14.7
75%	13.4	13.1
Median (50%)	12.2	11.9
25%	11.1	10.8
10%	10.3	9.9
Minimum	7.9	6.4

*20% of hospitals had no (0%) African-American patients.

Source Data and Population: Pneumonia Mortality Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the pneumonia readmission measure?

FIGURE II.A.11. *Distribution of pneumonia RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

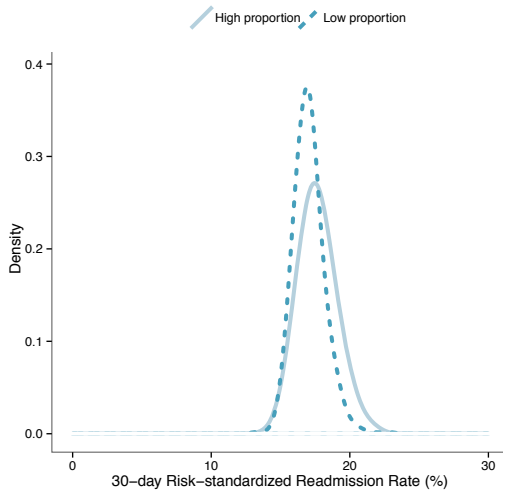
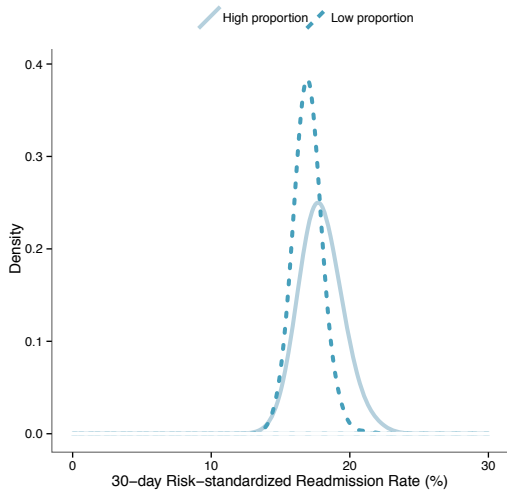


FIGURE II.A.12. *Distribution of pneumonia RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the pneumonia readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 6% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 28% of a hospital's patients – top decile of all hospitals). We also compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 22% of a hospital's patients – top decile of all hospitals). Figures II.A.11 and II.A.12 and Tables II.A.11 and II.A.12 display the comparisons.

The RSRRs following pneumonia hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 17.0% [interquartile range (IQR): 16.3%-17.6%] and 17.6% (IQR: 16.7%-18.5%), respectively. The RSRRs following pneumonia hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 16.9% (IQR: 16.4-17.5) and 17.8% (IQR: 17.0-18.7), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median pneumonia RSRR was 0.6 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 0.9 percentage points lower than among hospitals with the highest proportions.

TABLE II.A.11. *Distribution of pneumonia RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Pneumonia RSRR (%)	
	Lowest proportion (≤6%) Medicaid patients; n=428	Highest proportion (≥28%) Medicaid patients; n=427
Maximum	22.7	21.8
90%	18.4	19.4
75%	17.6	18.5
Median (50%)	17.0	17.6
25%	16.3	16.7
10%	15.9	16.0
Minimum	13.4	14.2

TABLE II.A.12. *Distribution of pneumonia RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	Pneumonia RSRR (%)	
	No (0%) African-American patients*; n=860	Highest proportion (≥22%) African-American patients; n=432
Maximum	21.4	21.8
90%	18.1	19.6
75%	17.5	18.7
Median (50%)	16.9	17.8
25%	16.4	17.0
10%	15.9	16.4
Minimum	14.1	14.4

*20% of hospitals had no (0%) African-American patients.

Source Data and Population: Pneumonia Readmission Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the COPD mortality measure?

FIGURE II.A.13. *Distribution of COPD RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

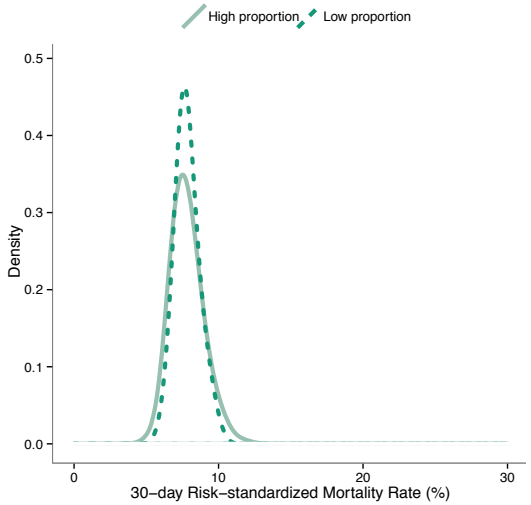
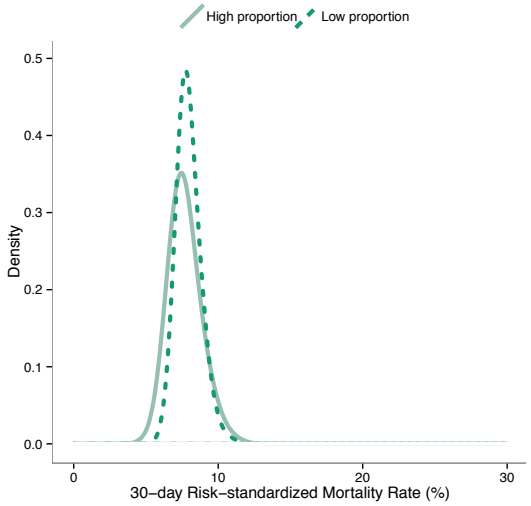


FIGURE II.A.14. *Distribution of COPD RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the chronic obstructive pulmonary disease (COPD) mortality measure, we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (> 29% of a hospital's patients – top decile of all hospitals). We also compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (> 23% of a hospital's patients – top decile of all hospitals). Figures II.A.13 and II.A.14 and Tables II.A.13 and II.A.14 display the comparisons.

The RSMRs following COPD hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 7.7% [interquartile range (IQR): 7.3%-8.3%] and 7.7% (IQR: 7.0%-8.4%), respectively. The RSMRs following COPD hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 7.8% (IQR: 7.4%-8.4%) and 7.6% (IQR: 7.0%-8.3%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median COPD RSMR was the same as among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSMR was 0.2 percentage points higher than among hospitals with the highest proportions.

TABLE II.A.13. *Distribution of COPD RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	COPD RSMR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=378	Highest proportion (≥29%) Medicaid patients; n=378
Maximum	10.3	12.1
90%	9.0	9.2
75%	8.3	8.4
Median (50%)	7.7	7.7
25%	7.3	7.0
10%	6.9	6.6
Minimum	5.8	4.8

TABLE II.A.14. *Distribution of COPD RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	COPD RSMR (%)	
	No (0%) African-American patients*; n=525	Highest proportion (≥23%) African-American patients; n=381
Maximum	11.1	11.5
90%	9.0	9.1
75%	8.4	8.3
Median (50%)	7.8	7.6
25%	7.4	7.0
10%	7.1	6.5
Minimum	6.1	5.0

*14% of hospitals had no (0%) African-American patients.

Source Data and Population: COPD Mortality Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the COPD readmission measure?

FIGURE II.A.15. *Distribution of COPD RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

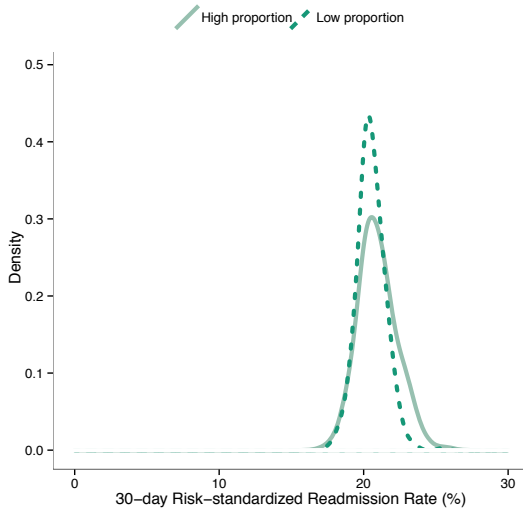
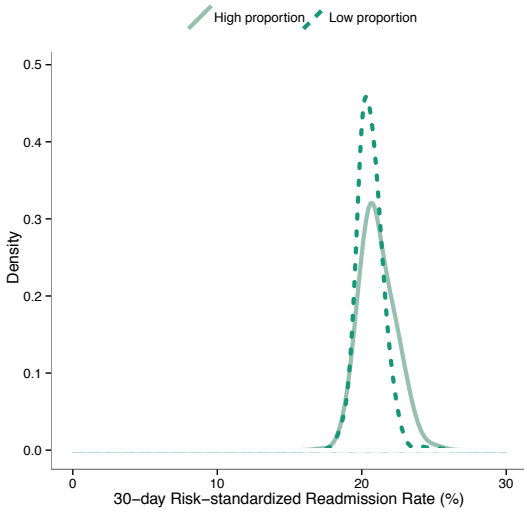


FIGURE II.A.16. *Distribution of COPD RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the chronic obstructive pulmonary disease (COPD) readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (> 29% of a hospital's patients – top decile of all hospitals). We also compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (> 23% of a hospital's patients – top decile of all hospitals). Figures II.A.15 and II.A.16 and Tables II.A.15 and II.A.16 display the comparisons.

The RSRRs following COPD hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 20.4% [interquartile range (IQR): 20.0%-21.1%] and 20.8% (IQR: 20.1%-21.7%), respectively. The RSRRs following COPD hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 20.5% (IQR: 20.0%-21.1%) and 20.9% (IQR: 20.2%-21.9%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median COPD RSRR was 0.4 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 0.4 percentage points lower than among hospitals with the highest proportions.

TABLE II.A.15. *Distribution of COPD RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	COPD RSRR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=385	Highest proportion (≥29%) Medicaid patients; n=385
Maximum	25.5	25.9
90%	21.7	22.8
75%	21.1	21.7
Median (50%)	20.4	20.8
25%	20.0	20.1
10%	19.3	19.4
Minimum	17.5	17.1

TABLE II.A.16. *Distribution of COPD RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	COPD RSRR (%)	
	No (0%) African-American patients*; n=563	Highest proportion (≥23%) African-American patients; n=389
Maximum	25.4	25.5
90%	21.7	22.8
75%	21.1	21.9
Median (50%)	20.5	20.9
25%	20.0	20.2
10%	19.6	19.6
Minimum	17.8	17.1

*14% of hospitals had no (0%) African-American patients.

Source Data and Population: COPD Readmission Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) For more information about figures, see Appendix VI. 6) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile.

Prepared for CMS by YNHHSC/CORE.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the stroke mortality measure?

FIGURE II.A.17. *Distribution of stroke RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

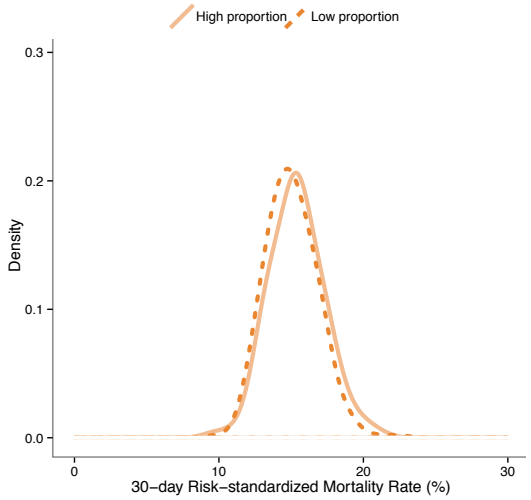
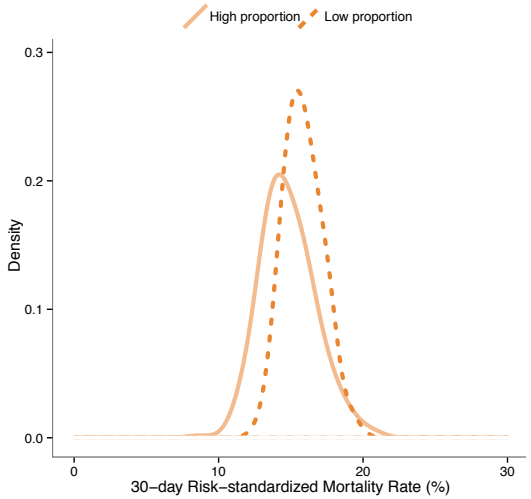


FIGURE II.A.18. *Distribution of stroke RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the stroke mortality measure, we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (> 30% of a hospital's patients – top decile of all hospitals). We also compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (> 23% of a hospital's patients – top decile of all hospitals). Figures II.A.17 and II.A.18 and Tables II.A.17 and II.A.18 display the comparisons.

The RSMRs following stroke hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 15.0% [interquartile range (IQR):13.8%-16.2%] and 15.3% (IQR: 14.0%-16.5%), respectively. The RSMRs following stroke hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 15.7% (IQR: 14.9%-16.8%) and 14.6% (IQR: 13.5%-15.9%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median stroke RSMR was 0.3 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSMR was 1.1 percentage points higher than among hospitals with the highest proportions.

TABLE II.A.17. *Distribution of stroke RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Stroke RSMR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=289	Highest proportion (≥30%) Medicaid patients; n=289
Maximum	22.4	21.3
90%	17.3	17.7
75%	16.2	16.5
Median (50%)	15.0	15.3
25%	13.8	14.0
10%	12.8	13.0
Minimum	9.8	9.6

TABLE II.A.18. *Distribution of stroke RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	Stroke RSMR (%)	
	No (0%) African-American patients; n=290	Highest proportion (≥23%) African-American patients; n=291
Maximum	19.9	20.9
90%	17.7	17.3
75%	16.8	15.9
Median (50%)	15.7	14.6
25%	14.9	13.5
10%	14.2	12.7
Minimum	12.4	8.6

Source Data and Population: Stroke Mortality Cohort data, – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the stroke readmission measure?

FIGURE II.A.19. *Distribution of stroke RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

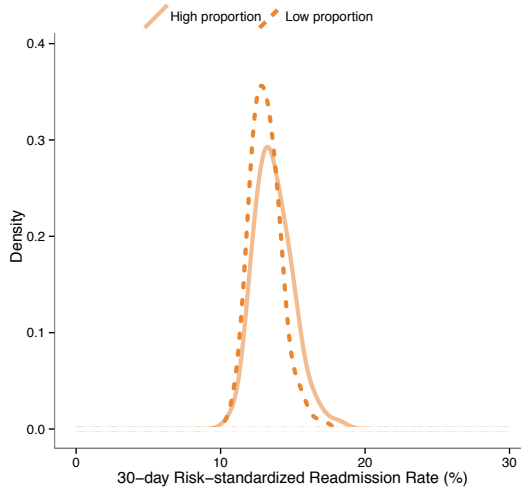
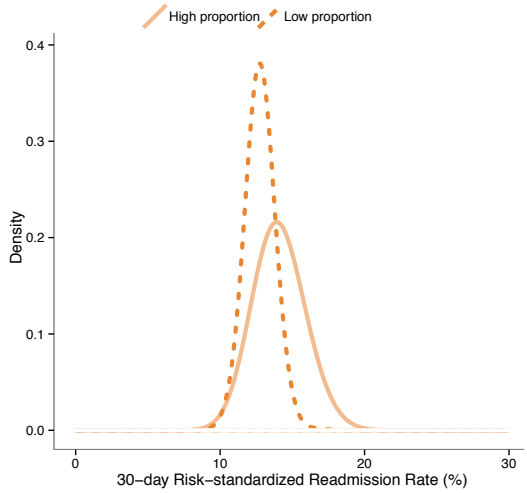


FIGURE II.A.20. *Distribution of stroke RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the stroke readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 30% of a hospital's patients – top decile of all hospitals). We also compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 23% of a hospital's patients – top decile of all hospitals). Figures II.A.19 and II.A.20 and Tables II.A.19 and II.A.20 display the comparisons.

The RSRRs following stroke hospitalization for the median hospitals with the lowest and highest proportions of Medicaid patients were 13.0% [interquartile range (IQR): 12.4%-13.8%] and 13.5% (IQR: 12.8%-14.5%), respectively. The RSRRs following stroke hospitalization for the median hospitals with the lowest and highest proportions of African-American patients were 12.8% (IQR: 12.3-13.2) and 14.0% (IQR: 13.1-14.9), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median stroke RSRR was 0.5 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 1.2 percentage points lower than among hospitals with the highest proportions.

