Technical Note

For

The California Report on Coronary Artery Bypass Graft Surgery 2023: Hospital Data

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Prepared by

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Introduction

This technical note describes the research methods used to develop the California Cardiovascular Outcomes Reporting Program's (CCORP) report: *The California Report on Coronary Artery Bypass Graft (CABG) Surgery in California, 2023: Hospital Data*. This report is produced by Department of Health Care Access and Information (HCAI) in compliance with California Health and Safety Code Sections 128745-128750 and can be found at: HCAI CABG Reports.

See Appendix A for definitions of the technical terms used in this document.

Provider Performance Measures Reported

This report provides hospital performance data on five key measures of CABG surgery quality:

Outcome measures	P*rocess measure*
Isolated CABG operative mortality	Use of the internal mammary artery (IMA) (isolated CABG)
CABG+Valve operative mortality	
Post-operative stroke (isolated CABG)	
30-day hospital readmission (isolated CABG)	

All outcome measures are risk-adjusted to account for variation in the health status of patients prior to CABG surgery.

Measure Definitions:

Operative mortality includes all deaths occurring during the hospitalization (up to 90 days) in which the CABG surgery was performed; all deaths after transfer to another acute care center up to 90 days; and all deaths after discharge within 30 days after the surgery (no matter where they occurred). Use of operative mortality instead of in-hospital mortality avoids potential manipulation of outcomes through early discharge practices and holds hospitals accountable for patients who died at home or in other facilities shortly after discharge. The National Quality Forum (NQF), which serves as the national body for vetting quality measures, has endorsed the Society of Thoracic Surgeons' (STS) operative mortality measure for CABG surgery.[1] CCORP verifies deaths following patient discharge using death records from the California Department of Public Health (CDPH).

- *Isolated CABG surgery* is defined as CABG surgery performed on patients aged 18 years or older without other major procedures, such as valve repair or carotid endarterectomy, during the same surgery. For a detailed definition of isolated CABG surgery, please contact CCORP@hcai.ca.gov.

- *CABG+Valve surgery* is defined as CABG surgery, performed on patients aged 18 years or older, that includes aortic valve replacement, mitral valve replacement or repair, or a combination thereof.

[1] National Quality Forum (NQF). National voluntary consensus standards for quality measurement, Washington, DC: National Quality Forum. In 2022, NQF updated its endorsement of the risk-adjusted operative mortality for isolated CABG measure by STS (#0119). Details can be found at NQF QPS.

Post-operative stroke is defined as a post-operative, central neurologic deficit that did not resolve within 24 hours after surgery.

30-day hospital readmission includes unplanned readmission that arise from acute clinical events requiring urgent rehospitalization within 30 days of discharge date after isolated CABG surgery. All unplanned readmissions are counted as an outcome, regardless of cause. Starting 2018 data, California adopted all-cause unplanned readmission from Centers for Medicare & Medicaid Services (CMS). The method was based on CMS readmission outcome measure- "Hospital-level 30-day All-Cause Unplanned Readmission Following Coronary Artery Bypass Graft Surgery". The measure can be found at CMS Health Quality Initiative.

Use of the internal mammary artery (IMA) is the preferred method for CABG surgery of the left anterior descending (LAD) artery. Research shows that IMA use results in better long-term graft patency and improved patient survival, compared with use of saphenous vein grafts.

Data Quality Review and Verification

Study Population

Under state law, California-licensed hospitals are required to report all isolated and non-isolated CABG surgeries to HCAI. The study populations for the measures vary by data year and exclusion criteria (Table 1).

Table 1: Study Populations Used in Measures (Denominator, Exclusion Criteria, and Year)

Measure	Study Population (Denominator)	Data Year(s)
Isolated CABG Operative Mortality	Total number of isolated CABG cases without salvage operative status	2023
CABG+Valve Operative Mortality	Total number of CABG cases without salvage operative status with aortic valve replacement, mitral valve repair or mitral valve replacement (or a combination)	2022−2023
Post-Operative Stroke	Total number of isolated CABG cases without salvage operative status	2022−2023
30-day Hospital Readmission	Total number of isolated CABG cases, where the patient was discharged alive from the CABG-performing hospital and could be followed via HCAI's hospital Patient Discharge Data (PDD) file. Patients in salvage operative status, patients who were transferred to acute care, and patients who left against medical advice were excluded.	2022−2023
Internal Mammary Artery Usage	First-time, non-cardiogenic shock, isolated CABG cases discharged where the operative status was elective or urgent and the LAD artery was bypassed.	2023

In 2022 and 2023, there were 31,102 adult CABG surgeries performed across 119 California hospitals (Table 2). Of these, 25,597 (82.3%) were isolated CABG surgeries and 5,505 (17.7%) were non-isolated CABG surgeries. The study population for two measures (hospital operative mortality and IMA use) in this report consists of all adult patients who underwent isolated CABG surgery and were discharged in 2023. To improve the statistical power for hospital CABG+Valve mortality, hospital isolated CABG post-operative stroke, and hospital isolated CABG 30-day readmissions, the study population includes those patients who were discharged in 2022 or 2023.

Table 2: California CABG Surgery Volume, 2022−2023

CABG Type	2022		2023		2022−2023 Combined	
	Cases	%	Cases	%	Cases	%
Isolated CABGs	12,579	82.8%	13,056	82.1%	25,635	82.4%
CABG+Valve	1,607	10.6%	1,838	11.6%	3,445	11.1%
Other CABGs	1,014	6.7%	1,008	6.3%	2,022	6.5%
All CABGs	15,200	100%	15,902	100%	31,102	100%

Data Sources and Data Quality Review

The clinical data used in this report is collected by CCORP's Cardiac Online Reporting for California (CORC) system which was developed to assist California hospitals with their state-mandated data submissions. CCORP aligns with most data elements from the STS Adult Cardiac Surgery Database. However, a few data elements are exclusive to CCORP. Although STS and CCORP data definitions are generally identical, CCORP provides additional clarifications to assist hospitals with coding. For a detailed definition of CABG surgery, please contact CCORP@hcai.ca.gov.

The CCORP 2022-2023 data (119 hospitals) was linked to HCAI's Patient Discharge Data (PDD) previously linked to CDPH death records to identify patients who died following CABG surgery and patients who were discharged alive and readmitted to a hospital within 30 days of discharge date after the CABG surgery.

CCORP reviews the data submitted by each hospital for completeness and errors. Using a three-step, data quality review and verification process, CCORP asks hospitals to check data quality, data discrepancies, and potential risk-factor coding problems.

Step 1: Data Collection and Acceptance

Hospitals submit data using CORC, the on-line data registry. Automated data acceptance reports notify hospitals of invalid, missing, and abnormally high or low data values. Data quality reports are also generated each time a hospital submits data. Hospitals review these summary reports before they adjust, finalize, and certify their data submission.

Step 2: Data Discrepancy Reports

HCAI generates data discrepancy reports, which compare the CCORP registry data with PDD data (the hospital administrative data record). Hospitals are asked to review and account for discrepancies between the two data sources via patient medical chart review to verify that: 1) all CABG cases were reported; 2) each CABG case was accurately coded as isolated or non-isolated CABG surgery; 3) coding of *Discharge Status* was consistent; 4) when relevant, resuscitation occurred prior to CABG surgery; and 5) coding of post-operative complications (including strokes) was consistent.