TABLE II.A.19. *Distribution of stroke RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Stroke RSRR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=282	Highest proportion (≥30%) Medicaid patients; n=283
Maximum	17.3	18.5
90%	14.4	15.3
75%	13.8	14.5
Median (50%)	13.0	13.5
25%	12.4	12.8
10%	11.8	12.1
Minimum	10.6	10.6

TABLE II.A.20. *Distribution of stroke RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	Stroke RSRR (%)	
	No (0%) African-American patients; n=284	Highest proportion (≥23%) African-American patients; n=283
Maximum	16.6	18.5
90%	13.7	15.9
75%	13.2	14.9
Median (50%)	12.8	14.0
25%	12.3	13.1
10%	11.8	12.5
Minimum	10.2	10.9

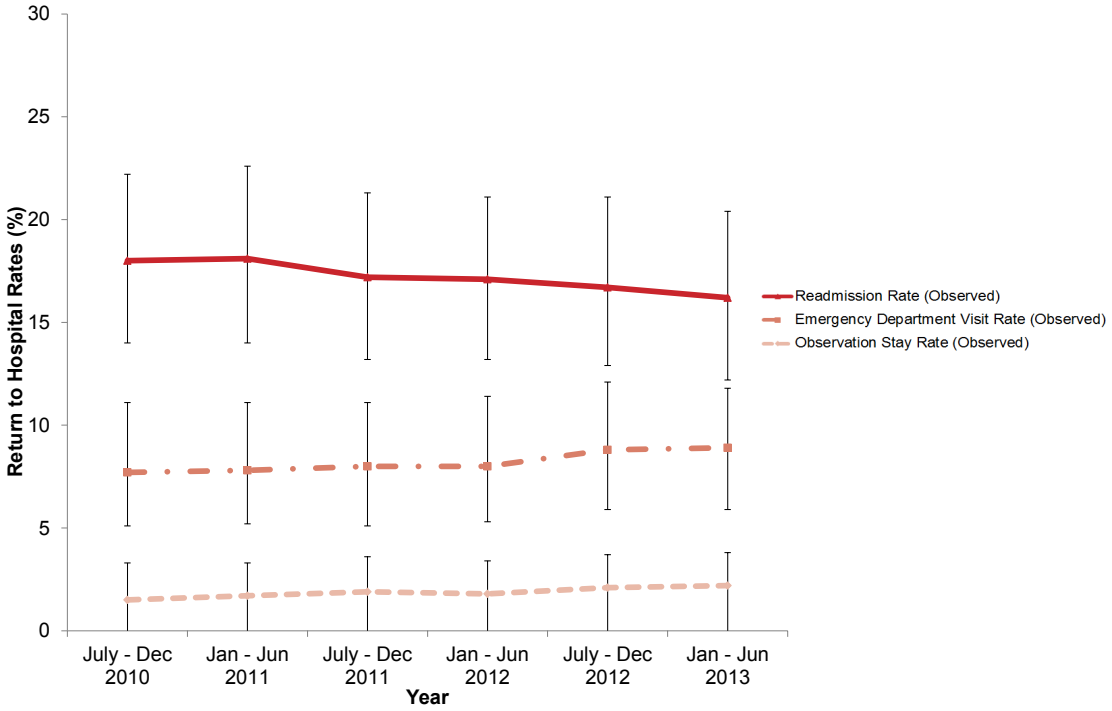
Source Data and Population: Stroke Readmission Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix III); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) For more information about figures, see Appendix VI. 6) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile.

Prepared for CMS by YNHHSC/CORE.

▶ Is the trend in hospital-level observation stays and ED visits following AMI hospitalizations continuing to rise?

FIGURE II.A.21. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the AMI readmission cohort, July 2010 – June 2013.*



In the 2013 *Medicare Hospital Quality Chartbook*, we documented increases in both post-discharge observation stays and emergency department (ED) visits following hospitalization for acute myocardial infarction (AMI) [3]. Given these increases and the concern that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the ED [9, 10], we once again examined return-to-hospital rates following AMI hospitalizations in the publicly reported data. In Figure II.A.21, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for AMI, as well as observed readmission rates, from July 2010 through June 2013. The median 30-day post-discharge observation stay rate is low compared with the 30-day observed readmission rate, but the use of post-discharge observation stays rose 0.7% (from 1.5% to 2.2%) during this time period (Appendix III). We observed a 1.8% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays likely does not fully explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 1.2% (from 7.7% to 8.9%) over the three-year period.

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 2.1%; interquartile range (IQR): 0.9%-3.4%), with 18.0% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate following AMI above 6.5%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission for an AMI, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 10.3% (IQR: 4.5%-16.7%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals were disproportionately using post-discharge observation stays at higher rates.

From 2010 to 2013, there was a 0.7 percentage point increase in observation stay rates following AMI hospitalization, but this increase is smaller than the decline in observed readmission rates (1.8 percentage points). Post-discharge ED visit rates following discharge increased by 1.2 percentage points.

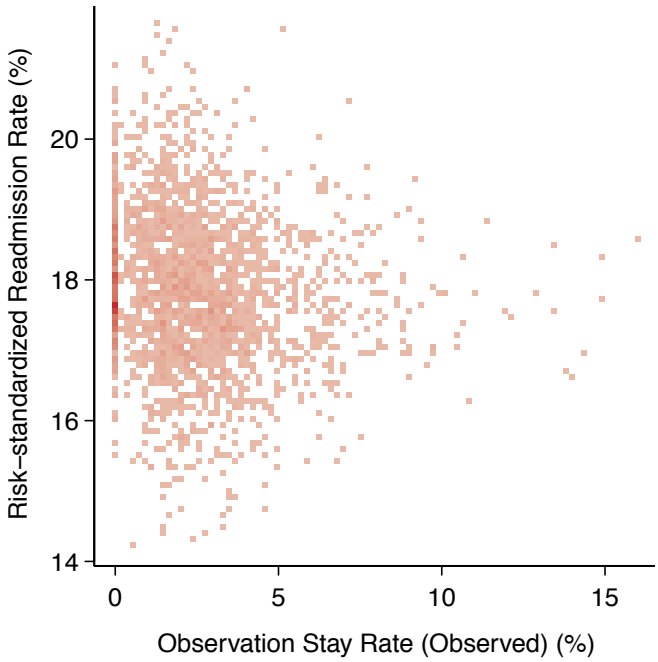
Source Data and Population: AMI Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period for the three-year trend and over the full three-year period for the remaining analyses are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Do hospitals with high rates of observation stays have lower AMI risk-standardized readmission rates?

FIGURE II.A.22. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the AMI readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays among hospitals and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following hospitalization for acute myocardial infarction (AMI) and their risk-standardized readmission rates (RSRRs) following AMI hospitalization.

Figure II.A.22 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 2,378 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information.* There was a statistically significant, but weak inverse correlation (r=-0.15, p<0.0001) between observed post-discharge observation stay rates and RSRRs [11], suggesting that higher post-discharge observation stay rates are associated with lower AMI RSRRs.

There was a significant but weak inverse association between hospital-level post-discharge observation stay use and RSRRs following AMI.

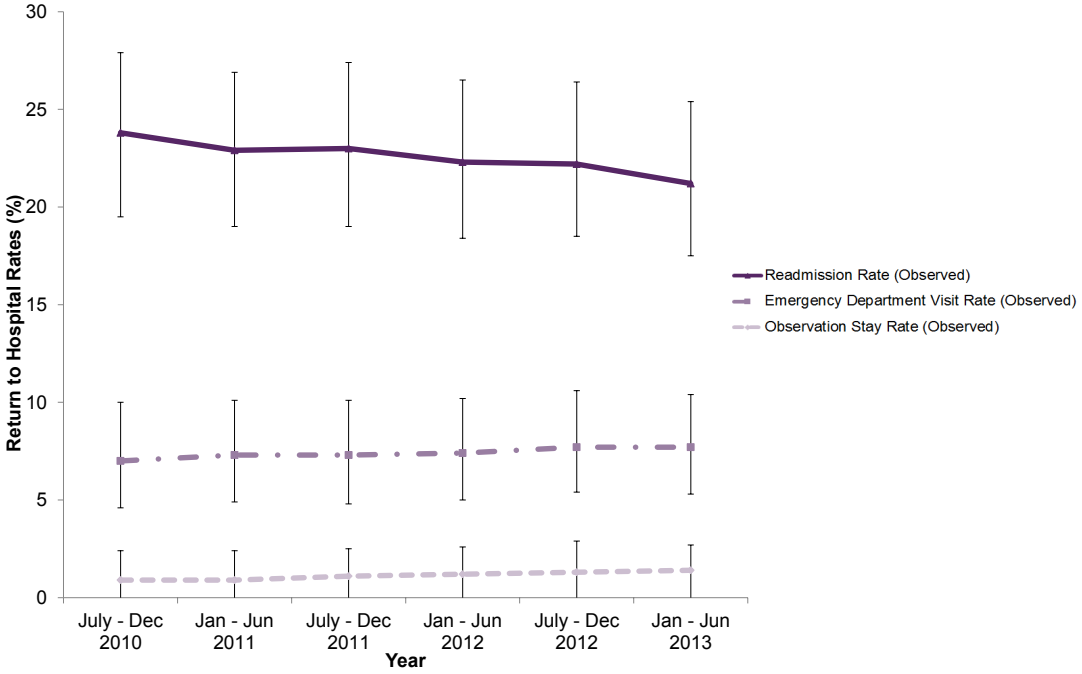
Source Data and Population: AMI Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Is the trend in hospital-level observation stays and ED visits following heart failure hospitalizations continuing to rise?

FIGURE II.A.23. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the heart failure readmission cohort, July 2010 – June 2013.*



In the 2013 *Medicare Hospital Quality Chartbook*, we documented increases in both post-discharge observation stays and emergency department (ED) visits following heart failure hospitalization [2]. Given these increases and the concern that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the ED [9, 10], we once again examined return-to-hospital rates following heart failure hospitalizations in the publicly reported data. In Figure II.A.23, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for heart failure, as well as observed readmission rates, from July 2010 through June 2013. The median 30-day post-discharge observation stay rate is low compared with the 30-day observed readmission rate, but the use of post-discharge observation stays rose 0.5% (from 0.9% to 1.4%) during this time period (Appendix III). We observed a 2.6% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays likely does not fully explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 0.7% (from 7.0% to 7.7%) over the three-year period.

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 1.5%; interquartile range (IQR): 0.5%-2.5%), with 19.9% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate following heart failure above 4.9%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission for heart failure, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 6.1% (IQR: 2.3%-10.5%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals were disproportionately using post-discharge observation stays at higher rates.

From 2010 to 2013, there was a 0.5 percentage point increase in observation stay rates following heart failure hospitalization, and a 0.7 percentage point increase in post-discharge ED visit rates. However, these increases were smaller than the total decline in observed readmission rates (2.6 percentage points).

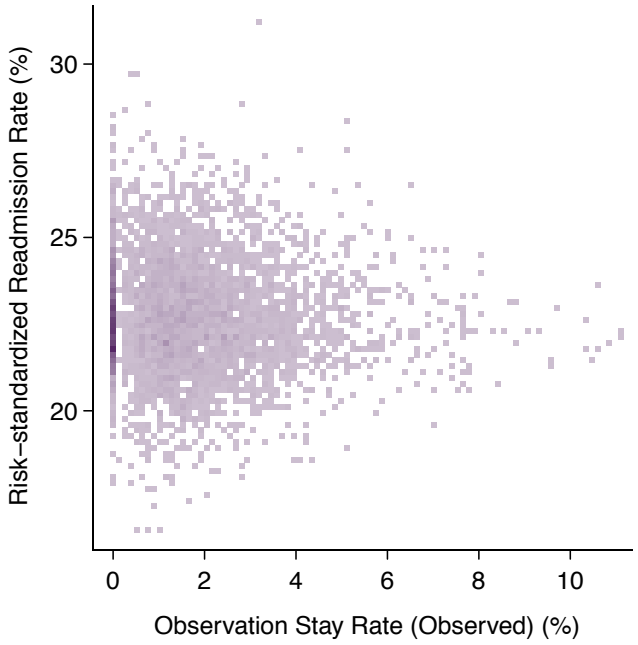
Source Data and Population: Heart Failure Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period for the three-year trend and over the full three-year period for the remaining analyses are not shown; however, these hospitals are included in the calculations.3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Do hospitals with high rates of observation stays have lower heart failure risk-standardized readmission rates?

FIGURE II.A.24. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the heart failure readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays among hospitals and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following heart failure hospitalization and their risk standardized readmission rates (RSRRs) following heart failure hospitalization.

Figure II.A.24 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 4,092 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There was a statistically significant, but very weak inverse correlation (r=-0.04, p=0.0071) between post-discharge observation stay rates and RSRRs following heart failure hospitalization [11] suggesting higher observation stay rates are associated with lower heart failure RSRRs.

There was a significant but very weak inverse association between hospital-level post-discharge observation stay use and RSRRs following heart failure.

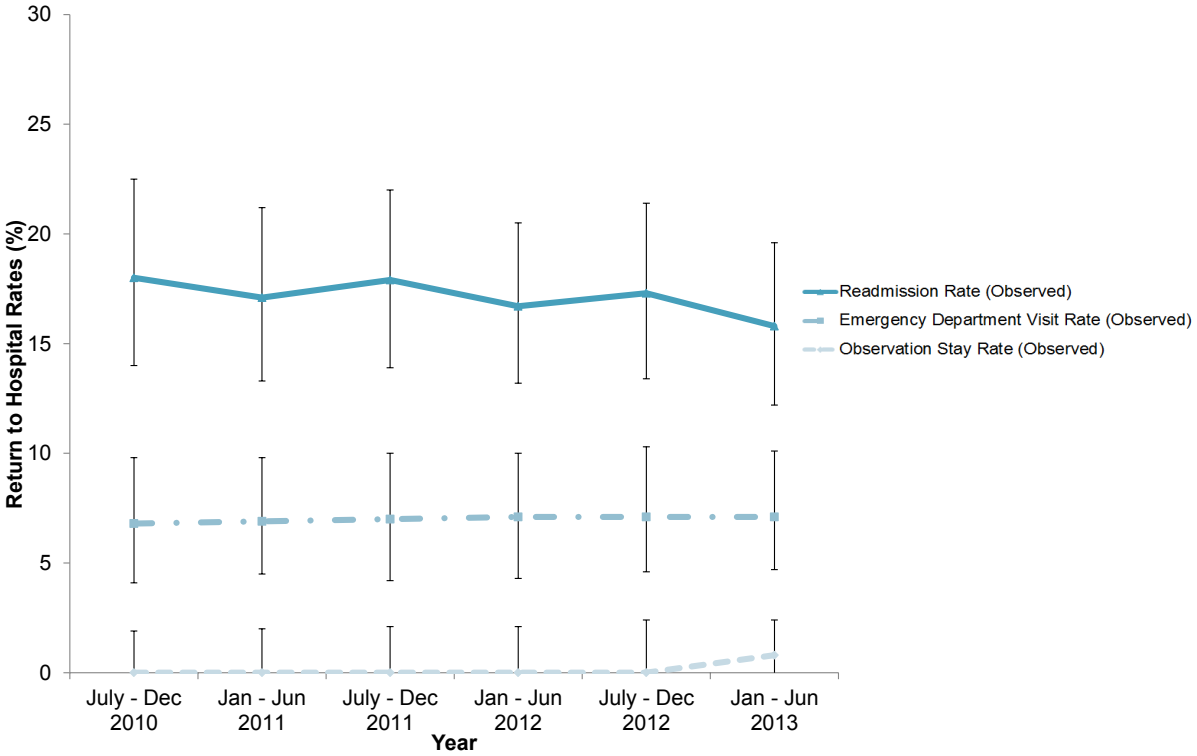
Source Data and Population: Heart Failure Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Is the trend in hospital-level observation stays and ED visits following pneumonia hospitalizations continuing to rise?

FIGURE II.A.25. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the pneumonia readmission cohort, July 2010 – June 2013.*



In the 2013 *Medicare Hospital Quality Chartbook*, we documented increases in post-discharge observation stays and emergency department (ED) visits following pneumonia hospitalization [2]. Given this increase and the concern that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the ED [9, 10], we once again examined return-to-hospital rates following pneumonia hospitalizations in the publicly reported data. In Figure II.A.25, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for pneumonia, as well as observed readmission rates, from July 2010 through June 2013. The median 30-day post-discharge observation stay rate is low compared with the 30-day observed readmission rate, but the use of post-discharge observation stays rose 0.8% (from 0.0% to 0.8%) during this time period (Appendix III). We observed a 2.2% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays likely does not explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 0.3% (from 6.8% to 7.1%) over the three-year period.