Step 3: Risk-Factor Coding Reports

Risk-factor coding reports identify values that may be extreme by comparing the hospital-reported prevalence rates for risk factors for CABG cases in the current year to prior years and to the administrative data from the PDD. CCORP requests hospitals to review and, when necessary, correct miscoded data elements.

Hospital Medical Chart Audit

After completing the data quality review and verification process, CCORP developed a preliminary risk model for operative mortality and post-operative stroke to help identify candidate hospitals for a medical chart audit. Candidate selection for the 2023 audit was based on 1) results of the preliminary model that identified **"Better"** or **"Worse"** hospital performers, and 2) data quality reports that identified problems in hospitals that over- and under-reported patient-risk factors. Additionally, a small number of hospitals were randomly selected for audit.

The 2023 audit included 27 hospitals and a total of 2,306 patient records representing 22.0% of 119 hospitals and 14.5% of all CABG surgery cases in 2023. Remote or on-site medical chart reviews were conducted by trained, independent auditors under contract with HCAI. All hospital deaths and post-operative strokes at selected hospitals were audited and high-risk patients, based on predicted mortality, were sampled at a higher rate. The number of patient records selected within a hospital was proportional to the CABG volume at each hospital, ranging from 40 to 200 cases. If a selected hospital performed fewer than 40 isolated CABG surgeries per year, all surgeries were audited. Individual audit summary reports were sent to each hospital for review and comment.

Risk Model for Adjusted Hospital Isolated CABG Operative Mortality Rates, 2023

This section explains the development and validation of CCORP's risk model that accounts for the variation in patient severity-of-illness for hospital operative mortality. CCORP used a multivariable logistic regression model to estimate the relationship between the demographic and pre-operative risk factors and the probability of operative mortality.

To develop the risk model for hospital mortality rates, the 13,043 isolated (non-salvage) CABG surgery cases in 2023 were evaluated for missing values. Values for the missing data were imputed by replacing the missing data with the lowest-risk category of each variable (e.g., *Chronic Lung Disease* = *none*) to ensure that the effects of risk factors were estimated based on the most complete data available. As a result, 13,043 cases had no missing data in any field and were used for the risk model parameter estimation.

CCORP assigned the lowest risk value for the following reasons: 1) some hospitals leave data fields blank by design when the risk factor is absent or the value is normal; 2) maintains consistency with other major cardiac reporting programs that replace missing data with the lowest-risk or normal value; and 3) creates an incentive for more complete reporting by hospitals. Finally, the parameters of the risk model were applied to all cases to estimate each patient's probability of death. These probabilities were summed to estimate the expected mortality for each hospital. The hospital risk model (based on 2023 data) is presented in Appendix A-1 with statistically significant risk factors identified in bolded text.

Discrimination of Risk Model for Hospital Isolated CABG Operative Mortality

A commonly used measure of discrimination is the C-statistic, also known as the area under the Receiver Operating Characteristic (ROC) curve. For all possible pairs of patients, where one dies and the other survives surgery, the C-statistic describes the proportion of pairs where the patient who died had a higher predicted risk of death than the patient who lived.

C-statistics range from 0.5 to 1, with higher values indicating better discrimination. For the 2023 risk model, the C-statistic was 0.825. In recently published CABG surgery mortality reports by other states (New Jersey, New York, and Pennsylvania), the C-statistics ranged from 0.777 to 0.830. Additionally, the Centers for Medicare and Medicaid Services reported that its 30-day all-cause CABG mortality risk model performance remained constant at 0.74 over a 30-month time period (2022-2023).[2]

Calibration of Risk Model for Hospital Isolated CABG Operative Mortality

A common measure of calibration is the Hosmer-Lemeshow χ^2 test, which compares observed and predicted outcomes over deciles of risk. The p-value of the Hosmer-Lemeshow test statistic for this 2023 risk model is 0.669 indicating there were no significant differences between observed and predicted outcomes over deciles of risk and there were no systematic over- or under-estimations at the extreme deciles of risk.

A second calibration test sorts the data into 10 risk groups and compares observed deaths with predicted deaths in each of 10 risk groups. As presented in Table 3, Risk Group 10 shows the patients in the highest risk group. Among the 1,303 patients in Group 10, 139 patients died, and the model predicted 134.0 patient deaths. Assuming a Poisson distribution for a binary outcome, the predicted range of deaths for Risk Group 10 is 112.3 to 158.7. The observed number of 139 deaths falls within the range of predicted readmissions. None of the risk groups showed observed deaths outside the 95% confidence interval (CI) for predicted deaths.

Table 3: Calibration of Risk Model for Hospital Isolated CABG Operative Mortality, 2023

Risk Group	Isolated CABG Cases	Observed Deaths	Predicted Deaths	Difference	95% CI of Predicted Deaths	
1	1,305	4	2.1	-1.9	0.3	7.4
2	1,304	2	4.2	2.2	1.2	10.5
3	1,305	6	6.0	0.0	2.2	13.0
4	1,304	8	8.0	0.0	3.4	15.7
5	1,305	8	10.5	2.5	5.1	19.0
6	1,305	11	13.7	2.7	7.5	23.1
7	1,304	19	18.3	-0.7	10.9	28.8
8	1,304	23	25.7	2.7	16.7	37.7
9	1,304	44	41.5	-2.5	29.9	56.2
10	1,303	139	134.0	-5.0	112.3	158.7

Note: Risk Group 1 is the lowest risk for mortality and Risk Group 10 is the highest risk.

[2] *2024 Procedure-Specific Measure Updates and Specifications Report Hospital-Level 30-Day Risk-Standardized Mortality Measure Isolated Coronary Artery Bypass Graft (CABG) Surgery – Version 11.0*. Centers for Medicare and Medicaid Services. QualityNet. April 2024.

Process for Calculating Hospital Risk-Adjusted Mortality Rates and Performance Rating

The risk-adjusted mortality rate (RAMR) is computed by dividing the provider's observed mortality by the provider's expected mortality (obtained from the risk model calculation) to get the observed/expected (O/E) ratio. The O/E ratio is then multiplied by the statewide mortality rate (2.02% in 2023 for hospitals) to obtain the provider's risk-adjusted mortality rate.

However, because a provider's point estimate of the RAMR can be attributed (in part) to chance, the performance rating is not based on a point estimate of the RAMR, but a comparison of the 95% CI of each provider's RAMR to the statewide mortality rate.[3] CCORP treated the 2023 data as a sample, and inferred a range within which each provider's true performance was likely to fall.