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 1.1%; interquartile range (IQR): 0.2%-2.0%), with 24.6% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate following pneumonia above 3.8%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission for pneumonia, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 6.1% (IQR: 1.1%-11.1%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals were disproportionately using post-discharge observation stays at higher rates.

From 2010 to 2013, there was a 0.8 percentage point increase in observation stay rates following pneumonia hospitalization and a 0.3 percentage point increase in post-discharge ED visit rates. However, these increases were smaller than the total decline in observed readmission rates (2.2 percentage points).

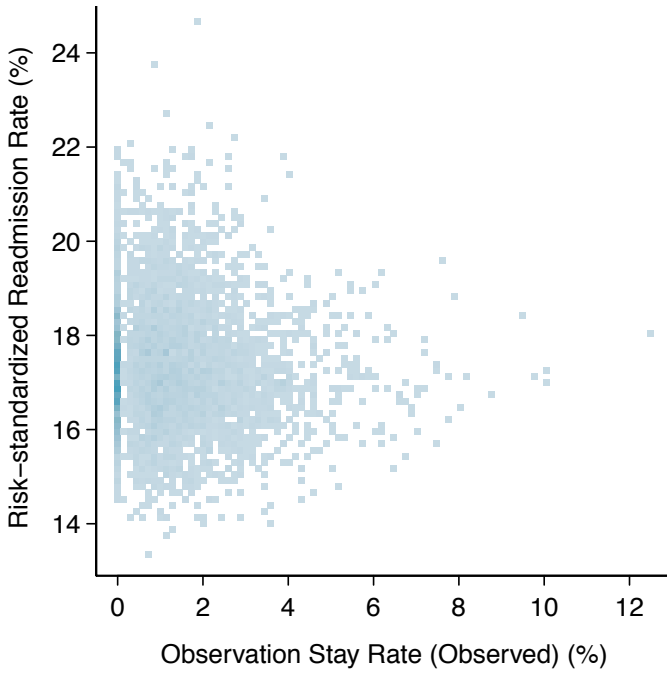
Source Data and Population: Pneumonia Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period for the three-year trend and over the full three-year period for the remaining analyses are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Do hospitals with high rates of observation stays have lower pneumonia risk-standardized readmission rates?

FIGURE II.A.26. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the pneumonia readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays among hospitals and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following pneumonia hospitalization and their risk standardized readmission rates (RSRRs) following pneumonia hospitalization.

Figure II.A.26 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 4,454 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There is a statistically significant, but very weak inverse correlation (r=-0.04, p=0.0069) between observed post-discharge observation stay rates and RSRRs following pneumonia hospitalization [11], suggesting that higher observation stay rates are associated with lower pneumonia RSRRs.

There was a significant but very weak inverse association between hospital-level post-discharge observation stay use and RSRRs following pneumonia hospitalization.

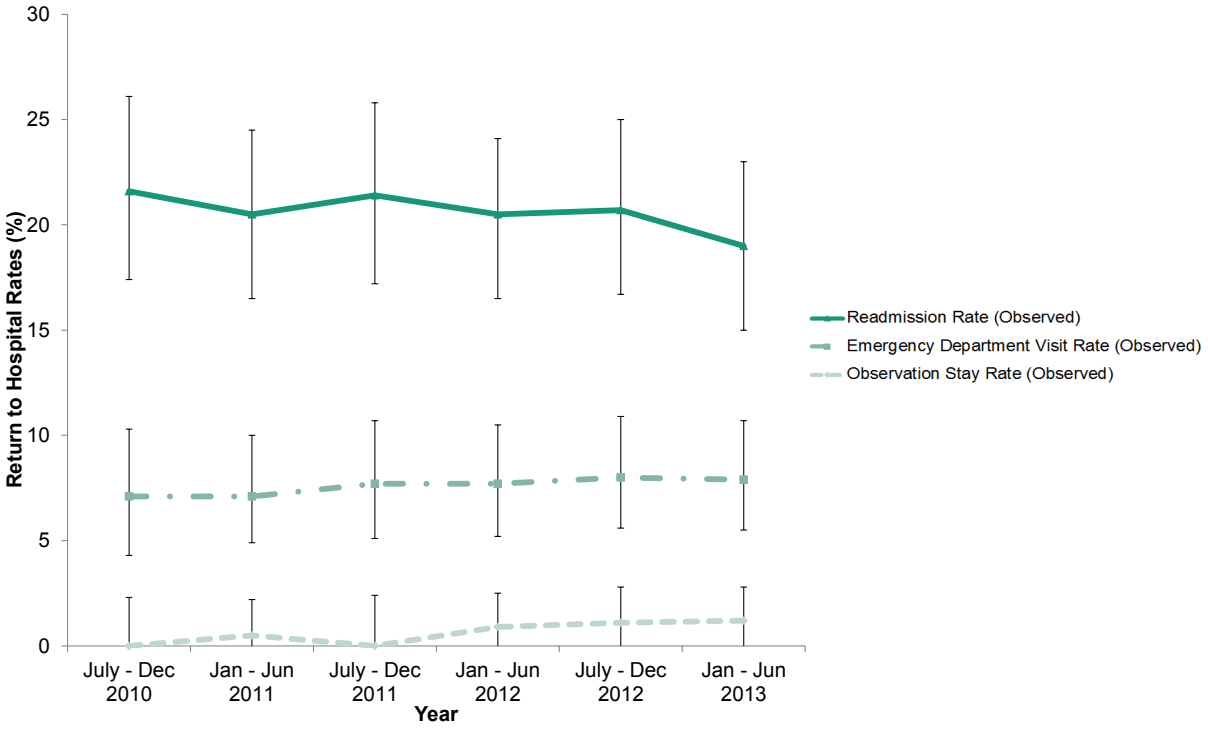
Source Data and Population: Pneumonia Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition across the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Is the trend in hospital-level observation stays and ED visits following COPD hospitalizations continuing to rise?

FIGURE II.A.27. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the COPD readmission cohort, July 2010 – June 2013.*



Due to concerns that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10], we examined return-to-hospital rates following chronic obstructive pulmonary disease (COPD) hospitalizations. In Figure II.A.27, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for COPD, as well as observed readmission rates, from July 2010 through June 2013. The median 30-day post-discharge observation stay rate is low compared with the 30-day observed readmission rate, but the use of post-discharge observation stays rose 1.2% (from 0% to 1.2%) during this time period (Appendix III). We observed a 2.6% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays does not fully explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 0.8% (from 7.1% to 7.9%) over the three-year period.

In addition, we identified variation in post-discharge observation stay use (median rate: 1.3%; interquartile range (IQR): 0.4%-2.2%), with 21.5% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate following COPD above 4.3%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission for COPD, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 5.9% (IQR: 2.1%-10.0%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals are disproportionately using post-discharge observation stays at higher rates.

From 2010 to 2013, there was a 1.2 percentage point increase in observation stay rates following COPD hospitalization and a 0.8 percentage point increase in post-discharge ED visit rates. However, these increases were smaller than the total decline in observed readmission rates (2.6 percentage points).

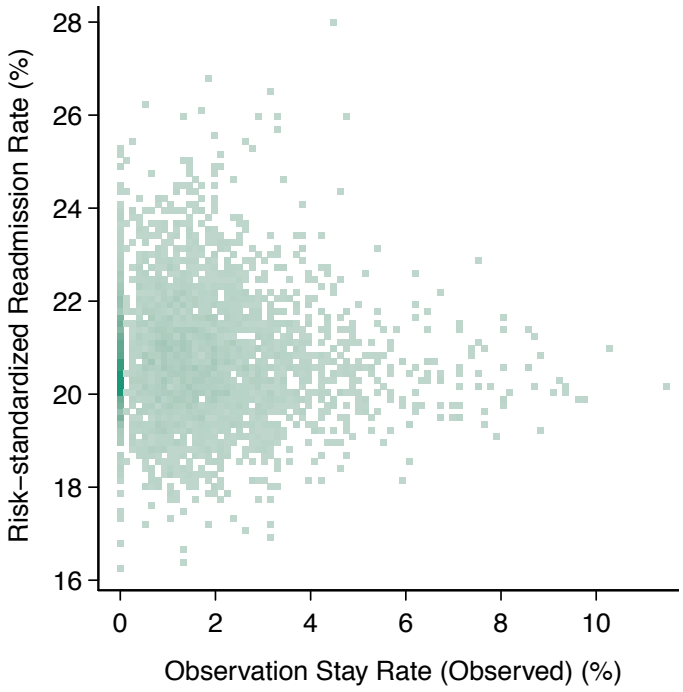
Source Data and Population: COPD Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period for the three-year trend and over the full three-year period for the remaining analyses are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Do hospitals with high rates of observation stays have lower COPD risk-standardized readmission rates?

FIGURE II.A.28. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the COPD readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays among hospitals and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following chronic obstructive pulmonary disease (COPD) hospitalization and their risk-standardized readmission rates (RSRRs) following COPD hospitalization.

There was a significant but very weak inverse association between hospital-level use of post-discharge observation stays and RSRRs following COPD hospitalization.

Figure II.A.28 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 3,905 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There was a statistically significant, but very weak inverse correlation (r=-0.03, p=0.0486) between observed post-discharge observation stay rates and RSRRs [11], suggesting higher observation stay rates are associated with lower COPD RSRRs.

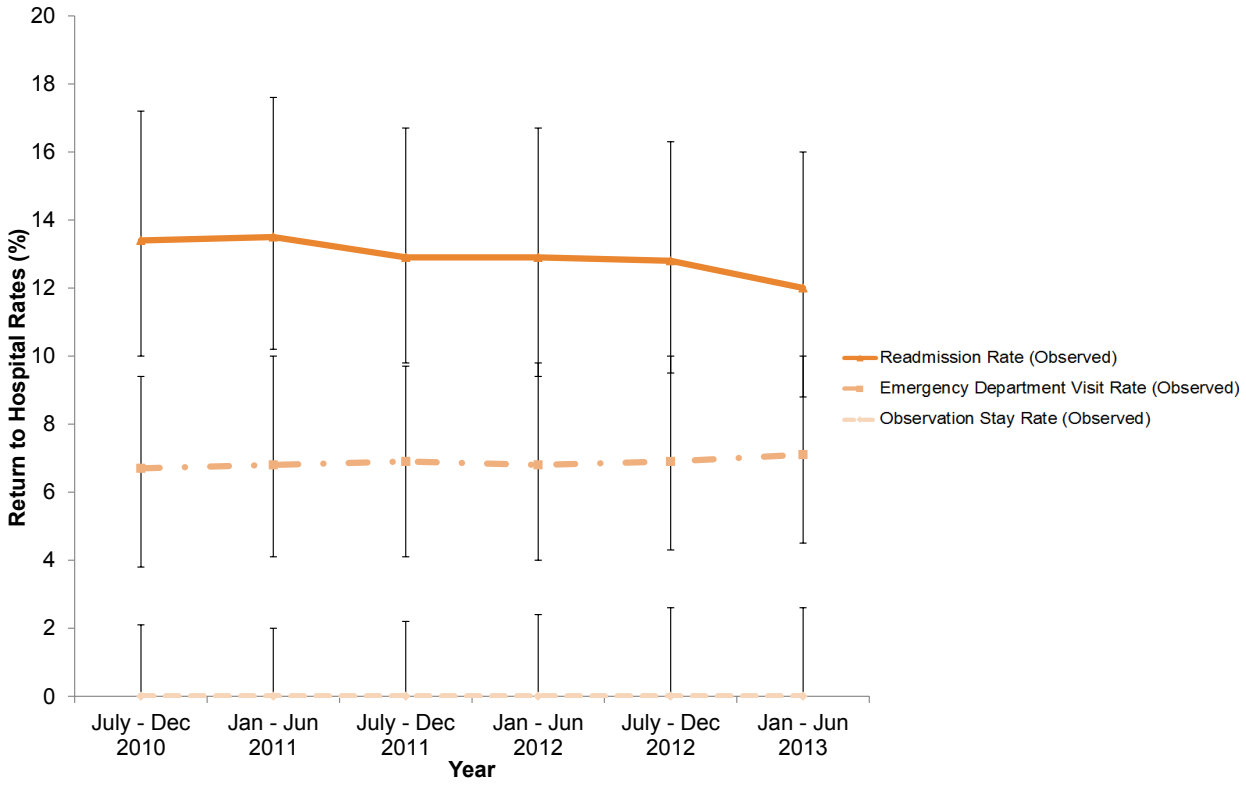
Source Data and Population: COPD Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition across the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Is the trend in hospital-level observation stays and ED visits following stroke hospitalizations continuing to rise?

FIGURE II.A.29. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the stroke readmission cohort, July 2010 – June 2013.*



Due to concerns that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10], we examined return-to-hospital rates following ischemic stroke hospitalizations. In Figure II.A.29, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for stroke, as well as observed readmission rates, from July 2010 through June 2013. The median 30-day post-discharge observation stay rate following stroke hospitalization remained at 0% over the three-year period (Appendix III). We observed a 1.4% decrease in the observed readmission rate during this time period. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 0.4% (from 6.7% to 7.1%) over the three-year period.

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 1.1%; interquartile range (IQR): 0.0%-2.1%), with 29.9% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate following stroke above 4.1%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission for a stroke, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 7.9% (IQR: 0.0%-14.3%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals are disproportionately using post-discharge observation stays at higher rates.

From 2010 to 2013, there was no increase in observation stay rates following stroke hospitalization and 0.4 percentage point increase in post-discharge ED visit rates. However, this increase was smaller than the total decline in observed readmission rates (1.4 percentage points).

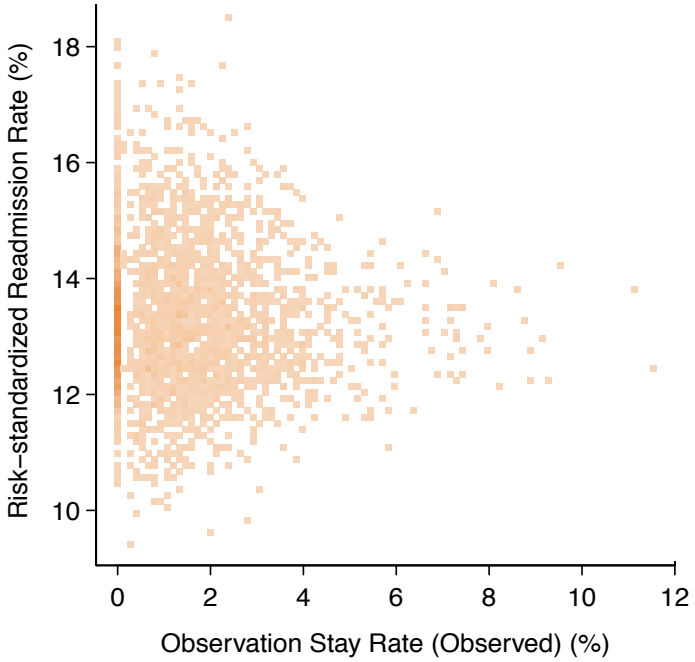
Source Data and Population: Stroke Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period are not shown as a part of the three-year trend; however, these hospitals are included in the calculations. The results of hospitals with fewer than 25 cases of the condition over the entire three-year period are not shown in the remaining analyses; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

Prepared for CMS by YNHHSC/CORE.

▶ Do hospitals with high rates of observation stays have lower stroke risk-standardized readmission rates?

FIGURE II.A.30. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the stroke readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays among hospitals and the concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following ischemic stroke hospitalization and their risk-standardized readmission rates (RSRRs) following stroke hospitalization.

There was no significant association between hospital-level use of post-discharge observation stays and RSRRs following stroke hospitalization.

Figure II.A.30 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 2,846 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There was no significant correlation (r=-0.02, p=0.2450) between observed post-discharge observation stay rates and RSRRs [11]. This finding indicates that observed post-discharge observation stays do not have a significant association with RSRRs following stroke hospitalization.