As shown in Appendix A-2, a provider's performance rating is **"Better"** if the upper 95% CI of its risk-adjusted mortality rate is below the state average mortality rate (indicating the provider's RAMR is significantly lower than the state average). A provider's performance rating is **"Worse"** if the lower 95% CI of its RAMR is above the state average mortality rate (indicating the provider's risk-adjusted mortality is significantly higher than the state average). If the state average mortality rate is within the 95% CI of a provider's RAMR, then the performance rating is **"Average."**

Hospital Risk-Adjusted Operative Mortality Results for Isolated CABG, 2023

Appendix A-2 presents the risk-adjusted isolated CABG operative mortality results for each hospital for 2023. The table is sorted by geographic region and contains, for each hospital, the total number of CABG surgeries performed (isolated and non-isolated combined), number of isolated CABG surgeries (excluding salvage cases), number of observed isolated CABG deaths, observed isolated CABG mortality rate, expected isolated CABG mortality rate predicted by the risk model, RAMR and 95% CI of the RAMR, and the associated hospital performance rating.

Among the 13,043 isolated and non-salvage CABG surgeries performed at 119 hospitals in 2022, 264 patients died either in-hospital (up to 90 days, including transfers to other acute care hospitals) or after discharge, but within 30 days of the surgery date, reflecting a statewide hospital operative mortality rate of 2.02%. The *observed* mortality rates among hospitals ranged from 0% to 66.67%. The *expected* mortality rates, which are generated by the risk model and account for patient severity-of-illness, were between 0.78% and 5.33%. The RAMRs, which reflect hospital performance, ranged from 0% to 81.61%.

Based on the 95% CIs for the RAMRs, 112 of 119 hospitals (94.1%) performed within the expected range when compared to the statewide mortality rate. Two hospitals were rated **"Better"** than the state average operative mortality rate (Kaiser Foundation Hospital – San Francisco and Mercy General Hospital) and five hospitals were rated **"Worse"** than the state average (Adventist Health Bakersfield, Adventist Health White Memorial Montebello, Emanate

[3] CCORP uses the Poisson Exact Probability method to compute the 95% confidence interval for the risk-adjusted mortality rate. (Buchan Iain, *Calculating Poisson Confidence Interval in Excel*, January 2004).

Health Inter – Community Hospital, Mercy Medical Center – Redding, and Saint Agnes Medical Center) (Appendix A-2).

Risk Model for Adjusting Hospital CABG + Valve Operative Mortality Rates, 2022−2023

Performance ratings for CABG+valve surgery are based on operations occurring in 2022 or 2023 that combined CABG and aortic valve replacement, mitral valve repair, and/or mitral valve replacement procedures. These exclude patients in salvage operative status.

To develop the risk model for hospital CABG+valve operative mortality, the 3,422 CABG+valve cases in 2022−2023 were evaluated for missing data. Values for the missing data were imputed by replacing them with the lowest risk category of the same variable (e.g., *Chronic Lung Disease* = *none*) to ensure that the effects of risk factors were estimated based on the most complete data available. As a result, 3,422 cases had no missing data in any field and were used for the risk model parameter estimation. The risk model, based on the 2022−2023 data, is presented in Appendix B-1 with statistically significant risk factors identified in bolded text.

Discrimination of Risk Model for Hospital CABG+Valve Operative Mortality

Discrimination methods are explained in the section for hospital isolated CABG operative mortality. For this 2022-2023 risk model, the C-statistic was 0.804. The STS 2018 cardiac surgery risk model[4] reported the CABG+Valve surgery mortality C-statistic was 0.761.

Calibration of Risk Model for Hospital CABG+Valve Operative Mortality

Calibration methods are explained in the section for hospital isolated CABG operative mortality. The p-value of the Hosmer-Lemeshow test statistic for this 2022-2023 risk model was 0.542, indicating there were no significant differences between observed and predicted outcomes over deciles of risk and there were no systematic over- or under-estimations at the extreme deciles of risk.

A second calibration test sorts the data into 10 risk groups and compares observed deaths with predicted deaths (Table 4). Among the 342 patients in Group 5, the model predicted 8.5 patient deaths, while 11 patients actually died. Assuming a Poisson distribution for a binary outcome, the predicted range of deaths for Risk Group 5 was 3.8 to 16.4. The observed number of 11 deaths falls within the range of predicted deaths. None of the risk groups showed observed deaths outside the 95% CI for predicted deaths.

[4] O'Brien SM, Feng, L, He X, et al. The Society of Thoracic Surgeons 2018 cardiac surgery risk models: part 2—Statistical Methods and Results. Annals of Thoracic Surgery. 2018; 105:1419–28.

Table 4: Calibration of Risk Model for Hospital CABG+Valve Operative Mortality, 2022-2023

Risk Group	CABG+Valve Cases	Observed Deaths	Predicted Deaths	Difference	95%CI of Predicted Deaths	
1	342	2	2.5	0.5	0.4	7.9
2	342	3	3.9	0.9	1.0	10.1
3	342	1	5.1	4.1	1.7	11.9
4	342	5	6.7	1.7	2.6	14.0
5	342	11	8.5	-2.5	3.8	16.4
6	342	12	11.1	-0.9	5.6	19.8
7	342	15	14.9	-0.1	8.3	24.7
8	342	20	21.3	1.3	13.2	32.5
9	342	40	32.6	-7.4	22.4	45.9
10	344	74	76.4	2.4	60.3	95.6

Note: Risk Group 1 is the lowest risk for mortality and Risk Group 10 is the highest risk.

Process for Calculating Hospital Risk-Adjusted CABG+Valve Operative Mortality Rates and Performance Rating

The RAMR is computed by dividing the provider's observed mortality by the provider's expected mortality (based on the risk model) to get the observed/expected (O/E) ratio. The O/E ratio is then multiplied by the statewide average mortality rate (5.35% in 2022−2023) to obtain the provider's RAMR.

However, because a provider's point estimate of the RAMR can be attributed (in part) to chance, the performance rating is not based on the point estimate of the RAMR, but on a comparison of the 95% CI of each provider's RAMR to the statewide mortality rate.[5] CCORP treated the 2022−2023 data as a sample, and inferred a range within which each provider's true performance was likely to fall. As shown in Appendix B-2, a provider's performance rating is **"Better"** if the upper 95% CI of a provider's risk-adjusted mortality is below the state average mortality rate (indicating the provider's RAMR is significantly lower than the state average). A provider's performance rating is **"Worse"** if the lower 95% CI of a provider's RAMR is above the state average mortality rate (indicating the provider's risk-adjusted mortality is significantly higher than the state average). If the state average mortality rate is within the 95% CI of a provider's RAMR, then the performance rating is **"Average."**

Hospital Risk-Adjusted CABG+Valve Operative Mortality Results, 2022−2023

Appendix B-2 presents the risk-adjusted CABG+valve operative mortality results for each hospital for 2022−2023. The table is sorted by geographic region and contains, for each hospital, the total number of CABG surgeries performed (isolated and non-isolated combined), number of CABG+valve surgeries (excluding salvage cases), number of observed CABG+valve operative deaths, observed CABG+valve mortality rate, expected CABG+valve mortality rate

[5] CCORP uses the Poisson Exact Probability method to compute the 95% confidence interval for the risk-adjusted mortality rate (Buchan Iain, Calculating Poisson Confidence Interval in Excel, January 2004).

predicted by the risk model, RAMR and 95% CI of the RAMR, and the associated hospital performance rating.

Among the 3,422 CABG+valve, non-salvage surgeries performed at 117 hospitals in 2022−2023, 183 patients died either in-hospital (up to 90 days) or after discharge but within 30 days of the surgery date, reflecting a statewide operative mortality rate of 5.35%, which was lower than the rate from 2021-2022 (5.66%). The *observed* mortality rates among hospitals ranged from 0.00% to 100.00%. The *expected* mortality rates, which are generated by the risk model and account for patient severity-of-illness, were between 0.87% and 26.24%. The RAMR, which reflects hospital performance, ranged from 0.00% to 97.55%.

Based on the 95% CIs for the RAMRs, 116 of 117 hospitals (99.1%) performed within the expected range when compared to the statewide mortality rate. No hospital was rated **"Better"** than the state average operative mortality rate, and one hospital was rated **"Worse"** than the state average rate (Providence Queen of the Valley Medical Center) (Appendix B-2).

Risk Model for Adjusting Hospital Post-Operative Stroke Rates, 2022−2023

Post-operative stroke is a relatively rare, but serious, complication that can occur after CABG surgery. To assess hospital performance, CCORP combined 2022 and 2023 data to increase the number of cases and reliability of hospital results. Similar to the methodology used to assess the operative mortality rate, CCORP used a multivariable logistic regression model to estimate the relationship between each of the demographic and pre-operative risk factors and the probability of post-operative stroke. The risk model, based on the 2022−2023 data, is presented in Appendix C-1 with statistically significant risk factors identified in bolded text.

Discrimination of Risk Model for Hospital Post-Operative Stroke

Discrimination methods are explained in the section for hospital isolated CABG operative mortality. For the 2022−2023 risk model, the C-statistic was 0.711. This risk model compares favorably with an earlier STS post-operative stroke model (C-statistic = 0.697 for isolated CABG surgery).[4]

Calibration of Risk Model for Hospital Post-Operative Stroke

A common measure of calibration is the Hosmer-Lemeshow χ^2 test, which compares observed and predicted outcomes over deciles of risk. The p-value of the Hosmer-Lemeshow test statistic for this post-operative stroke risk model is 0.538, indicating there were no significant differences between observed and predicted outcomes over deciles of risk and there were no systematic over- or under-estimations at the extreme deciles of risk.

A second calibration test sorts the data and compares observed stroke cases with predicted stroke cases in each of 10 risk groups. As presented in Table 5, Risk Group 7 shows patients in a mid-level risk group. Among the 2,564 patients in this group, 29 patients had post-operative strokes, but the model predicted 34.2 cases. Assuming a Poisson distribution for a binary outcome, the predicted range of strokes for this group is 23.7 to 47.7. The observed number of 29 strokes falls within the 95% CI for predicted strokes.

Table 5: Calibration of Risk Model for Hospital Post-Operative Stroke, 2022−2023

Risk Group	Isolated CABG Cases	Observed Post-Op Strokes	Predicted Post-Op Strokes	Difference	95% CI of Predicted Post-Op Stroke	
1	2,607	13	8.8	-4.2	4.0	16.9
2	2,561	8	12.7	4.7	6.7	21.9
3	2,558	13	16.2	3.2	9.3	26.3
4	2,525	22	19.4	-2.6	11.8	30.2
5	2,550	23	23.3	0.3	14.8	34.9
6	2,561	27	28.0	1.0	18.6	40.4
7	2,564	29	34.2	5.2	23.7	47.7
8	2,558	44	42.8	-1.2	30.9	57.6
9	2,561	67	58.3	-8.7	44.3	75.3
10	2,562	108	110.3	2.3	90.7	132.9

Note: Risk Group 1 is the lowest risk and Risk Group 10 is the highest risk.

Process for Calculating Hospital Risk-Adjusted Post-Operative Stroke Rate and Performance Ratings

The risk-adjusted post-operative stroke rate (RASR) is computed by dividing the provider's observed number of patient strokes by the provider's expected number of patient strokes (based on the risk model) to obtain the observed/expected (O/E) ratio. The O/E ratio is multiplied by the statewide post-operative stroke rate (1.38% for 2022−2023) to obtain the provider's RASR.

The performance rating is based on a comparison of the 95% CI of each provider's RASR to the statewide post-operative stroke rate. Thus, CCORP treated 2022−2023 data as a sample, and inferred the range in which each provider's true performance was likely to fall. As shown in Appendix C-2, if the upper 95% CI of a provider's risk-adjusted stroke rate is below the state average stroke rate, indicating the provider's RASR is significantly lower than the state average, the performance rating is **"Better."** If the lower 95% CI of a provider's RASR is above the state average stroke rate, indicating the provider's risk-adjusted stroke rate is significantly higher than the state average, the performance rating is **"Worse."** If the state average stroke rate is within the 95% CI of a provider's RASR, the performance rating is **"Average."**

Hospital Risk-Adjusted Post-Operative Stroke Results, 2022−2023

Appendix C-2 presents the risk-adjusted post-operative stroke results for each hospital for 2022−2023. The table is sorted by geographic region and contains, for each hospital, the total number of CABG surgeries performed (isolated and non-isolated combined), number of isolated CABG surgeries (excluding salvage cases), number of observed isolated-CABG post-operative stroke cases, observed post-operative stroke rate, expected post-operative stroke rate predicted by the risk model, RASR and 95% CI of the RASR, and the associated hospital performance rating.

Among the 25,607 isolated CABG surgeries performed in 2022 and 2023, 354 patients had a post-operative stroke in-hospital, reflecting an overall statewide rate of 1.38%. Among the 354 patients with post-operative stroke, 44 (12.43%) died either in-hospital (up to 90 days, including

transfers to other acute care hospitals) or after discharge, but within 30 days of the surgery date. The observed stroke rate among hospitals ranged from 0.00% to 8.25%. The expected stroke rates, which are generated by the model and measure patient severity of illness, were between 0.90% and 2.64%. The RASR ranged from 0.00% to 7.85%.

Based on the 95% CIs for the RASR, 111 of 119 hospitals (93.3%) performed within the expected range when compared to the state average stroke rate. Three hospitals were rated **"Better"** than the state average post-operative stroke rate (Hoag Memorial Hospital Presbyterian, Kaiser Foundation Hospital – Los Angeles, and St. Joseph's Medical Center of Stockton) and five hospitals were rated **"Worse"** than the state average post-operative stroke rate (Good Samaritan Hospital - San Jose, Northridge Hospital Medical Center, Salinas Valley Memorial Hospital, Stanford Health Care, and UC Irvine Medical Center) (Appendix C-2).

Risk Model for Adjusting Hospital 30-Day Readmission Rates, 2022−2023

Readmissions account for a significant percentage of hospital healthcare costs. With better care and discharge planning, hospitals might avoid unnecessary readmissions. To assess hospital performance on this outcome, CCORP limited the analysis to isolated CABG surgery patients at risk for readmission to any acute care hospital within 30 days of being discharged to home or a non-acute care setting (see study population noted on page 2). Patients in salvage operative status, patients who were transferred to acute care, and patients who left against medical advice were excluded. Starting 2017−2018 data, CCORP adopted the CMS's 30-day all-cause unplanned readmission methodology. The detail about the readmission methodology can be found at "Hospital-level 30-day All-Cause Unplanned Readmission Following Coronary Artery Bypass Graft Surgery" published by CMS.