Source Data and Population: Stroke Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition across the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

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Background

DISPARITIES | OBSERVATION STAYS & EMERGENCY DEPARTMENT VISITS

This section focuses on potential socioeconomic and race-based disparities in hospital performance on the mortality, complication, and readmission measures, and monitors return-to-hospital rates in the 30-day post-discharge period for the following procedures:

- Isolated coronary artery bypass graft (CABG) surgery
- Primary elective total hip and/or knee arthroplasty

The analyses in this section are used to explore potential consequences of publicly reporting hospital outcomes. The analyses for the CABG measures and the hip/knee arthroplasty readmission measure include data from July 2010 through June 2013 while the analyses for the hip/knee complication measure include data from April 2010 through March 2013.

Many stakeholders are concerned that hospitals caring for large numbers of Medicaid or African-American patients may not perform as well on hospital outcome measures [1]. To address this concern, we compare hospital performance of hospitals that care for the lowest proportions of Medicaid patients with hospitals that care for the highest proportions of Medicaid patients. Similarly, we compare performance of hospitals that care for the lowest and highest proportions of African-American patients.

Stakeholders are also concerned about the rising rates of post-discharge observation stays among Medicare fee-for-service (FFS) beneficiaries. Specifically, recent press reports and research have raised concerns that hospitals may be avoiding readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10]. To characterize hospital use of post-discharge observation stays, we analyze the hospital-level trends and distributions of post-discharge observation stays and ED visit rates within 30 days of an inpatient hospitalization for hip/knee arthroplasty. We also examine the correlation between hospital-level risk-standardized readmission rates (RSRRs) and 30-day observation stay rates following an admission for hip/knee arthroplasty.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the isolated CABG mortality measure?

FIGURE II.B.1. *Distribution of isolated CABG RSMRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

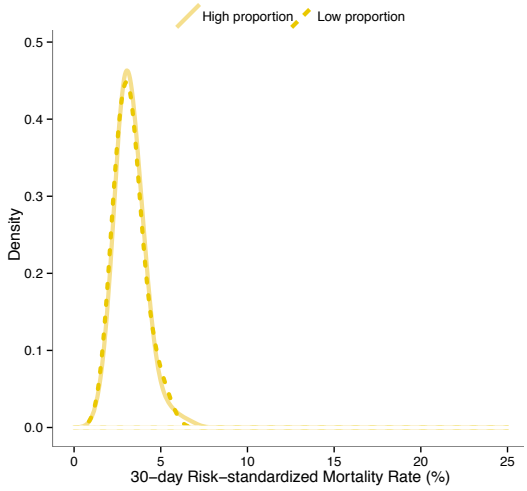
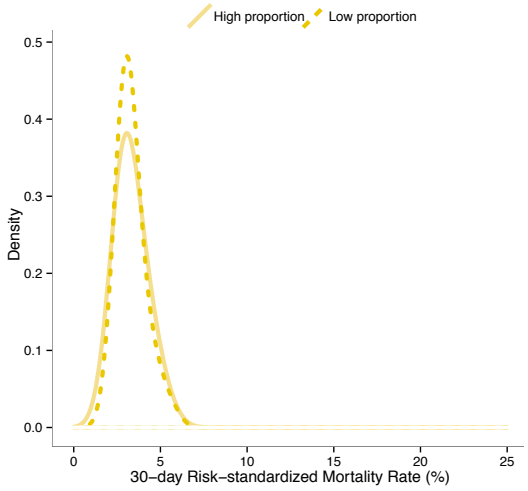


FIGURE II.B.2. *Distribution of isolated CABG RSMRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the isolated coronary artery bypass graft (CABG) surgery mortality measure ("isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement), we compared the 30-day risk-standardized mortality rates (RSMRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 30% – top decile of all hospitals). Similarly, we compared the RSMRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 21% of a hospital's patients – top decile of all hospitals). Figures II.B.1 and II.B.2 and Tables II.B.1 and II.B.2 display the comparisons.

The RSMRs following CABG surgery for the median hospitals with the lowest and highest proportions of Medicaid patients were 3.1% [interquartile range (IQR): 2.6%-3.6%] and 3.2% (IQR: 2.7%-3.7%), respectively. The RSMRs following CABG surgery for the median hospitals with the lowest and highest proportions of African-American patients were both 3.2%, with IQRs of 2.8%-3.6% and 2.7%-3.8%, respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median CABG RSMR was 0.1 percentage points lower than among hospitals with the highest proportions. Hospitals with the lowest and highest proportions of African-American patients had the same median RSMRs following CABG surgery.

TABLE II.B.1. *Distribution of isolated CABG RSMRs by proportion of Medicaid patients, July 2010 – June 2013.*

	CABG RSMR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=107	Highest proportion (≥30%) Medicaid patients; n=107
Maximum	5.5	6.6
90%	4.4	4.3
75%	3.6	3.7
Median (50%)	3.1	3.2
25%	2.6	2.7
10%	2.2	2.4
Minimum	1.5	1.7

TABLE II.B.2. *Distribution of isolated CABG RSMRs by proportion of African-American patients, July 2010 – June 2013.*

	CABG RSMR (%)	
	No (0%) African-American patients; n=108	Highest proportion (≥21%) African-American patients; n=108
Maximum	5.8	5.8
90%	4.5	4.6
75%	3.6	3.8
Median (50%)	3.2	3.2
25%	2.8	2.7
10%	2.5	2.4
Minimum	2.0	1.8

Source Data and Population: CABG Mortality Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the isolated CABG readmission measure?

FIGURE II.B.3. *Distribution of isolated CABG RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

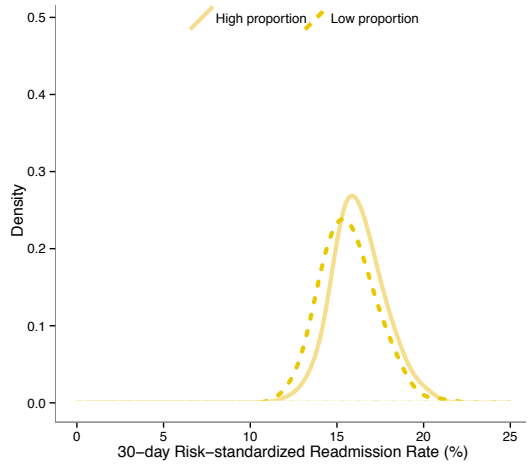
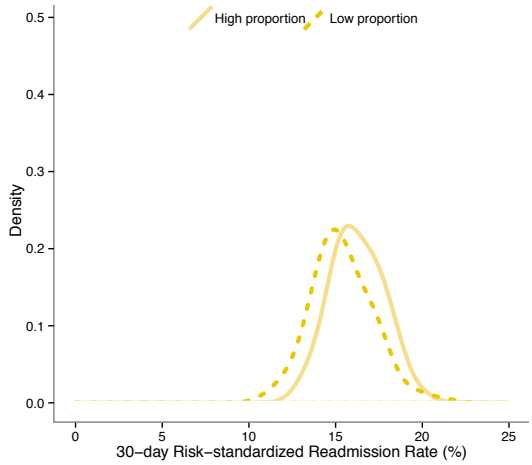


FIGURE II.B.4. *Distribution of isolated CABG RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the isolated coronary artery bypass graft (CABG) surgery readmission measure ("isolated" CABG procedures are those performed without concomitant high-risk cardiac and non-cardiac procedures, such as valve replacement), we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 8% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 30% of a hospital's patients – top decile of all hospitals). Similarly, we compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 21% of a hospital's patients – top decile of all hospitals). Figures II.B.3 and II.B.4 and Tables II.B.3 and II.B.4 display the comparisons.

The RSRRs following CABG surgery for the median hospitals with the lowest and highest proportions of Medicaid patients were 15.5% [interquartile range (IQR): 14.6%-16.6%] and 16.1% (IQR: 15.3%-17.1%), respectively. The RSRRs following CABG surgery for the median hospitals with the lowest and highest proportions of African-American patients were 15.3% (IQR: 14.3%-16.5%) and 16.2% (IQR: 15.2%-17.3%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median RSRR following CABG surgery was 0.6 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR following CABG surgery was 0.9 percentage points lower than among hospitals with the highest proportions.

TABLE II.B.3. *Distribution of isolated CABG RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	CABG RSRR (%)	
	Lowest proportion (≤8%) Medicaid patients; n=107	Highest proportion (≥30%) Medicaid patients; n=107
Maximum	20.9	20.1
90%	17.7	18.3
75%	16.6	17.1
Median (50%)	15.5	16.1
25%	14.6	15.3
10%	14.0	14.8
Minimum	12.4	12.3

TABLE II.B.4. *Distribution of isolated CABG RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	CABG RSRR (%)	
	No (0%) African-American patients; n=107	Highest proportion (≥21%) African-American patients; n=107
Maximum	21.2	20.0
90%	17.5	18.2
75%	16.5	17.3
Median (50%)	15.3	16.2
25%	14.3	15.2
10%	13.5	14.4
Minimum	11.2	13.0

Source Data and Population: CABG Readmission Cohort data – July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) For more information about figures, see Appendix VI. 6) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the elective total hip and/or knee arthroplasty complication measure?

FIGURE II.B.5. *Distribution of hip/knee arthroplasty RSCRs for hospitals with the lowest and highest proportions of Medicaid patients, April 2010 – March 2013.*

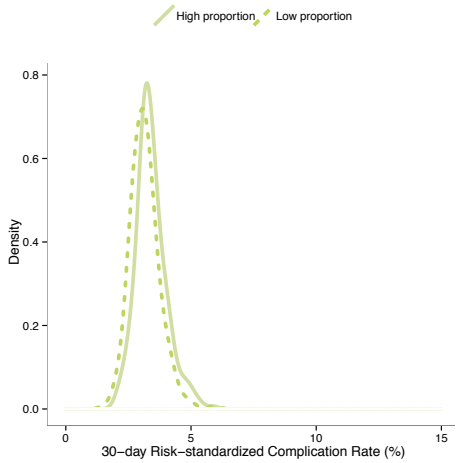
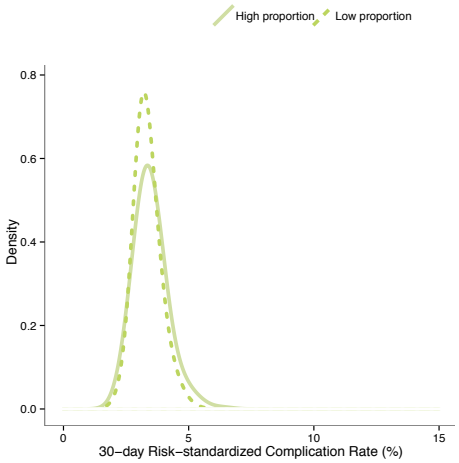


FIGURE II.B.6. *Distribution of hip/knee arthroplasty RSCRs for hospitals with the lowest and highest proportions of African-American patients, April 2010 – March 2013.*



For the elective total hip/knee arthroplasty complication measure, we compared the risk-standardized complication rates (RSCRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 28% of a hospital's patients – top decile of all hospitals). Similarly, we compared the RSCRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 19% of a hospital's patients – top decile of all hospitals). Figures II.B.5 and II.B.6 and Tables II.B.5 and II.B.6 display the comparisons.

The RSCRs following hip/knee arthroplasty for the median hospitals with the lowest and highest proportions of Medicaid patients were 3.1% [interquartile range (IQR): 2.8 %-3.5%] and 3.3% (IQR: 3.1%-3.7%), respectively. The RSCRs following hip/knee arthroplasty for the median hospitals with the lowest and highest proportions of African-American patients were 3.3% (IQR: 3.0%-3.6%) and 3.4% (IQR: 3.1%-3.8%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median hip/knee arthroplasty RSCR was 0.2 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSCR was 0.1 percentage point lower than among hospitals with the highest proportions.

TABLE II.B.5. *Distribution of hip/knee arthroplasty RSCRs by proportion of Medicaid patients, April 2010 – March 2013.*

	Hip/Knee Arthroplasty RSCR (%)	
	Low proportion (≤7%) Medicaid patients; n=279	High proportion (≥28%) Medicaid patients; n=279
Maximum	5.9	5.9
90%	3.9	4.2
75%	3.5	3.7
Median (50%)	3.1	3.3
25%	2.8	3.1
10%	2.5	2.7
Minimum	1.5	2.1

TABLE II.B.6. *Distribution of hip/knee arthroplasty RSCRs for hospitals with the lowest and highest proportions of African-American patients, April 2010 – March 2013.*

	Hip/Knee Arthroplasty RSCR (%)	
	No (0%) African-American patients; n=282	High proportion (≥19%) African-American patients; n=282
Maximum	5.3	6.4
90%	4.0	4.2
75%	3.6	3.8
Median (50%)	3.3	3.4
25%	3.0	3.1
10%	2.8	2.7
Minimum	2.1	2.0

Source Data and Population: Hip/Knee Arthroplasty Complication Cohort data, April 2010 – March 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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How do hospitals caring for high proportions of Medicaid or African-American patients perform on the elective total hip and/or knee arthroplasty readmission measure?

FIGURE II.B.7. *Distribution of hip/knee arthroplasty RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2010 – June 2013.*

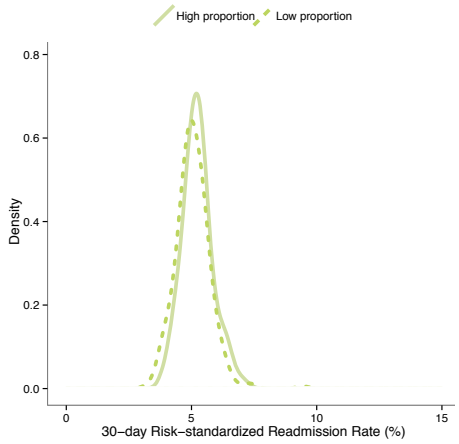
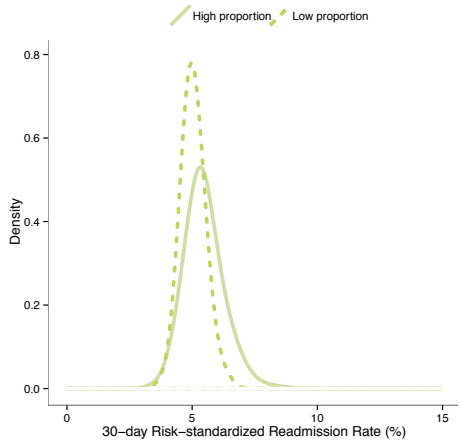


FIGURE II.B.8. *Distribution of hip/knee arthroplasty RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2010 – June 2013.*



For the elective total hip/knee arthroplasty readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 7% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 28% of a hospital's patients – top decile of all hospitals). Similarly, we compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 20% of a hospital's patients – top decile of all hospitals). Figures II.B.7 and II.B.8 and Tables II.B.7 and II.B.8 display the distributions.

The RSRRs following hip/knee arthroplasty for the median hospitals with the lowest and highest proportions of Medicaid patients were 5.0% [interquartile range (IQR): 4.7%-5.4%] and 5.2% (IQR: 4.9%-5.5%), respectively. The RSRRs following hip/knee arthroplasty for the median hospitals with the lowest and highest proportions of African-American patients were 5.0% (IQR: 4.8%-5.3%) and 5.4% (IQR: 5.0%-5.8%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median hip/knee arthroplasty RSRR was 0.2 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median RSRR was 0.4 percentage points lower than among hospitals with the highest proportions.