Similar to the methodology used to assess the operative mortality and post-operative stroke rates, CCORP used a multivariable logistic regression model to estimate the relationship between each of the demographic and pre-operative risk factors and the probability of a readmission within 30 days. The risk model, based on the 2022−2023 data, is presented in Appendix D-1 with statistically significant risk factors identified in bolded text.

Discrimination of Risk Model for Hospital 30-Day Readmission

Discrimination methods are explained in the section for hospital isolated CABG operative mortality. For the 2022−2023 risk model, the C-statistic was 0.663 which is similar to the CMS risk model C-statistic of 0.64 for hospital 30-day readmission following CABG surgery using data from 2022 to 2023.[6]

Calibration of Risk Model for Hospital 30-Day Readmission

A common measure of calibration is the Hosmer-Lemeshow χ^2 test, which compares observed and predicted outcomes over deciles of risk. The p-value of the Hosmer-Lemeshow test statistic for this 2022−2023 risk model is 0.333, indicating there were no significant differences between observed and predicted outcomes over deciles of risk and there were no systematic over- or under-estimations at the extreme deciles of risk.

[6] 2024 Procedure-Specific Readmission Measures Updates and Specifications Report Isolated Coronary Artery Bypass Graft (CABG) Surgery – Version 11.0 Elective Primary Total Hip Arthroplasty (THA) and/or Total Knee Arthroplasty (TKA) – Version 13.0. Centers for Medicare and Medicaid Services. April, 2024.

Another way to test model calibration is to partition the data and compare observed readmissions with predicted readmissions in each of 10 risk groups. As presented in Table 6, Risk Group 3 shows the patients in the lowest risk group. Among the 2,083 patients in this group, 127 patients were readmitted to the hospital, but the model predicted 141.7 readmissions. Assuming a Poisson distribution for a binary outcome, the predicted range of readmissions for Risk Group 3 is 119.4 to 167.1. The observed number of 127 readmissions falls outside the range of predicted readmissions. Nine of the risk groups showed observed readmissions within the 95% cCI for predicted readmissions.

Table 6: Calibration of Risk Model for Hospital 30-Day Readmission, 2022−2023

Risk Group	Isolated CABG cases	Observed 30-Day Readmission	Predicted 30-Day Readmission	Difference	95% CI of predicted 30-Day Readmission	
1	2,081	111	100.1	-10.9	81.5	121.8
2	2,084	106	124.0	18.0	103.1	147.8
3	2,083	127	141.7	14.7	119.4	167.1
4	2,083	162	160.0	-2.0	136.2	186.8
5	2,083	186	180.9	-5.1	155.5	209.3
6	2,083	211	205.4	-5.6	178.3	235.5
7	2,083	249	236.1	-12.9	207.0	268.3
8	2,083	296	278.4	-17.6	246.6	313.1
9	2,083	332	348.9	16.9	313.2	387.5
10	2,079	544	548.4	4.4	503.5	596.3

Note: Risk Group 1 is the lowest risk and Risk Group 10 is the highest risk.

Process for Calculating Hospital Risk-Adjusted 30-Day Readmission Rate and Performance Ratings

The risk-adjusted 30-day readmission rate (RARR) is computed by dividing the provider's observed readmission rate by the provider's expected readmission rate (obtained from the risk model calculation) to get the observed/expected (O/E) ratio. The O/E ratio is then multiplied by the statewide readmission rate (11.16% for 2022−2023) to obtain the provider's RARR.

However, because a provider's point estimate of the RARR can be attributed (in part) to chance, the performance rating is not based on a point estimate of the RARR, but on a comparison of the 95% CI of each provider's RARR to the California average readmission rate.[7] CCORP treated the 2022−2023 data as samples, and inferred a range within which each provider's true performance was likely to fall. As shown in Appendix D-2, if the upper 95% CI of a provider's RARR is below the state average readmission rate, indicating the provider's RARR is significantly lower than the state average, the performance rating is **"Better."** If the lower 95% CI of a provider's RARR is above the state average readmission rate, indicating the provider's RARR is significantly higher than the state average, the performance rating is **"Worse."** If the state average readmission rate is within the 95% CI of a provider's RARR, the performance rating is **"Average."**

[7] The Poisson Exact Probability method is used for computing the 95% confidence interval for the risk-adjusted readmission rate. (Buchan Iain, *Calculating Poisson Confidence Interval in Excel*, January 2004)

Hospital Risk-Adjusted 30-Day Readmission Results, 2022−2023

Appendix D-2 presents the risk-adjusted readmission results for each hospital for 2022−2023. The table is sorted by geographic region and contains, for each hospital, the total number of CABG surgeries performed (isolated and non-isolated combined), number of patients discharged alive after isolated CABG surgeries (excluding salvage patients), number of observed isolated CABG readmissions, observed readmission rate, expected readmission rate predicted by the risk model, RARR and 95% CI of the RARR, and the associated hospital performance rating.

Among the 20,825 patients discharged alive following isolated (non-salvage) CABG surgeries in 2022−2023, 2,324 patients were readmitted to the same or another acute care hospital within 30 days of the surgery date, reflecting a statewide readmission rate of 11.16%. The observed readmission rates among hospitals ranged from 0.00% to 29.82%. The expected readmission rates, which are generated by the risk model and account for patient severity of illness, ranged between 8.68% and 15.25%. The RARR, which reflects hospital performance, ranged from 0.00% to 32.14%.

Based on the 95% CIs for RARRs, 95 of 119 hospitals (79.8%) performed within the expected range compared to the statewide readmission rate. Nine hospitals were rated **"Better"** than the state average readmission rate (Alta Bates Summit Medical Center, John Muir Medical Center - Concord Campus, Kaiser Foundation Hospital – Fontana, Kaiser Foundation Hospital – Los Angeles, Kaiser Foundation Hospital – San Francisco, Kaiser Foundation Hospital - Santa Clara, Mercy General Hospital, Salinas Valley Memorial Hospital, and Temecula Valley Hospital), and fifteen hospitals were rated **"Worse"** than the state average readmission rate (AHMC Anaheim Regional Medical Center, Centinela Hospital Medical Center, Community Hospital of the Monterey Peninsula, Community Regional Medical Center - Fresno, Doctors Medical Center, Garfield Medical Center, Grossmont Hospital, Los Angeles County + USC Medical Center, Los Angeles County/Harbor – UCLA Medical Center, Los Robles Hospital and Medical Center, Northridge Hospital Medical Center, St. Joseph's Medical Center of Stockton, St. Mary Medical Center - Long Beach, Torrance Memorial Medical Center, and UC San Francisco Medical Center) (Appendix D-2).

Hospital Internal Mammary Artery Usage Results, 2023

A widely accepted definition of healthcare quality contains three dimensions: process, structure, and outcomes.[8] In addition to publishing hospital outcomes, this report also assesses a process of care measure by reporting hospital use of the IMA in surgery. Although outcomes measurement permits comparison of provider performance and can be used within health care organizations for investigating processes and structures, assessing the process of care provides a more immediate path to improved care since it measures a specific step in patient care. If diagnostic and therapeutic strategies with clear links to outcomes are monitored, some healthcare quality problems can be detected and ameliorated long before demonstrable health outcomes occur.

In most cases of first-time, isolated CABG surgery where the operative status is elective or urgent, the surgeon has the option of using the IMA (also known as the internal mammary artery). Clinical literature strongly supports use of the IMA to promote long-term graft patency (durability) and patient survival. Research also suggests a reduction in immediate operative

[8] Donabedian A. Evaluating the Quality of Medical Care. *The Milbank Quarterly*, 2005; 83(4):691-729.

mortality associated with use of the IMA rather than saphenous (leg) vein revascularization.[9] The IMA, and especially the left IMA, is considered the preferred conduit for revascularizing the left anterior descending (LAD) coronary artery.

Many nationally respected organizations encourage the use of IMA when appropriate. The Leapfrog Evidence-Based Hospital Referral program endorses the goal of 80% hospital adherence to IMA use. The National Quality Forum does not endorse a specific rate but states that the goal is to raise the IMA usage rates of hospitals with low utilization. The STS states that IMA use should be given primary consideration in every CABG surgery patient. Furthermore, a number of healthcare quality advocates recommend public reporting of IMA usage rates for CABG surgery.

Appendix E presents hospital results by region for usage of the IMA during 2023. Only first-time, non-cardiogenic shock isolated CABG surgeries where the operative status is elective or urgent and the LAD was bypassed are included in calculating IMA usage rates. There is no consensus on an optimal usage rate, so performance ratings are not given. The IMA average usage rate for all hospitals was 99.3 percent in 2023, 99.4 percent in 2022, and 89.6 percent in 2003.

Definitions of IMA Terms (see Appendix E)

Isolated CABG Surgeries: Includes only first-time, non-cardiogenic shock, isolated CABG surgeries for 2023 where the operative status was elective or urgent and the LAD artery was bypassed. This number is usually smaller than the total isolated CABG cases performed by the hospital.

IMA Usage Rate: The ratio of the number of CABG surgeries with IMA grafts (including left IMA, right IMA, and bilateral IMA) and selected first-time isolated CABG cases multiplied by 100: Percent IMA Use = Number of IMA Grafts used for First-Time Isolated CABG Surgeries/Number of First-Time Isolated CABG Cases × 100.

[9] Ferguson TB Jr, Coombs LP, Peterson ED. "Internal thoracic artery grafting in the elderly patient undergoing coronary artery bypass grafting: room for process improvement?" *Journal of Thoracic and Cardiovascular Surgery*, 2002; 123(5):869-80.

Appendix A-1 : Logistic Regression Risk Model for Isolated CABG Operative Mortality, 2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Intercept		-9.45				<.0001
Age (Years)		**0.04**	**1.05**	**1.03**	**1.06**	**<.0001**
Gender	Male	Reference				
	Female	**0.63**	**1.89**	**1.43**	**2.50**	**<.0001**
Race	White	Reference				
	Asian	0.30	1.35	0.94	1.93	0.1016
	Black	0.08	1.09	0.58	2.03	0.7900
	Hispanic	0.01	1.01	0.72	1.41	0.9631
	Native American	-12.86	<0.001	<0.001	>100.00	0.9858
	Pacific Islander	-13.11	<0.001	<0.001	>100.00	0.9752
Body Mass Index	Normal 18.5 - < 30.0	Reference				
	< 18.5	**1.77**	**5.87**	**2.93**	**11.80**	**<.0001**
	30.0 - 40.0	0.05	1.05	0.78	1.41	0.7640
	> 40.0	**0.81**	**2.24**	**1.27**	**3.95**	**0.0052**
Status of Procedure	Elective	Reference				
	Urgent	**0.69**	**1.99**	**1.36**	**2.94**	**0.0005**
	Emergent	**1.15**	**3.15**	**1.51**	**6.57**	**0.0022**
Hypertension	No	Reference				
	Yes	0.06	1.06	0.65	1.74	0.8113
Cerebrovascular Disease	No	Reference				
	Yes	0.21	1.23	0.92	1.65	0.1565
Pneumonia	No	Reference				
	Yes	0.06	1.06	0.63	1.79	0.8328
Chronic Lung Disease	None/Mild/Moderate	Reference				
	Severe	**0.59**	**1.81**	**1.26**	**2.59**	**0.0013**
Myocardial Infarction (MI)	No MI	Reference				
	< 24 hours	**0.79**	**2.20**	**1.14**	**4.27**	**0.0195**
	1 - 7 days ago	0.14	1.15	0.86	1.54	0.3525
Heart Failure	No	Reference				
	Yes	**0.44**	**1.55**	**1.14**	**2.12**	**0.0052**
Ejection Fraction (EF)	EF >=50%	Reference				
	EF less than 20%	**1.08**	**2.96**	**1.29**	**6.78**	**0.0104**
	EF 20- <30%	**0.71**	**2.03**	**1.28**	**3.22**	**0.0025**
	EF 30- <40%	0.32	1.38	0.93	2.05	0.1153
	EF 40- <50%	0.15	1.17	0.81	1.69	0.4131
Cardiogenic Shock	No	Reference				
	Yes, at the time of procedure	**1.43**	**4.17**	**2.29**	**7.59**	**<.0001**
	Yes, within 24 hours	0.64	1.90	0.59	6.12	0.2835
Atrial Fibrillation	No	Reference				
	Yes	**0.56**	**1.76**	**1.27**	**2.42**	**0.0006**

Appendix A-1 : Logistic Regression Risk Model for Isolated CABG Operative Mortality, 2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Mitral Insufficiency	None, Trival, Mild	Reference				
	Moderate/Severe	**0.50**	**1.66**	**1.19**	**2.30**	**0.0027**
Left Main Disease	No	Reference				
	Yes	**0.28**	**1.33**	**1.02**	**1.72**	**0.0339**
Number of Diseased Coronary Vessels	None, One, or Two	Reference				
	3 or more	**0.56**	**1.76**	**1.23**	**2.53**	**0.0022**
Diabetes	No Diabetes	Reference				
	Non-Insulin	0.04	1.04	0.77	1.40	0.8094
	Insulin	0.04	1.04	0.72	1.50	0.8307
MELD Score	<10	Reference				
	>=10	**0.64**	**1.89**	**1.41**	**2.54**	**<.0001**
Dialysis	No	Reference				
	Yes	**0.55**	**1.73**	**1.14**	**2.63**	**0.0107**
Prior Cardiac Surgery	First	Reference				
	Second or more	**0.95**	**2.57**	**1.13**	**5.89**	**0.0252**
Previous PCI	No PCI	Reference				
	< = 6 hours	0.11	1.12	0.40	3.09	0.8298
	> 6 hours	0.20	1.22	0.91	1.62	0.1854

Bolded text indicates statistically significant (p≤0.05).