TABLE II.B.7. *Distribution of hip/knee arthroplasty RSRRs by proportion of Medicaid patients, July 2010 – June 2013.*

	Hip/Knee Arthroplasty RSRR (%)	
	Lowest proportion (≤7%) Medicaid patients; n=279	Highest proportion (≥28%) Medicaid patients; n=278
Maximum	9.4	7.2
90%	5.8	6.0
75%	5.4	5.5
Median (50%)	5.0	5.2
25%	4.7	4.9
10%	4.2	4.5
Minimum	3.2	3.8

TABLE II.B.8. *Distribution of hip/knee arthroplasty RSRRs by proportion of African-American patients, July 2010 – June 2013.*

	Hip/Knee Arthroplasty RSRR (%)	
	No (0%) African-American patients; n=281	Highest proportion (≥20%) African-American patients; n=281
Maximum	6.5	8.7
90%	5.6	6.4
75%	5.3	5.8
Median (50%)	5.0	5.4
25%	4.8	5.0
10%	4.5	4.7
Minimum	3.7	3.3

Source Data and Population: Hip/Knee Arthroplasty Readmission Cohort data, July 2010 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix III); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix III).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the three-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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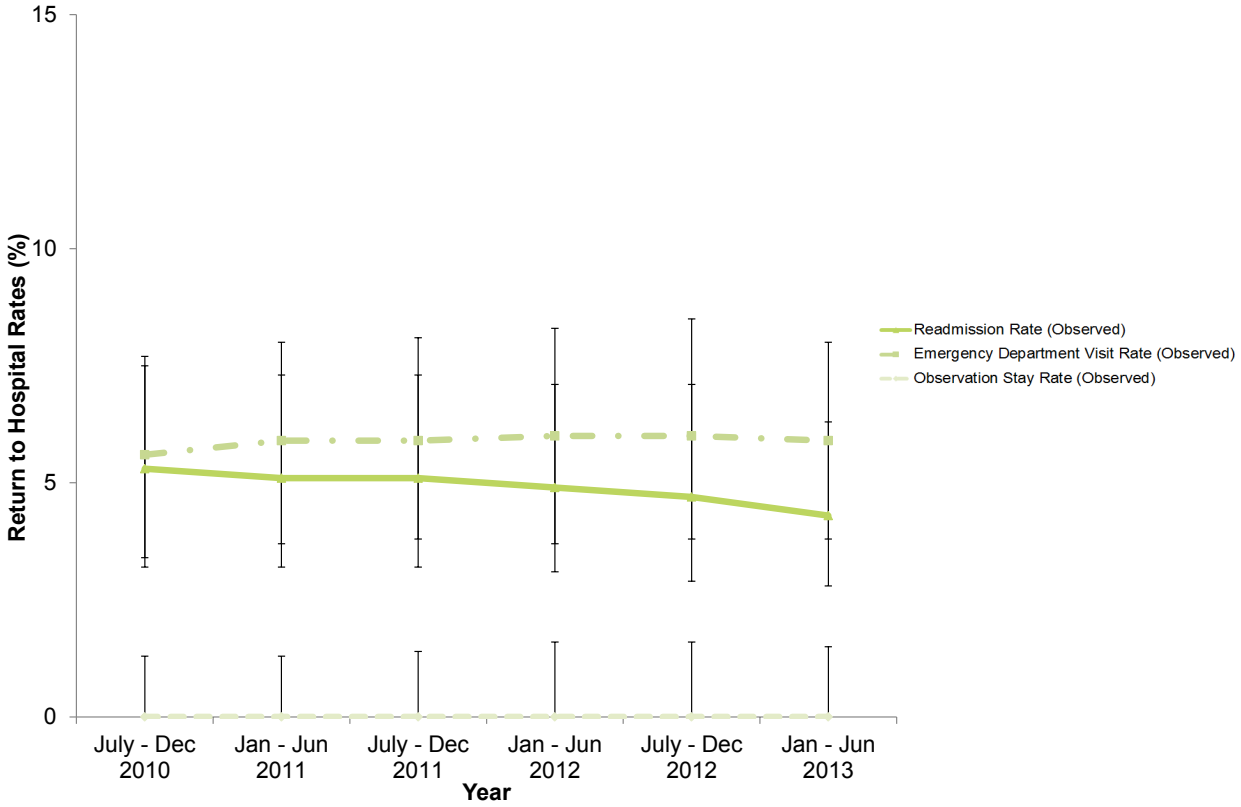
▶ Is the trend in hospital-level observation stays and ED visits following elective total hip and/or knee arthroplasty continuing to rise?

FIGURE II.B.9. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the hip/knee arthroplasty readmission cohort, July 2010 – June 2013.*



Due to concerns that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10], we examined return-to-hospital rates following hip/knee arthroplasty. In Figure II.B.9, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for hip/knee arthroplasty, as well as observed readmission rates from July 2010 to June 2013. The median 30-day post-discharge observation stay rate remained at 0% over the three-year period (Appendix III). We observed a 1.0% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays does not explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate for patients with ED visits but no observation stays or readmissions increased 0.3% (from 5.6% to 5.9%) over the three-year period.

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 0.7%; interquartile range (IQR): 0.0%-1.3%), with 29.3% of hospitals using no post-discharge observation stays and 5% of hospitals having a post-discharge observation stay rate above 2.7%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 12.0% (IQR: 0.0%-20.0%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals are disproportionally using post-discharge observation stays at higher rates.

From 2010 to 2013, there was no increase in post-discharge observation stay rates following hip/knee arthroplasty, and a 0.3 percentage point increase in post-discharge ED visit rates. These increases were smaller than the total decline in observed readmission rates (1.0 percentage point).

Source Data and Population: Hip/Knee Arthroplasty Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in each six-month period for the three-year trend and over the full three-year period for the remaining analyses are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

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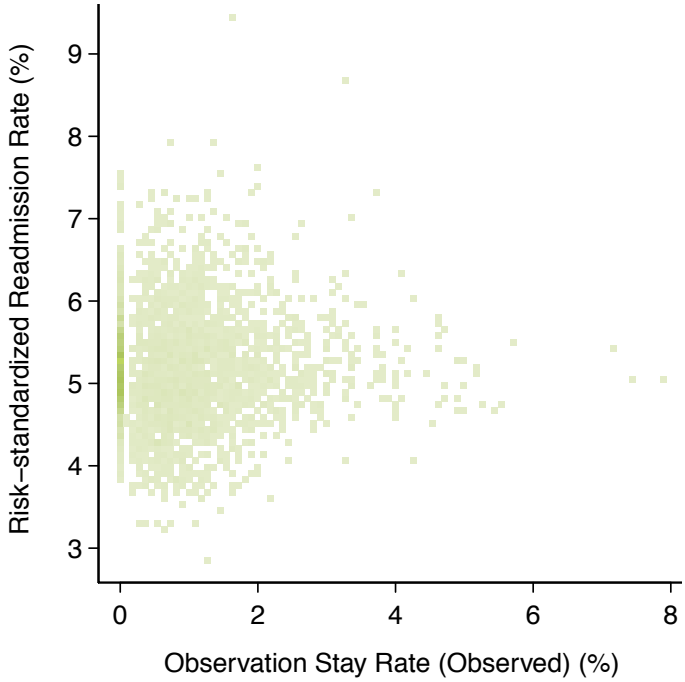
▶ Do hospitals with high rates of observation stays have lower elective total hip and/or knee arthroplasty risk-standardized readmission rates?

FIGURE II.B.10. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the hip/knee arthroplasty readmission cohort, July 2010 – June 2013.*



Given the variation in the use of post-discharge observation stays and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following hip/knee arthroplasty and their risk-standardized readmission rate (RSRR).

Figure II.B.10 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 2,833 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There was no correlation (r=0.00, p=0.8910) between observed post-discharge observation stay rates and RSRRs for hip/knee arthroplasty [11]. This finding indicates that observed post-discharge observation stays do not have a significant association with RSRRs following hip/knee arthroplasty.

There was no significant association between observed hospital-level post-discharge observation stay use and hip/knee arthroplasty RSRRs.

Source Data and Population: Hip/Knee Arthroplasty Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition across the three-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

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Background

DISPARITIES | OBSERVATION STAYS & EMERGENCY DEPARTMENT VISITS

This section focuses on potential socioeconomic and race-based disparities in hospital performance on the readmission measure, and monitors return-to-hospital rates in the 30-day post-discharge period from July 2012 through June 2013 for the following cohort:

- Hospital-wide readmission

Many stakeholders are concerned that hospitals caring for large numbers of Medicaid or African-American patients may not perform as well on hospital outcome measures [1]. To address this concern, we compare hospital performance of hospitals that care for the lowest proportion of Medicaid patients with hospitals that care for the highest proportion of Medicaid patients. Similarly, we compare performance of hospitals that care for the lowest and highest proportions of or African-American patients.

Stakeholders are also concerned about the rising rates of post-discharge observation stays among Medicare fee-for-service (FFS) beneficiaries. Specifically, recent press reports and research have raised concerns that hospitals may be avoiding readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10]. To characterize hospital use of post-discharge observation stays, we analyze the hospital-level trends and distributions of post-discharge observation stays and ED visit rates within 30 days of an inpatient hospitalization qualifying for inclusion in the hospital-wide cohort. We also examine the correlation between hospital-level risk-standardized readmission rates (RSRRs) and 30-day observation stay rates following an admission.

How do hospitals caring for high proportions of Medicaid or African-American patients perform on the hospital-wide readmission measure?

FIGURE II.C.1. *Distribution of hospital-wide RSRRs for hospitals with the lowest and highest proportions of Medicaid patients, July 2012 – June 2013.*

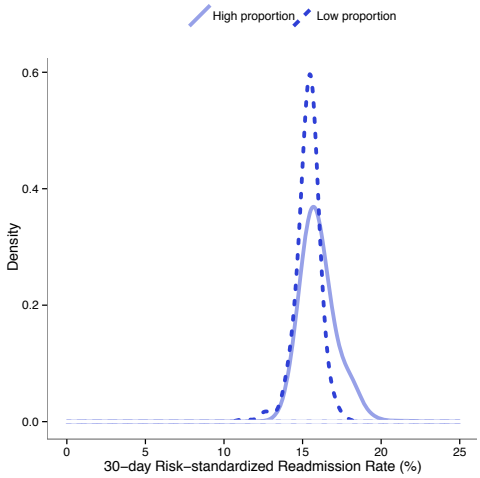
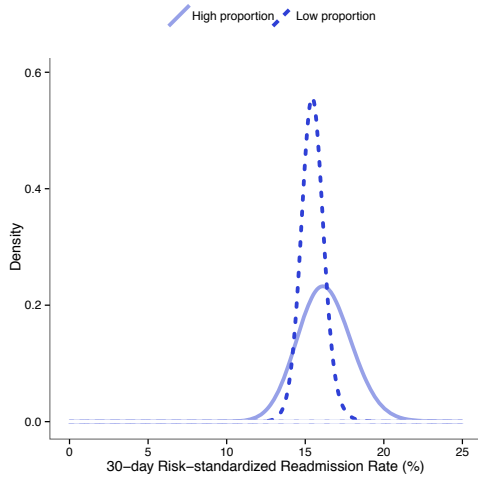


FIGURE II.C.2. *Distribution of hospital-wide RSRRs for hospitals with the lowest and highest proportions of African-American patients, July 2012 – June 2013.*



For the hospital-wide readmission measure, we compared the 30-day risk-standardized readmission rates (RSRRs) for hospitals with the lowest overall proportion of Medicaid patients (≤ 5% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest overall proportion of Medicaid patients (≥ 28% of a hospital's patients – top decile of all hospitals). Similarly, we compared the RSRRs for hospitals with the lowest proportion of African-American Medicare fee-for-service (FFS) patients (0% of a hospital's patients – bottom decile of all hospitals) to hospitals with the highest proportion of African-American Medicare FFS patients (≥ 22% of a hospital's patients – top decile of all hospitals). Figures II.C.1 and II.C.2 and Tables II.C.1 and II.C.2 display the comparisons.

The hospital-wide RSRRs for the median hospitals with the lowest and highest proportions of Medicaid patients were 15.4% [interquartile range (IQR): 15.0%-15.8%] and 15.9% (IQR: 15.2%-16.6%), respectively. The hospital-wide RSRRs for the median hospitals with the lowest and highest proportions of African-American patients were 15.4% (IQR: 15.2%-15.8%) and 16.1% (IQR: 15.5%-16.9%), respectively.

Among hospitals with the lowest proportions of Medicaid patients, the median hospital-wide RSRR was 0.5 percentage points lower than among hospitals with the highest proportions. Among hospitals with the lowest proportions of African-American patients, the median hospital-wide RSRR was 0.7 percentage points lower than among hospitals with the highest proportions.

TABLE II.C.1. *Distribution of hospital-wide RSRRs by proportion of Medicaid patients, July 2012 – June 2013.*

	Hospital-Wide RSRR (%)	
	Lowest proportion (≤5%) Medicaid patients; n=458	Highest proportion (≥28%) Medicaid patients; n=457
Maximum	17.9	21.4
90%	16.2	17.7
75%	15.8	16.6
Median (50%)	15.4	15.9
25%	15.0	15.2
10%	14.4	14.8
Minimum	11.1	13.1

TABLE II.C.2. *Distribution of hospital-wide RSRRs by proportion of African-American patients, July 2012 – June 2013.*

	Hospital-Wide RSRR (%)	
	No (0%) African-American patients*; n=977	Highest proportion (≥22%) African-American patients; n=464
Maximum	18.7	21.4
90%	16.1	17.8
75%	15.8	16.9
Median (50%)	15.4	16.1
25%	15.2	15.5
10%	14.8	15.0
Minimum	13.2	13.9

*21% of hospitals had 0% African-American Medicare FFS patients.

Source Data and Population: Hospital-Wide Readmission Measure Cohort data, July 2012 – June 2013 (Appendix I); 2012 Medicare Part A Inpatient Claims data to calculate proportion of African-American Medicare FFS patients (Appendix IV); 2011 American Hospital Association (AHA) data to calculate overall proportion of Medicaid patients (Appendix IV).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition over the one-year period are not shown; however, these hospitals are included in the calculations. 3) The proportion of Medicaid patients is calculated among all hospital patients. 4) The proportion of African-American patients is calculated among all Medicare FFS patients. 5) All hospitals with 0% African-American or Medicaid patients were included in the lowest decile. 6) For more information about figures, see Appendix VI.

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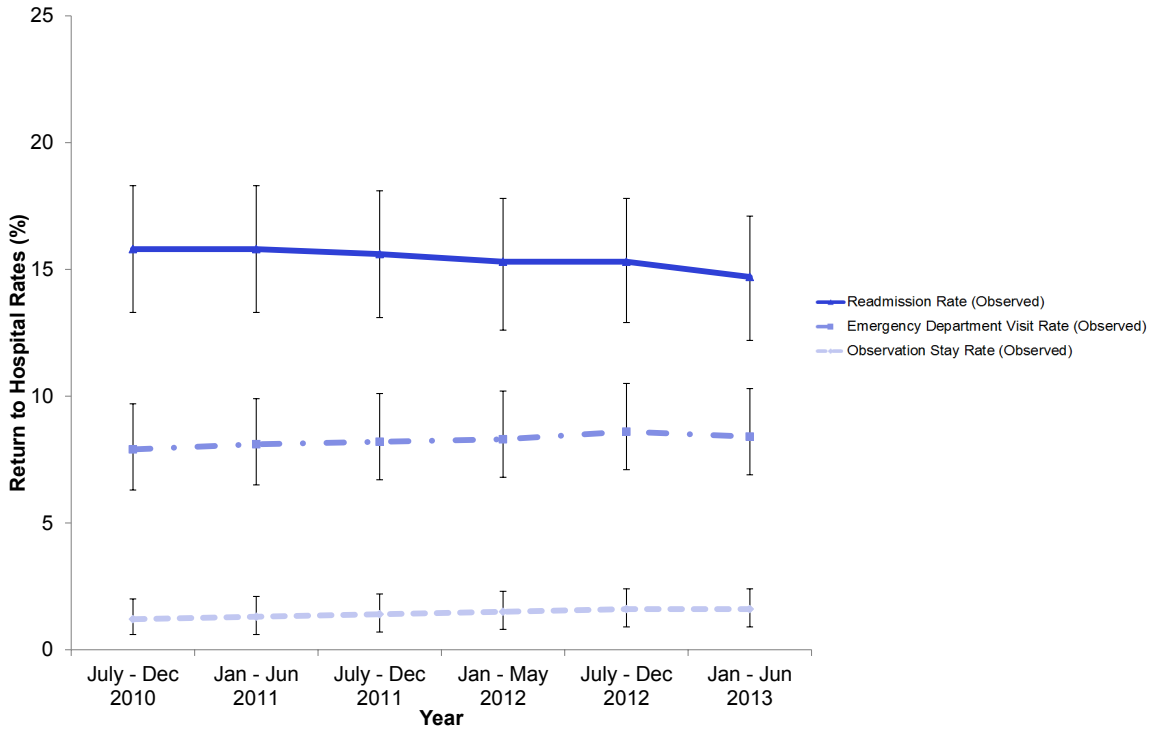
▶ Are hospitals' use of observation stays and ED visits following discharge from the hospital for all conditions continuing to rise?