C Statistic =0.826

Hosmer-Lemeshow test: p-value=0.7881

Appendix A-2: Hospital Risk-Adjusted Isolated CABG Operative Mortality Results by Region, 2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
State		**15,894**	**13,043**	**264**	**2.02**					
Sacramento Valley & Northern California Region	Adventist Health and Rideout	56	44	3	6.82	2.23	6.19	1.28	18.10	Average
	Enloe Medical Center - Esplanade	102	80	2	2.50	1.96	2.58	0.31	9.34	Average
	Mercy General Hospital	690	527	2	0.38	1.89	0.41	0.05	1.47	**Better**
	Mercy Medical Center - Redding	81	71	8	11.27	3.63	6.29	2.71	12.39	**Worse**
	Mercy San Juan Medical Center	124	80	0	0.00	1.63	0.00	0.00	5.74	Average
	Providence St. Joseph Hospital - Eureka	19	18	0	0.00	4.91	0.00	0.00	8.45	Average
	Shasta Regional Medical Center	90	73	1	1.37	1.91	1.45	0.04	8.08	Average
	Sutter Medical Center - Sacramento	513	399	10	2.51	2.23	2.27	1.09	4.18	Average
	UC Davis Medical Center	101	88	2	2.27	3.22	1.43	0.17	5.16	Average
San Francisco Bay Area & San Jose	AHMC Seton Medical Center	24	24	3	12.50	4.71	5.38	1.11	15.71	Average
	Adventist Health St. Helena	82	59	1	1.69	2.54	1.35	0.03	7.51	Average
	Alta Bates Summit Medical Center	137	114	1	0.88	2.81	0.63	0.02	3.52	Average
	California Pacific Medical Center - Van Ness Campus	105	83	2	2.41	1.90	2.57	0.31	9.28	Average
	Community Hospital of the Monterey Peninsula	94	61	1	1.64	0.96	3.46	0.09	19.28	Average
	Dominican Hospital	82	53	1	1.89	2.24	1.71	0.04	9.52	Average
	El Camino Hospital	104	88	1	1.14	1.60	1.43	0.04	7.99	Average
	Good Samaritan Hospital - San Jose	50	41	1	2.44	2.24	2.20	0.06	12.28	Average
	John Muir Medical Center - Concord Campus	281	225	2	0.89	2.31	0.78	0.09	2.81	Average
	Kaiser Foundation Hospital - San Francisco	626	548	0	0.00	1.14	0.00	0.00	1.20	**Better**
	Kaiser Foundation Hospital - Santa Clara	590	492	6	1.22	1.68	1.47	0.54	3.21	Average
	Marinhealth Medical Center	34	27	0	0.00	1.04	0.00	0.00	26.53	Average
	Mills-Peninsula Medical Center	71	58	2	3.45	1.71	4.07	0.49	14.71	Average
	North Bay Medical Center	45	41	0	0.00	1.74	0.00	0.00	10.46	Average
	O'Connor Hospital	53	48	1	2.08	1.60	2.63	0.07	14.66	Average
	Providence Queen of the Valley Medical Center	55	52	1	1.92	1.72	2.27	0.06	12.62	Average
	Providence Santa Rosa Memorial Hospital - Montgomery	70	60	1	1.67	1.90	1.78	0.05	9.90	Average
	Regional Medical Center of San Jose	32	31	1	3.23	3.39	1.93	0.05	10.74	Average
	Salinas Valley Health Medical Center	122	112	1	0.89	3.22	0.56	0.01	3.13	Average
	San Ramon Regional Medical Center	17	16	0	0.00	1.33	0.00	0.00	35.20	Average
	Santa Clara Valley Medical Center	66	45	1	2.22	1.82	2.47	0.06	13.78	Average
	Sequoia Hospital	91	59	1	1.69	3.27	1.05	0.03	5.85	Average
	Stanford Health Care	301	215	2	0.93	1.59	1.18	0.14	4.27	Average
	Stanford Health Care Tri-Valley	84	59	2	3.39	1.86	3.69	0.45	13.32	Average
	UC San Francisco Medical Center	142	119	1	0.84	1.68	1.01	0.03	5.63	Average
	Washington Hospital - Fremont	73	64	0	0.00	1.84	0.00	0.00	6.34	Average

Appendix A-2: Hospital Risk-Adjusted Isolated CABG Operative Mortality Results by Region, 2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Central California	Adventist Health Bakersfield	70	64	9	14.06	3.71	7.68	3.51	14.58	**Worse**
	Bakersfield Heart Hospital	43	43	1	2.33	1.13	4.16	0.11	23.17	Average
	Bakersfield Memorial Hospital	90	81	2	2.47	1.59	3.15	0.38	11.37	Average
	Clovis Community Medical Center	97	84	1	1.19	1.70	1.42	0.04	7.89	Average
	Community Regional Medical Center - Fresno	79	68	2	2.94	4.13	1.44	0.17	5.20	Average
	Dameron Hospital	71	63	6	9.52	5.33	3.62	1.33	7.87	Average
	Doctors Medical Center	229	206	6	2.91	2.49	2.37	0.87	5.16	Average
	Fresno Heart and Surgical Hospital	272	217	6	2.76	1.94	2.88	1.06	6.28	Average
	Kaweah Health Medical Center	248	229	6	2.62	2.21	2.39	0.88	5.21	Average
	Marian Regional Medical Center	108	98	5	5.10	2.22	4.65	1.51	10.85	Average
	Memorial Medical Center - Modesto	163	143	1	0.70	2.17	0.65	0.02	3.64	Average
	Saint Agnes Medical Center	250	197	12	6.09	2.39	5.16	2.67	9.02	**Worse**
	St. Joseph's Medical Center of Stockton	282	235	7	2.98	2.63	2.30	0.92	4.73	Average
San Fernando Valley, Antelope Valley, Ventura & Santa Barbara	Adventist Health Glendale	106	92	3	3.26	1.28	5.14	1.06	15.02	Average
	Antelope Valley Hospital	51	49	1	2.04	2.60	1.59	0.04	8.85	Average
	Community Memorial Hospital - San Buenaventura	126	105	3	2.86	1.95	2.97	0.61	8.67	Average
	French Hospital Medical Center	99	78	0	0.00	1.22	0.00	0.00	7.84	Average
	Glendale Memorial Hospital and Health Center	70	59	0	0.00	1.26	0.00	0.00	10.07	Average
	Los Robles Hospital and Medical Center	79	66	1	1.52	1.88	1.63	0.04	9.08	Average
	Northridge Hospital Medical Center	59	57	0	0.00	1.21	0.00	0.00	10.79	Average
	Providence Cedars-Sinai Tarzana Medical Center	82	72	1	1.39	1.77	1.59	0.04	8.87	Average
	Providence Holy Cross Medical Center	51	47	3	6.38	1.57	8.25	1.70	24.11	Average
	Providence Saint Joseph Medical Center	44	40	2	5.00	0.95	10.62	1.29	38.38	Average
	Santa Barbara Cottage Hospital	105	91	0	0.00	1.77	0.00	0.00	4.63	Average
	St. John's Regional Medical Center	50	47	3	6.38	2.79	4.64	0.96	13.55	Average
	Valley Presbyterian Hospital	26	26	1	3.85	4.59	1.70	0.04	9.45	Average
	West Hills Hospital and Medical Center	56	47	4	8.51	2.65	6.51	1.77	16.67	Average