FIGURE II.C.3. *Trends in the median hospital's observed readmission rate, ED visit rate, and observation stay rate for the hospital-wide readmission cohort, July 2010 – June 2013.*



Due to concerns that hospitals may be avoiding hospital readmissions by placing more patients under observation stay status or keeping them in the emergency department (ED) [9, 10], we examined return-to-hospital rates following hospitalizations for all causes. In Figure II.C.3, we show trends in the observed rates of post-discharge observation stays and ED visits among patients without a readmission in the 30 days following index admissions for all causes, as well as observed readmission rates from July 2010 to June 2013. The median 30-day post-discharge observation stay rate is low compared with the 30-day readmission rate, but the use of post-discharge observation stays rose 0.4% (from 1.2% to 1.6%) during this time period (Appendix III). We observed a 1.1% decrease in the observed readmission rate during this time period, suggesting that replacement by post-discharge observation stays likely does not explain the observed reduction in readmission rates. The median 30-day post-discharge ED visit rate (for patients with ED visits but no observation stays or readmissions) increased 0.4% (from 8.0% to 8.4%).

In addition, we identified hospital variation in post-discharge observation stay use (median rate: 1.6%; interquartile range (IQR): 1.0% - 2.4%), with 7.8% of hospitals having no post-discharge observation stays and 5.0% of hospitals having a post-discharge observation stay rate above 4.3%. Among the patients who returned to the hospital for either a readmission or an observation stay within 30 days following discharge from an index admission, we calculated the proportion of patients with a post-discharge observation stay. Results showed that 10.0% (IQR: 6.3% - 14.3%) of the median hospital's combined observation stay/readmission rate was due to observation stays. These data indicate that some hospitals were disproportionally using post-discharge observation stays at higher rates.

Source Data and Population: Hospital-Wide Readmission Cohort data, July 2010 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases in each time period are not shown; however, these hospitals are included in the calculations. 3) The bars on the graph represent the interquartile range. 4) For more information about figures, see Appendix VI.

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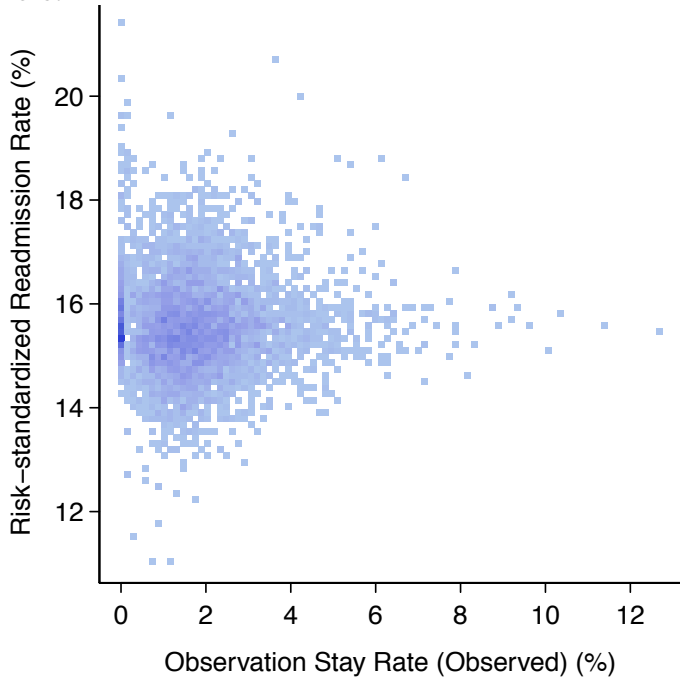
From 2010 to 2013, there was a 0.4 percentage point increase in hospital-wide post-discharge observation stay rates, and a 0.4 percentage point increase in post-discharge ED visit rates. However, these increases are smaller than the total decline in observed readmission rates (1.1 percentage points).

▶ Do hospitals with high rates of observation stays have lower hospital-wide risk-standardized readmission rates?

FIGURE II.C.4. *Correlation of RSRRs and post-discharge observation stay rates (observed) for the hospital-wide readmission cohort, July 2012 – June 2013.*



There was no significant association between observed hospital-level post-discharge observation stay use and hospital-wide RSRRs.

Given the variation in the use of post-discharge observation stays among hospitals and concerns about observation stays potentially replacing readmissions, we examined the relationship between hospitals' observation stay rates in the 30 days following discharge from an index admission for any cause and their hospital-wide risk-standardized readmission rate (RSRR).

Figure II.C.4 shows the association between observed hospital-level, post-discharge observation stay rates and RSRRs. There are 4,651 hospitals shown in the figure and many have overlapping information; therefore, *dark dots represent many hospitals with the same information and light dots indicate there are fewer hospitals with the same information*. There was no statistically significant correlation (r=0.02, p=0.3072) between post-discharge observation stay rates and RSRRs for all-cause unplanned readmissions [11]. This finding indicates that observed post-discharge observation stay rates were not associated with all-cause unplanned RSRRs.

Source Data and Population: Hospital-Wide Readmission Cohort data, July 2012 – June 2013 (Appendix I).

Notes: 1) Veterans Health Administration (VA) hospitals are not included in this analysis. 2) The results of hospitals with fewer than 25 cases of the condition in the one-year period are not shown; however, these hospitals are included in the calculations. 3) For more information about figures, see Appendix VI.

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Appendices

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A. Condition-Specific Mortality Measures

Index Admissions Included in the Condition-Specific Mortality Measures

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

- Having a principal discharge diagnosis of acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), or stroke for each respective measure[1,2];
- Enrolled in Medicare fee-for-service (FFS) or who are VA beneficiaries[3];
- Aged 65 or over;
- Not transferred from another acute care facility[4]; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission. This requirement is dropped for patients with an index admission within a VA hospital.

Index Admissions Excluded from the Condition-Specific Mortality Measures[5]

The mortality measures exclude index admissions for patients:

- Discharged alive on the day of admission or the following day who were not transferred[6];
- With inconsistent or unknown vital status or other unreliable demographic (age and gender) data;
- Enrolled in the Medicare hospice program or used VA hospice services any time in the 12 months prior to the index admission, including the first day of the index admission; or
- Discharged against medical advice (AMA).

For patients with more than one admission in a given year for a given condition, only one index admission for that condition is randomly selected for inclusion in the cohort.

Additionally, for index admissions that occur during the transition between measure reporting periods, June and July of each year, the measures include admissions only if they were the first to occur in the 30 days prior to a patient's death. Additional admissions in that 30-day period are excluded. This exclusion criterion is applied after one admission per patient per year is randomly selected to avoid assigning a single death to two admissions in two separate reporting periods. For example, a patient who is admitted on June 18, 2011, readmitted on July 2, 2011, and subsequently dies on July 15, 2011: if both admissions are randomly selected for inclusion (one for the July 2010-June 2011 time period and the other for the July 2011-June 2012 time period), the measure will exclude the July 2, 2011 admission to avoid assigning the death to two admissions.

Patients Transferred Between Hospitals

The measures include patients admitted to a non-federal acute care hospital or VA hospital with a diagnosis of AMI, heart failure, pneumonia, COPD, or stroke who are not transferred from another acute care facility (VA or non-federal). The measures consider admission to the first hospital as the start of an acute episode of care and assigns the patient's outcome to the hospital that initially admitted him/her. For patients seen in the emergency department who are then admitted to the hospital or transferred to another hospital, the measures assign them to the hospital that initially admits them as an inpatient.

[1]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[2]The COPD measure cohort also includes admissions with a principal discharge diagnosis of respiratory failure and a secondary discharge diagnosis of COPD.

[3]VA beneficiaries are only included in the AMI, heart failure, and pneumonia mortality and readmission measures.

[4]The acute episode is included in the measure, but the death is attributed to the hospital where the patient was initially admitted rather than the hospital receiving the transferred patient.

[5]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

[6]This exclusion criterion only applies to the AMI, heart failure, and pneumonia mortality measures.

B. Condition-Specific Readmission Measures

Index Admissions Included in the Condition-Specific Readmission Measures

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

- Having a principal discharge diagnosis of AMI, heart failure, pneumonia, COPD, or stroke for each respective measure[7,8];
- Enrolled in Medicare fee-for-service (FFS) or who are VA beneficiaries[9];
- Aged 65 or over;
- Discharged from non-federal acute care hospitals or VA hospitals[10] alive;
- Not transferred to another acute care facility; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission. This requirement is dropped for patients with an index admission within a VA hospital.

Index Admissions Excluded from the Condition-Specific Readmission Measures[11]

The readmission measures exclude index admissions for patients:

- Without at least 30 days post-discharge enrollment in FFS Medicare. This exclusion applies only to patients who have index admissions in non-VA hospitals; or
- Discharged against medical advice (AMA).

With regard to the AMI cohort, patients admitted and discharged on the same day are not included as index admissions because it is unlikely these patients had clinically significant AMIs.

Finally, admissions within 30 days of discharge from an index admission are not considered index admissions. Thus, no hospitalization will be counted as both an index admission and a readmission within the same measure. However, because the cohorts for the readmission measures are determined independently of each other, a readmission in one measure may qualify as an index admission in other CMS readmission measures.

Patients Transferred Between Hospitals

The measures consider multiple contiguous hospitalizations a single acute episode of care. Admissions to a hospital within one day of discharge from another hospital are considered transfers whether or not the first institution indicates intent to transfer the patient in the discharge disposition code.

Readmissions for transferred patients are attributed to the hospital that ultimately discharges the patient to a non-acute care setting (e.g., home or skilled nursing facility). Thus, if a patient is admitted to Hospital A, transferred to Hospital B, and ultimately discharged from Hospital B to a non-acute care setting, a readmission within 30 days of discharge to any acute care hospital is attributed to Hospital B.

If a patient is readmitted to the same hospital on the same day of discharge for the same diagnosis as the index admission, then the patient is considered to have had one single continuous admission in the measures. However, if the diagnosis at readmission is different from the index admission, this is considered a readmission in the measures.

[7]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[8]The COPD measure cohort also includes admissions with a principal discharge diagnosis of respiratory failure and a secondary discharge diagnosis of COPD.

[9]VA beneficiaries are only included in the AMI, heart failure, and pneumonia mortality and readmission measures.

[10]VA hospitals are only included in the AMI, heart failure, and pneumonia mortality and readmission measures.

[11]As a part of data processing prior to the measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and records for providers with invalid provider IDs.

C. Procedure-Specific Mortality and Complication Measures

Index Admissions Included in the Coronary Artery Bypass Graft (CABG) Mortality Measure

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

- Having a qualifying isolated CABG procedure[12]; isolated CABG procedures are defined as those procedures without any of the following:
  - Valve procedures
  - Procedures to correct atrial and/or ventricular septal defects
  - Procedures to correct congenital anomalies
  - Other open cardiac procedures
  - Heart transplants
  - Aorta or other non-cardiac arterial bypass procedures
  - Head, neck, intracranial vascular procedures
- Enrolled in Medicare fee-for-service (FFS);
- Aged 65 or over; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission.

Index Admissions Excluded from the CABG Mortality Measure[13]

This measure excludes index admissions for patients:

- With inconsistent or unknown vital status or other unreliable demographic (e.g., age and gender) data; or
- Discharged against medical advice (AMA).

After applying these exclusion criteria, we randomly select one index admission per patient per year for patients with multiple index admissions in a year. Therefore, we exclude all other eligible index admissions in that given year.

Patients Transferred Between Hospitals

Patients who are admitted to an acute care hospital on the same day or the day after discharge from an eligible admission are identified as transferred in the measure. Following a CABG procedure, transfer to another acute care facility is most likely due to a complication of the surgery or the perioperative care the patient received; hence, the mortality risk is likely attributed to the care provided by the hospital that performed the CABG procedure, even among transferred patients. Therefore, the mortality outcome is attributed to the hospital performing the first ("index") CABG procedure. For example, a patient may be admitted to Hospital A for a CABG that qualifies them for inclusion in the measure and is then transferred to Hospital B. The initial admission to Hospital A and the admission to Hospital B are considered one acute episode of care, made up of two inpatient admissions, and the mortality outcome would be attributed to Hospital A.

Index Admissions Included in the Hip/Knee Arthroplasty Complication Measure

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

- Having a qualifying elective primary total hip arthroplasty (THA) / total knee arthroplasty (TKA) procedure[14]; elective primary THA/TKA procedures are defined as those procedures without any of the following:
  - Femur, hip, or pelvic fractures coded in principal or secondary discharge diagnosis fields of the index admission;
  - Partial hip arthroplasty (PHA) procedures with a concurrent THA/TKA;
  - Revision procedures with a concurrent THA/TKA;
  - Resurfacing procedures with a concurrent THA/TKA;
  - Mechanical complication coded in the principal discharge diagnosis field;
  - Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field;
  - Removal of implanted devices/prostheses;
  - Transfer from another acute care facility for the THA/TKA.
- Enrolled in Medicare fee-for-service (FFS);
- Aged 65 or over; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission.

Index Admissions Excluded from the Hip/Knee Arthroplasty Complication Measure[15]

This measure excludes index admissions for patients:

- Discharged against medical advice (AMA); or
- With more than two THA/TKA procedure codes during the index hospitalization.

After applying these exclusion criteria, we randomly select one index admission for patients with multiple index admissions in a calendar year. Therefore, we exclude all other eligible index admissions in that year.

Patients Transferred Between Hospitals

Multiple contiguous hospitalizations are considered a single acute episode of care in the measures. Admissions to another hospital within one day of discharge are considered transfers, regardless of the discharge disposition code of the previous admission.

The THA/TKA complication measure does not include index admissions for patients who are transferred into the index hospital, as they likely do not represent elective THA/TKA procedures.

Patients admitted for the index procedure and subsequently transferred to another acute care facility are included in the measure, as transfer following THA/TKA likely indicates a complication of care occurring during the index hospitalization. In this case, the complication outcome is attributed to the hospital performing the initial THA/TKA procedure.

[12]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[13]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

[14]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[15]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

D. Procedure-Specific Readmission Measures

Index Admissions Included in the CABG Readmission Measure

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

- Having a qualifying isolated CABG procedure[16]; isolated CABG procedures are defined as those procedures without any of the following:
  - Valve procedures
  - Procedures to correct atrial and/or ventricular septal defects
  - Procedures to correct congenital anomalies
  - Other open cardiac procedures
  - Heart transplants
  - Aorta or other non-cardiac arterial bypass procedures
  - Head, neck, intracranial vascular procedures
- Enrolled in Medicare fee-for-service (FFS);
- Aged 65 or over;
- Discharged from non-federal acute care hospitals alive; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission.

Index Admissions Excluded from the CABG Readmission Measure[17]

This measure excludes index admissions for patients:

- Without at least 30 days post-discharge enrollment in FFS Medicare;
- Discharged against medical advice (AMA); or
- With subsequent qualifying CABG procedures during the measurement period. Only the first qualifying CABG admission during the measurement period is included as an index admission for the measure.

Patients Transferred Between Hospitals

Patients who are admitted to an acute care hospital on the same day or the day after discharge from an eligible admission are identified as transferred in the measure. Following a CABG procedure, transfer to another acute care facility is most likely due to a complication of the surgery or the perioperative care the patient received; hence the readmission risk is likely attributed to the care provided by the hospital performing the CABG procedure, even among transferred patients. Therefore, the readmission outcome is attributed to the hospital performing the first ("index") CABG procedure, even if this is not the discharging hospital. For example, a patient may be admitted to Hospital A for a CABG that qualifies them for inclusion in the measure and is then transferred to Hospital B. The initial admission to Hospital A and the admission to Hospital B are considered one acute episode of care, made up of two inpatient admissions, and the readmission outcome would be attributed to Hospital A.

Index Admissions Included in the Hip/Knee Arthroplasty Readmission Measure

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

- Having a qualifying elective primary THA/TKA procedure[18]; elective primary THA/TKA procedures are defined as those procedures without any of the following:
  - Femur, hip, or pelvic fractures coded in principal or secondary discharge diagnosis fields of the index admission;

  - Partial hip arthroplasty (PHA) procedures with a concurrent THA/TKA;
  - Revision procedures with a concurrent THA/TKA;
  - Resurfacing procedures with a concurrent THA/TKA;
  - Mechanical complication coded in the principal discharge diagnosis field;
  - Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field;
  - Removal of implanted devices/prostheses; and
  - Transfer from another acute care facility for the THA/TKA.
- Enrolled in Medicare fee-for-service (FFS);
- Aged 65 or over;
- Discharged from non-federal acute care hospitals alive; and
- Enrolled in Part A and Part B Medicare for the 12 months prior to the date of the index admission.

Index Admissions Excluded from the Hip/Knee Arthroplasty Readmission Measure[19]

This measure excludes index admissions for patients:

- Without at least 30 days post-discharge enrollment in FFS Medicare;
- Discharged against medical advice (AMA);
- Admitted for the index procedure and subsequently transferred to another acute care facility; or
- With more than two THA/TKA procedure codes during the index hospitalization.

Finally, admissions within 30 days of discharge from an index admission are not considered index admissions. Thus, no hospitalization will be counted as both a readmission and an index admission within this measure. However, because the cohorts for the readmission measures are determined independently of each other, a readmission in one measure may qualify as an index admission in other CMS measures.

Patients Transferred Between Hospitals

Multiple contiguous hospitalizations are considered a single acute episode of care in the measure. Admissions to a hospital within one day of discharge from another hospital are considered transfers, whether or not the first institution indicates intent to transfer the patient in the discharge disposition code.

The THA/TKA readmission measure does not include admissions for patients transferred in to the index hospital, as they likely do not represent elective THA/TKA procedures.

Patients admitted for the index procedure and subsequently transferred to another acute care facility are excluded, as it is difficult to determine which hospital the readmission outcome should be attributed.

[16]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[17]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

[18]For specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes used to define the cohort for each condition, refer to Appendix II.

[19]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

E. Hospital-Wide Readmission Measure

Index Admissions Included in the Hospital-Wide Readmission Measure

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

- Enrolled in Medicare fee-for-service (FFS);
- Aged 65 or over;
- Discharged from non-federal acute care hospitals;
- Without an in-hospital death;
- Not transferred to another acute care facility; and
- Enrolled in Part A Medicare for the 12 months prior to the date of the index admission.

Index Admissions Excluded from the Hospital-Wide Readmission Measure[20]

This measure excludes index admissions for patients:

- Admitted to Prospective Payment System (PPS)-exempt cancer hospitals;
- Without at least 30 days post-discharge enrollment in FFS Medicare;
- Discharged against medical advice (AMA);
- Admitted for primary psychiatric diagnoses;
- Admitted for rehabilitation; or
- Admitted for medical treatment of cancer.

In addition, specific Clinical Classification Software (CCS) categories that are excluded from the hospital-wide readmission measure can be found in the 2014 Measures Updates and Specifications Report for Hospital-Wide All-Cause Unplanned Readmission [12].

Patients Transferred Between Hospitals

Multiple contiguous hospitalizations are considered a single acute episode of care in the measure. Admissions to a hospital within one day of discharge from another hospital are considered transfers, whether or not the first institution indicates intent to transfer the patient in the discharge disposition code.

Readmissions for transferred patients are attributed to the hospital that ultimately discharges the patient to a non-acute care setting (e.g., home or skilled nursing facility). Thus, if a patient is admitted to Hospital A, transferred to Hospital B, and ultimately discharged from Hospital B to a non-acute care setting, a readmission within 30 days of discharge to any acute care hospital is attributed to Hospital B.

If a patient is readmitted to the same hospital on the same day of discharge for the same diagnosis as the index admission, then the patient is considered to have had one single continuous admission in the measure. However, a diagnosis at the readmission that differs from the index admission is considered a readmission.

Specialty Cohort Assignment

Each admission is assigned to one of five mutually exclusive specialty cohorts: medicine, surgery/gynecology, cardiorespiratory, cardiovascular, and neurology. The cohorts reflect organization of patient care within hospitals. To assign admissions to cohorts, admissions are first screened for the presence of an eligible surgical procedure category. Admissions with an eligible surgical procedure category are assigned to the surgical cohort, regardless of the diagnosis code entered at admission. All remaining admissions are assigned to cohorts based on the discharge condition category of the principal diagnosis. See Appendix II for more information on the assignment of patients to specialty cohorts.

[20]As a part of data processing prior to measure calculation, records are removed for non-short-term acute care facilities such as psychiatric facilities, rehabilitation facilities, or long-term care hospitals. Additional data cleaning steps include removing claims with stays longer than one year, claims with overlapping dates, and stays for patients not listed in the Medicare enrollment file, as well as records for providers with invalid provider IDs.

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A. Condition-Specific Measures

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) Codes Defining Acute Myocardial Infarction (AMI), Heart Failure, Pneumonia, Chronic Obstructive Pulmonary Disease (COPD), and Acute Ischemic Stroke

The specific ICD-9-CM codes meeting the inclusion criteria for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and stroke measure cohorts are as follows:

For the AMI measures: 410.00, 410.01, 410.10, 410.11, 410.20, 410.21, 410.30, 410.31, 410.40, 410.41, 410.50, 410.51, 410.60, 410.61, 410.70, 410.71, 410.80, 410.81, 410.90, and 410.91

For the heart failure measures: 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9

For the pneumonia measures: 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.42, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, 487.0, and 488.11

For the COPD measures: 491.21, 491.22, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, 496, 518.81*, 518.82*, 518.84*, 799.1*

*Principal diagnosis when combined with a secondary diagnosis of acute exacerbation of COPD (491.21, 491.22, 493.21, 493.22)

For the stroke measures: 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, and 434.91

B. Procedure-Specific Measures

ICD-9-CM Codes Defining Coronary Artery Bypass Graft (CABG) and Hip/Knee Arthroplasty

The specific ICD-9-CM codes meeting the inclusion criteria for the coronary artery bypass graft (CABG) and hip/knee arthroplasty measure cohorts are as follows:

For the CABG measures: 36.1x, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, and 36.19

For the hip/knee arthroplasty measures: 81.51 and 81.54

C. Hospital-Wide Readmission Measure

Clinical Classification Software (CCS) Diagnosis and Procedure Categories Defining the Hospital-Wide Readmission Measure Specialty Cohorts

The specific ICD-9-CM codes meeting the inclusion criteria for the hospital-wide readmission measure specialty cohorts are grouped by the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS) diagnosis and procedure categories. The specific CCS categories that are included in each specialty cohort are listed in Appendix II Table 1, Appendix II Table 2, Appendix II Table 3, Appendix II Table 4, and Appendix II Table 5.

Appendix II Table 1. Procedure categories defining the surgery/gynecology cohort.

AHRQ Procedure CCS	Description	AHRQ Procedure CCS	Description
1	Incision and excision of CNS	94	Other OR upper GI therapeutic procedures
2	Insertion; replacement; or removal of extracranial ventricular shunt	96	Other OR lower GI therapeutic procedures
3	Laminectomy; excision intervertebral disc	99	Other OR gastrointestinal therapeutic procedures
9	Other OR therapeutic nervous system procedures	101	Transurethral excision; drainage; or removal urinary obstruction
10	Thyroidectomy; partial or complete	103	Nephrotomy and nephrostomy
12	Other therapeutic endocrine procedures	104	Nephrectomy; partial or complete
13	Corneal transplant	105	Kidney transplant
14	Glaucoma procedures	106	Genitourinary incontinence procedures
15	Lens and cataract procedures	112	Other OR therapeutic procedures of urinary tract
16	Repair of retinal tear; detachment	113	Transurethral resection of prostate (TURP)
17	Destruction of lesion of retina and choroid	114	Open prostatectomy
20	Other intraocular therapeutic procedures	118	Other OR therapeutic procedures; male genital
21	Other extraocular muscle and orbit therapeutic procedures	119	Oophorectomy; unilateral and bilateral
22	Tympanoplasty	120	Other operations on ovary
23	Myringotomy	121	Ligation or occlusion of fallopian tubes
24	Mastoidectomy	122	Removal of ectopic pregnancy
26	Other therapeutic ear procedures	123	Other operations on fallopian tubes
28	Plastic procedures on nose	124	Hysterectomy; abdominal and vaginal
30	Tonsillectomy and/or adenoidectomy	125	Other excision of cervix and uterus
33	Other OR therapeutic procedures on nose; mouth and pharynx	126	Abortion (termination of pregnancy)
36	Lobectomy or pneumonectomy	127	Dilatation and curettage (D&C); aspiration after delivery or abortion
42	Other OR Rx procedures on respiratory system and mediastinum	129	Repair of cystocele and rectocele; obliteration of vaginal vault
43	Heart valve procedures	131	Other non-OR therapeutic procedures; female organs
44	Coronary artery bypass graft (CABG)	132	Other OR therapeutic procedures; female organs
49	Other OR heart procedures	133	Episiotomy
51	Endarterectomy; vessel of head and neck	134	Cesarean section
52	Aortic resection; replacement or anastomosis	135	Forceps; vacuum; and breech delivery
53	'Varicose vein stripping; lower limb	136	Artificial rupture of membranes to assist delivery
55	Peripheral vascular bypass	137	Other procedures to assist delivery
56	Other vascular bypass and shunt; not heart	139	Fetal monitoring
59	Other OR procedures on vessels of head and neck	140	Repair of current obstetric laceration
60	Embolectomy and endarterectomy of lower limbs	141	Other therapeutic obstetrical procedures
66	Procedures on spleen	142	Partial excision bone
67	Other therapeutic procedures; hemic and lymphatic system	143	Bunionectomy or repair of toe deformities
72	Colostomy; temporary and permanent	144	Treatment; facial fracture or dislocation
73	Ileostomy and other enterostomy	145	Treatment; fracture or dislocation of radius and ulna
74	Gastrectomy; partial and total	146	Treatment; fracture or dislocation of hip and femur
75	Small bowel resection	147	Treatment; fracture or dislocation of lower extremity (other than hip or femur)
78	Colorectal resection		
79	Local excision of large intestine lesion (not endoscopic)	148	Other fracture and dislocation procedure
80	Appendectomy	150	Division of joint capsule; ligament or cartilage
84	Cholecystectomy and common duct exploration	151	Excision of semilunar cartilage of knee
85	Inguinal and femoral hernia repair	152	Arthroplasty knee
86	Other hernia repair	153	Hip replacement; total and partial
89	Exploratory laparotomy	154	Arthroplasty other than hip or knee
90	Excision; lysis peritoneal adhesions	157	Amputation of lower extremity

AHRQ Procedure CCS	Description
158	Spinal fusion
160	Other therapeutic procedures on muscles and tendons
161	Other OR therapeutic procedures on bone
162	Other OR therapeutic procedures on joints
164	Other OR therapeutic procedures on musculoskeletal system
166	Lumpectomy; quadrantectomy of breast
167	Mastectomy
172	Skin graft
175	Other OR therapeutic procedures on skin and breast
176	Other organ transplantation

Appendix II Table 2. Diagnosis categories defining the cardiorespiratory cohort.

AHRQ Diagnosis CCS	Description
56	Cystic Fibrosis
103	Pulmonary heart disease
108	Congestive heart failure; non-hypertensive
122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)
125	Acute bronchitis
127	Chronic obstructive pulmonary disease and bronchiectasis
128	Asthma
131	Respiratory failure; insufficiency; arrest (adult)

Appendix II Table 3. Diagnosis categories defining the cardiovascular cohort.

AHRQ Diagnosis CCS	Description
96	Heart valve disorders
97	Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted)
100	Acute myocardial infarction
101	Coronary atherosclerosis and other heart disease
102	Nonspecific chest pain
104	Other and ill-defined heart disease
105	Conduction disorders
106	Cardiac dysrhythmias
107	Cardiac arrest and ventricular fibrillation
114	Peripheral and visceral atherosclerosis
115	Aortic; peripheral; and visceral artery aneurysms
116	Aortic and peripheral arterial embolism or thrombosis
117	Other circulatory disease
213	Cardiac and circulatory congenital anomalies

Appendix II Table 4. Diagnosis categories defining the neurology cohort.

AHRQ Diagnosis CCS	Description
78	Other CNS infection and poliomyelitis
79	Parkinson`s disease
80	Multiple sclerosis
81	Other hereditary and degenerative nervous system conditions
82	Paralysis
83	Epilepsy; convulsions
85	Coma; stupor; and brain damage
95	Other nervous system disorders
109	Acute cerebrovascular disease
110	Occlusion or stenosis of precerebral arteries
111	Other and ill-defined cerebrovascular disease
112	Transient cerebral ischemia
113	Late effects of cerebrovascular disease
216	Nervous system congenital anomalies
227	Spinal cord injury
233	Intracranial injury

Appendix II Table 5. Diagnosis categories defining the medicine cohort.

AHRQ Diagnosis CCS	Description
1	Tuberculosis
2	Septicemia (except in labor)
3	Bacterial infection; unspecified site
4	Mycoses
5	HIV infection
6	Hepatitis
7	Viral infection
8	Other infections; including parasitic
9	Sexually transmitted infections (not HIV or hepatitis)
10	Immunizations and screening for infectious disease
46	Benign neoplasm of uterus
47	Other and unspecified benign neoplasm
48	Thyroid disorders
49	Diabetes mellitus without complication
50	Diabetes mellitus with complications
51	Other endocrine disorders
52	Nutritional deficiencies
53	Disorders of lipid metabolism
54	Gout and other crystal arthropathies
55	Fluid and electrolyte disorders
57	Immunity disorders
58	Other nutritional; endocrine; and metabolic disorders

AHRQ Diagnosis CCS	Description
59	Deficiency and other anemia
60	Acute posthemorrhagic anemia
61	Sickle cell anemia
62	Coagulation and hemorrhagic disorders
63	Diseases of white blood cells
64	Other hematologic conditions
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
84	Headache; including migraine
86	Cataract
87	Retinal detachments; defects; vascular occlusion; and retinopathy
88	Glaucoma
89	Blindness and vision defects
90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)
91	Other eye disorders
92	Otitis media and related conditions
93	Conditions associated with dizziness or vertigo
94	Other ear and sense organ disorders
98	Essential hypertension
99	Hypertension with complications and secondary hypertension
118	Phlebitis; thrombophlebitis and thromboembolism
119	Varicose veins of lower extremity
120	Hemorrhoids
121	Other diseases of veins and lymphatics
123	Influenza
124	Acute and chronic tonsillitis
126	Other upper respiratory infections
129	Aspiration pneumonitis; food/vomitus
130	Pleurisy; pneumothorax; pulmonary collapse
132	Lung disease due to external agents
133	Other lower respiratory disease
134	Other upper respiratory disease
135	Intestinal infection
136	Disorders of teeth and jaw
137	Diseases of mouth; excluding dental
138	Esophageal disorders
139	Gastroduodenal ulcer (except hemorrhage)
140	Gastritis and duodenitis
141	Other disorders of stomach and duodenum
142	Appendicitis and other appendiceal conditions
143	Abdominal hernia
144	Regional enteritis and ulcerative colitis

AHRQ Diagnosis CCS	Description
145	Intestinal obstruction without hernia
146	Diverticulosis and diverticulitis
147	Anal and rectal conditions
148	Peritonitis and intestinal abscess
149	Biliary tract disease
151	Other liver diseases
152	Pancreatic disorders (not diabetes)
153	Gastrointestinal hemorrhage
154	Noninfectious gastroenteritis
155	Other gastrointestinal disorders
156	Nephritis; nephrosis; renal sclerosis
157	Acute and unspecified renal failure
158	Chronic renal failure
159	Urinary tract infections
160	Calculus of urinary tract
161	Other diseases of kidney and ureters
162	Other diseases of bladder and urethra
163	Genitourinary symptoms and ill-defined conditions
164	Hyperplasia of prostate
165	Inflammatory conditions of male genital organs
166	Other male genital disorders
167	Nonmalignant breast conditions
168	Inflammatory diseases of female pelvic organs
169	Endometriosis
170	Prolapse of female genital organs
171	Menstrual disorders
172	Ovarian cyst
173	Menopausal disorders
175	Other female genital disorders
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
199	Chronic ulcer of skin
200	Other skin disorders
201	Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease
202	Rheumatoid arthritis and related disease
203	Osteoarthritis
204	Other non-traumatic joint disorders
205	Spondylosis; intervertebral disc disorders; other back problems
206	Osteoporosis
207	Pathological fracture
208	Acquired foot deformities
209	Other acquired deformities
210	Systemic lupus erythematosus and connective tissue disorders

AHRQ Diagnosis CCS	Description
211	Other connective tissue disease
212	Other bone disease and musculoskeletal deformities
214	Digestive congenital anomalies
215	Genitourinary congenital anomalies
217	Other congenital anomalies
225	Joint disorders and dislocations; trauma-related
226	Fracture of neck of femur (hip)
228	Skull and face fractures
229	Fracture of upper limb
230	Fracture of lower limb
231	Other fractures
232	Sprains and strains
234	Crushing injury or internal injury
235	Open wounds of head; neck; and trunk
236	Open wounds of extremities
237	Complication of device; implant or graft
238	Complications of surgical procedures or medical care
239	Superficial injury; contusion
240	Burns
241	Poisoning by psychotropic agents
242	Poisoning by other medications and drugs

AHRQ Diagnosis CCS	Description
243	Poisoning by non-medicinal substances
244	Other injuries and conditions due to external causes
245	Syncope
246	Fever of unknown origin
247	Lymphadenitis
248	Gangrene
249	Shock
250	Nausea and vomiting
251	Abdominal pain
252	Malaise and fatigue
253	Allergic reactions
255	Administrative/social admission
256	Medical examination/evaluation
257	Other aftercare
258	Other screening for suspected conditions (not mental disorders or infectious disease)
259	Residual codes; unclassified
653	Delirium, dementia, and amnestic and other cognitive disorders
660	Alcohol-related disorders
661	Substance-related disorders
663	Screening and history of mental health and substance abuse codes

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Return-to-Hospital Visits

Median and range of readmission, emergency department (ED) visits, and observation stay rates for acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), stroke, hip/knee arthroplasty, and hospital-wide readmission cohorts.

Appendix III Table 1. Return-to-hospital rates for AMI readmission cohort.
This table corresponds to Figure II.A.21 (page 58) in the main text.

Median (Range) of Return-to-Hospital Rates for AMI (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	18.0	18.1	17.2	17.1	16.7	16.2
	(0, 46.4)	(0, 52.0)	(0, 40.0)	(0, 42.9)	(0, 40.5)	(2.2, 43.6)
ED Visits	7.7	7.8	8.0	8.0	8.8	8.9
	(0, 29.4)	(0, 27.0)	(0, 28.6)	(0, 28.2)	(0, 27.6)	(0, 28.1)
Observation Stays	1.5	1.7	1.9	1.8	2.1	2.2
	(0, 13.9)	(0, 15.4)	(0, 16.1)	(0, 17.8)	(0, 19.4)	(0, 21.9)

Appendix III Table 2. Return-to-hospital rates for heart failure readmission cohort.
This table corresponds to Figure II.A.23 (page 60) in the main text.

Median (Range) of Return-to-Hospital Rates for Heart Failure (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	23.8	22.9	23.0	22.3	22.2	21.2
	(3.2, 52.0)	(3.4, 60.6)	(0, 53.8)	(0, 51.9)	(0, 51.4)	(0, 57.5)
ED Visits	7.0	7.3	7.3	7.4	7.7	7.7
	(0, 30.8)	(0, 30.6)	(0, 32.1)	(0, 27.7)	(0, 33.3)	(0, 31.1)
Observation Stays	0.9	0.9	1.1	1.2	1.3	1.4
	(0, 11.8)	(0, 15.2)	(0, 17.2)	(0, 15.2)	(0, 16.1)	(0, 15.6)

Appendix III Table 3. Return-to-hospital rates for pneumonia readmission cohort.
This table corresponds to Figure II.A.25 (page 62) in the main text.

Median (Range) of Return-to-Hospital Rates for Pneumonia (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	18.0	17.1	17.9	16.7	17.3	15.8
	(0, 50.8)	(0, 44.8)	(0, 46.9)	(0, 41.9)	(0, 42.2)	(0, 38.5)
ED Visits	6.8	6.9	7.0	7.1	7.1	7.1
	(0, 30.0)	(0, 33.3)	(0, 28.0)	(0, 28.0)	(0, 34.6)	(0, 30.3)
Observation Stays	0	0	0	0	0	0.8
	(0, 16.7)	(0, 11.5)	(0, 12.1)	(0, 15.4)	(0, 16.0)	(0, 15.2)

Appendix III Table 4. Return-to-hospital rates for COPD readmission cohort.
This table corresponds to Figure II.A.27 (page 64) in the main text.

Median (Range) of Return-to-Hospital Rates for COPD (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	21.6	20.5	21.4	20.5	20.7	19.0
	(0, 51.5)	(0, 50.0)	(0, 60.0)	(0, 52.0)	(2.9, 53.6)	(0, 54.8)
ED Visits	7.1	7.1	7.7	7.7	8.0	7.9
	(0, 26.7)	(0, 33.3)	(0, 29.7)	(0, 26.7)	(0, 35.7)	(0, 31.3)
Observation Stays	0	0.5	0	0.9	1.1	1.2
	(0, 13.3)	(0, 22.2)	(0, 15.6)	(0, 11.8)	(0, 17.2)	(0, 19.2)

Appendix III Table 5. Return-to-hospital rates for stroke readmission cohort.
This table corresponds to Figure II.A.29 (page 66) in the main text.

Median (Range) of Return-to-Hospital Rates for Stroke (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	13.4	13.5	12.9	12.9	12.8	12.0
	(0, 34.4)	(0, 38.5)	(0, 41.4)	(0, 35.1)	(0, 32.0)	(0, 40.0)
ED Visits	6.7	6.8	6.9	6.8	6.9	7.1
	(0, 34.6)	(0, 26.7)	(0, 28.0)	(0, 32.3)	(0, 33.3)	(0, 30.8)
Observation Stays	0	0	0	0	0	0
	(0, 13.9)	(0, 16.7)	(0, 14.8)	(0, 12.1)	(0, 18.5)	(0, 15.4)

Appendix III Table 6. Return-to-hospital rates for hip/knee arthroplasty readmission cohort.
This table corresponds to Figure II.B.9 (page 74) in the main text.

Median (Range) of Return-to-Hospital Rates for Hip/Knee Arthroplasty (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	5.3	5.1	5.1	4.9	4.7	4.3
	(0, 21.6)	(0, 25.0)	(0, 23.3)	(0, 28.6)	(0, 22.6)	(0, 24.1)
ED Visits	5.6	5.9	5.9	6.0	6.0	5.9
	(0, 23.5)	(0, 28.6)	(0, 30.3)	(0, 23.1)	(0, 25.0)	(0, 26.5)
Observation Stays	0	0	0	0	0	0
	(0, 8.1)	(0, 9.2)	(0, 8.6)	(0, 12.5)	(0, 10.0)	(0, 8.3)

Appendix III Table 7. Return-to-hospital rates for hospital-wide readmission cohort.
This table corresponds to Figure II.C.3 (page 79) in the main text.

Median (Range) of Return-to-Hospital Rates for Hospital-Wide Readmission (%)

	July-Dec 2010	Jan-Jun 2011	July-Dec 2011	Jan-Jun 2012	July-Dec 2012	Jan-Jun 2013
Readmission	15.8	15.8	15.6	15.3	15.3	14.7
	(0, 44.7)	(0, 36.6)	(0, 54.7)	(0, 52.9)	(0, 38.3)	(0, 43.6)
ED Visits	8.0	8.0	8.2	8.3	8.6	8.4
	(0, 28.0)	(0, 31.3)	(0, 31.3)	(0, 37.8)	(0, 27.6)	(0, 28.6)
Observation Stays	1.2	1.3	1.4	1.5	1.6	1.6
	(0, 15.7)	(0, 12.0)	(0, 10.7)	(0, 14.3)	(0, 15.4)	(0, 14.3)

1. American Hospital Association (AHA) Annual Survey Database Fiscal Year 2011.
   - This data was used to determine the overall proportion of Medicaid beneficiaries at each hospital.

2. Medicare Part A Inpatient Claims 2012.
   - This data was used to determine the proportion of African-American Medicare fee-for-service patients at each hospital.

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Definition

The geographic distribution of risk-standardized mortality rates (RSMRs), risk-standardized readmission rates (RSRRs), and risk-standardized complication rates (RSCRs) was reported using the Hospital Referral Region (HRR) for each hospital based on the definition of HRRs produced by the Dartmouth Atlas of Health Care project [13]. HRRs are categorizations of regional market areas for tertiary medical care defined by at least one hospital that performs both major cardiovascular procedures and neurosurgery.

HRR-level RSMRs, RSRRs, and RSCRs were calculated as a weighted average of hospital risk-standardized rates for each HRR, with the inverse of the variance of the hospital risk-standardized rate as the weight. The variance of each hospital risk-standardized rate was estimated using the bootstrap simulation results. To categorize quality at the HRR level, we ran a linear mixed-effect model using the HRR risk-standardized rate as the dependent variable with HRR as the independent variable. If the random intercept of the HRR was significantly different from zero, then we categorized the HRR as "better" or "worse" performing depending on the directionality of the estimate; otherwise we categorized the HRR as "average" performing. For geographic variation maps that display results of a single measure, these performance categories were directly applied. For geographic variation maps that display combined results for several measures, we applied the calculation methodology described below.

Combined Geographic Variation Maps (pages 26 and 27) Score Calculation and Supplemental Data

Utilizing the above HRR measure methodology, we created geographic variation maps with the following combined measures to provide summary information regarding HRR-level performance variation across measures:

- Acute myocardial infarction (AMI), heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), and stroke mortality measures; and
- AMI, heart failure, pneumonia, COPD, and stroke readmission measures

For each measure that an HRR was classified as "worse," it received a score of "1." For each measure that an HRR was classified as "average," it received a score of "2." For each measure that an HRR was classified as "better," it received a score of "3."

For each HRR, we summarized the scores it received for each measure. For example, if an HRR was "better" performing on AMI and heart failure mortality, and "average" performing on pneumonia, stroke and COPD mortality, the HRR received a combined score of "12" (3+3+2+2+2). Based on the combined score, we categorized HRRs as "better performing," "moderately better performing," "average performing," "moderately worse performing," and "worse performing" (Appendix V Table 1.).

Appendix V Table 1. HRR combined score classification.

HRR classification – based on combined score	Combined score (minimum = 5)
Poor performing	5 or 6
Moderately poor performing	7 or 8
Average performing	9, 10, or 11
Moderately well performing	12 or 13
Well performing	14 or 15

Hospital Referral Region (HRR) Scores

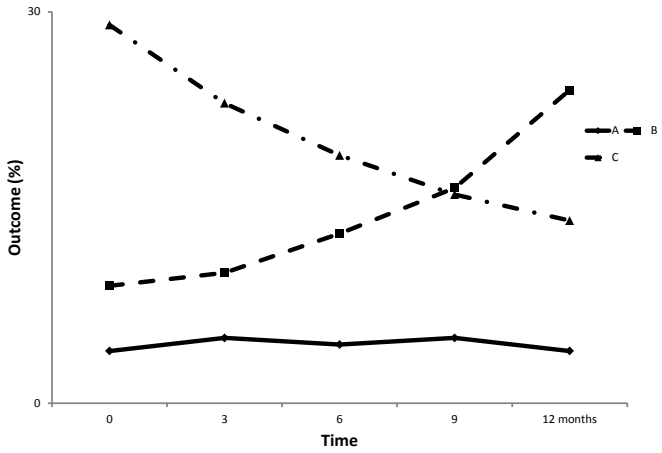
Appendix V Table 2 displays all possible combinations to get each HRR combined score for condition-specific mortality and readmission, respectively, and the number of HRRs with each combination. The numerical pattern must be present to achieve the combined score; however, any measure may be assigned any score contained in the pattern. For example, to achieve a combined score of 6 in the mortality measures calculation, at least one measure must have a score of 2 and four measures must have a score of 1. Measures 1 through 4 may have a score of 2, however, rather than only Measure 5.

Appendix V Table 2. Possible HRR score combinations for AMI, heart failure, pneumonia, COPD, and stroke mortality and readmission.

Combined Score	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Number of HRRs with combination - Mortality	Number of HRRs with combination - Readmission
5	1	1	1	1	1	0	7
6	1	1	1	1	2	2	9
7	1	1	1	2	2	5	6
	1	1	1	1	3	0	0
8	1	1	2	2	2	10	17
	1	1	1	2	3	0	1
9	1	2	2	2	2	32	22
	1	1	2	2	3	0	0
	1	1	1	3	3	0	0
10	1	1	2	3	3	0	0
	1	2	2	2	3	1	0
	2	2	2	2	2	211	196
11	1	2	2	3	3	0	0
	2	2	2	2	3	20	25
12	2	2	2	3	3	11	15
	1	2	3	3	3	0	0
13	1	3	3	3	3	0	0
	2	2	3	3	3	6	6
14	2	3	3	3	3	3	2
15	3	3	3	3	3	5	0

Line Graphs

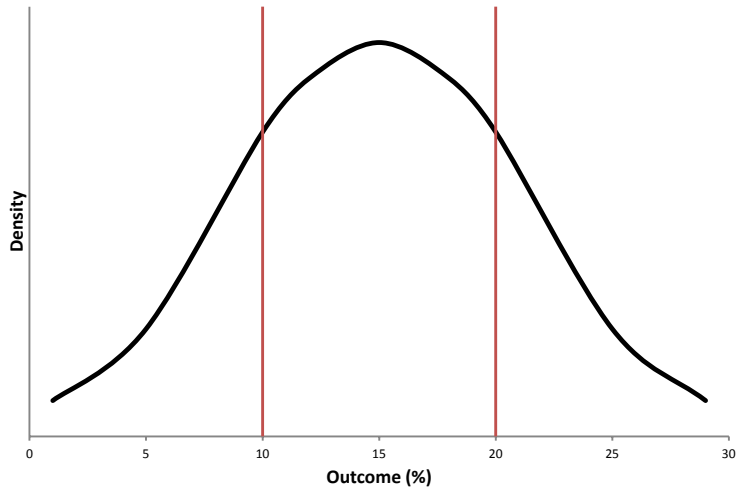
Appendix VI Figure 1. Example line graph.



A line graph visually represents the relationship between independent and dependent variables. In the Chartbook, line graphs are typically used to show how an outcome (mortality/complication/readmission) rate has changed over time. A line graph can illustrate whether the outcome rate is increasing, decreasing, or remaining the same over a given time period. In Appendix VI Figure 1, line A illustrates an outcome that is not changing over time. Line B shows an outcome that starts at a low rate but steadily increases over time. Line C shows an outcome that starts at a high rate but steadily decreases over time.

Density Plots

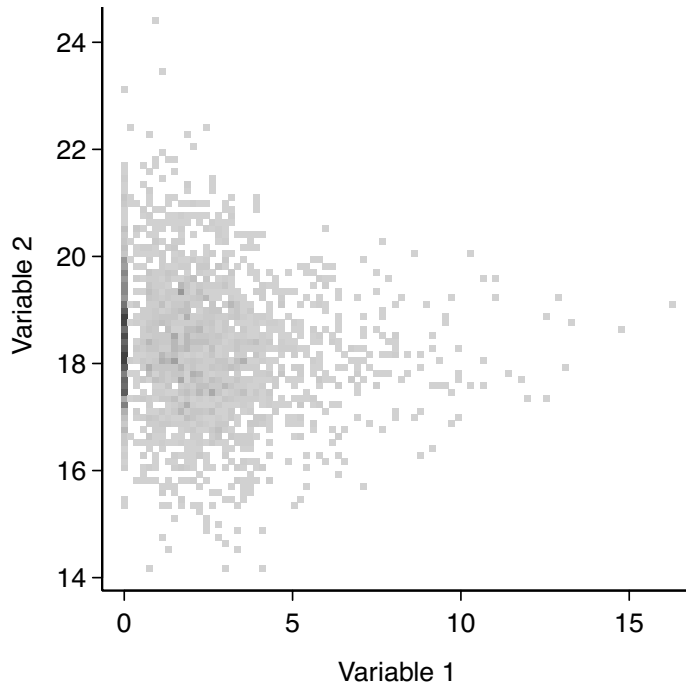
Appendix VI Figure 2. Example density plot.



A density plot shows the estimate of an unobservable underlying probability density function. In Chartbook, we present and interpret the density plots in a similar fashion to histograms. In Appendix VI Figure 2, the horizontal axis (x-axis) shows the outcome rate and the vertical axis (y-axis) shows the density. If you calculate the area under the curve between the two red lines shown on the figure, you could estimate the proportion of hospitals that have outcome rates between 10% and 20%. For the outcome shown in this example, the majority of hospitals had a risk-standardized outcome rate between 5% and 25%.

Density Scatterplots

Appendix VI Figure 3. Example density scatterplot.



A density scatterplot displays information about the data in two dimensions. Like a conventional scatterplot, the horizontal position of the dot is determined by the variable along the horizontal axis (x-axis) and the vertical position of the dot is determined by the variable along the vertical axis (y-axis). Therefore, scatterplots illustrate how the variable on the horizontal axis (x-axis) relates to the variable on the vertical axis (y-axis). For example, if the vertical axis is readmission rate and the horizontal axis is observation stays, and the position of the hospital dot is in the upper-left corner, then that hospital had a high rate of readmissions but a low rate of observation stay use. Additionally, the color of the dot in a density scatterplot provides information about the number of hospitals that fall into a given area; the darker the color of the dot, the greater the number of hospitals that have that position on the scatterplot. The relationship between the two variables can be determined by examining the overall pattern of the dots.

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