Appendix A-2: Hospital Risk-Adjusted Isolated CABG Operative Mortality Results by Region, 2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Greater Los Angeles	Adventist Health White Memorial	34	31	0	0.00	0.80	0.00	0.00	29.93	Average
	Adventist Health White Memorial Montebello	3	3	2	66.67	1.65	81.61	9.88	100.00	**Worse**
	California Hospital Medical Center - Los Angeles	52	48	1	2.08	1.68	2.51	0.06	13.96	Average
	Cedars Sinai Medical Center	256	203	2	0.99	1.42	1.41	0.17	5.08	Average
	Centinela Hospital Medical Center	41	39	4	10.26	2.90	7.17	1.95	18.35	Average
	Emanate Health Inter-Community Hospital	140	134	7	5.22	2.06	5.12	2.06	10.55	**Worse**
	Garfield Medical Center	166	144	4	2.78	2.41	2.33	0.64	5.97	Average
	Henry Mayo Newhall Hospital	38	32	1	3.13	2.97	2.13	0.05	11.87	Average
	Hollywood Presbyterian Medical Center	30	28	0	0.00	1.68	0.00	0.00	15.84	Average
	Huntington Hospital	124	92	2	2.17	1.60	2.75	0.33	9.94	Average
	Kaiser Foundation Hospital - Los Angeles	757	619	6	0.97	1.64	1.20	0.44	2.60	Average
	Keck Hospital of USC	156	75	3	4.00	1.98	4.09	0.84	11.94	Average
	Lakewood Regional Medical Center	99	95	1	1.05	2.17	0.98	0.02	5.46	Average
	Los Angeles County + USC Medical Center	41	37	0	0.00	0.78	0.00	0.00	26.04	Average
	Los Angeles County/Harbor - UCLA Medical Center	57	45	0	0.00	1.06	0.00	0.00	15.61	Average
	Memorialcare Long Beach Medical Center	155	122	4	3.28	3.06	2.17	0.59	5.56	Average
	PIH Health Good Samaritan Hospital	75	56	3	5.36	3.62	2.99	0.62	8.75	Average
	PIH Health Hospital - Downey	17	17	0	0.00	1.04	0.00	0.00	42.22	Average
	PIH Health Hospital - Whittier	94	72	3	4.17	3.54	2.38	0.49	6.96	Average
	Providence Little Company of Mary Medical Center - Torrance	91	80	1	1.25	1.56	1.63	0.04	9.06	Average
	Providence St. John's Health Center	31	30	0	0.00	1.23	0.00	0.00	20.22	Average
	Ronald Reagan UCLA Medical Center	247	166	0	0.00	1.28	0.00	0.00	3.51	Average
	St. Francis Medical Center	25	23	1	4.35	1.44	6.11	0.15	34.04	Average
	St. Mary Medical Center - Long Beach	55	54	3	5.56	1.94	5.80	1.20	16.94	Average
	Torrance Memorial Medical Center	73	61	2	3.28	1.58	4.21	0.51	15.20	Average
	USC Arcadia Hospital	87	75	1	1.33	3.19	0.85	0.02	4.71	Average
Inland Empire, Riverside & San Bernardino	Arrowhead Regional Medical Center	17	16	0	0.00	1.31	0.00	0.00	35.53	Average
	Desert Regional Medical Center	76	73	1	1.37	2.50	1.11	0.03	6.17	Average
	Eisenhower Medical Center	165	139	2	1.44	1.86	1.57	0.19	5.67	Average
	Kaiser Foundation Hospital - Fontana	345	288	3	1.04	1.57	1.35	0.28	3.93	Average
	Loma Linda University Medical Center	242	198	4	2.02	2.31	1.77	0.48	4.54	Average
	Loma Linda University Medical Center - Murrieta	104	83	3	3.61	1.35	5.43	1.12	15.87	Average
	Pomona Valley Hospital Medical Center	137	128	3	2.34	2.94	1.61	0.33	4.71	Average
	Riverside Community Hospital	213	149	2	1.34	1.38	1.97	0.24	7.12	Average
	San Antonio Regional Hospital	194	159	1	0.63	1.73	0.74	0.02	4.10	Average
	St. Bernardine Medical Center	231	211	7	3.32	2.67	2.52	1.01	5.19	Average
	St. Mary Medical Center - Apple Valley	62	59	1	1.69	1.65	2.08	0.05	11.58	Average
	Temecula Valley Hospital	195	170	3	1.76	1.28	2.79	0.57	8.15	Average

Appendix A-2: Hospital Risk-Adjusted Isolated CABG Operative Mortality Results by Region, 2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Orange County	AHMC Anaheim Regional Medical Center	131	105	3	2.86	2.66	2.18	0.45	6.36	Average
	Fountain Valley Regional Hospital and Medical Center - Euclid	110	106	3	2.83	2.64	2.17	0.45	6.33	Average
	Hoag Memorial Hospital Presbyterian	253	184	1	0.54	1.27	0.86	0.02	4.81	Average
	Memorialcare Orange Coast Medical Center	142	117	0	0.00	2.26	0.00	0.00	2.82	Average
	Memorialcare Saddleback Medical Center	70	65	1	1.54	2.00	1.56	0.04	8.68	Average
	Orange County Global Medical Center	91	78	0	0.00	1.45	0.00	0.00	6.62	Average
	Providence Mission Hospital	117	91	1	1.10	2.43	0.91	0.02	5.09	Average
	Providence St. Joseph Hospital	173	147	2	1.36	2.04	1.35	0.16	4.88	Average
	Providence St. Jude Medical Center	98	73	1	1.37	2.10	1.32	0.03	7.35	Average
	UC Irvine Medical Center	160	122	2	1.64	2.41	1.38	0.17	4.98	Average
	West Anaheim Medical Center	49	47	3	6.38	3.40	3.80	0.78	11.10	Average
Greater San Diego	Grossmont Hospital	131	109	2	1.83	2.69	1.38	0.17	4.99	Average
	Palomar Medical Center	66	60	3	5.00	1.88	5.39	1.11	15.76	Average
	Scripps Memorial Hospital - La Jolla	440	346	5	1.45	1.88	1.55	0.50	3.63	Average
	Scripps Mercy Hospital	91	77	0	0.00	1.59	0.00	0.00	6.12	Average
	Sharp Chula Vista Medical Center	174	158	4	2.53	2.80	1.83	0.50	4.68	Average
	Sharp Memorial Hospital	156	101	1	0.99	1.27	1.58	0.04	8.78	Average
	Tri-City Medical Center	45	34	1	2.94	2.78	2.14	0.05	11.92	Average
	UC San Diego Health La Jolla - Jacobs Medical Center & Sulpizio Cardiovascular Center	259	191	3	1.57	1.85	1.72	0.35	5.02	Average

Appendix B-1 : Logistic Regression Risk Model for CABG+Valve Operative Mortality, 2022-2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Intercept		-7.52				<.0001
Surgery Type	IsoAVRCAB	Reference				
	IsoMVRepairCAB	0.52	1.68	0.98	2.86	0.0586
	IsoMVRCAB	**0.74**	**2.10**	**1.43**	**3.08**	**0.0001**
	IsoAVMVCAB	**1.00**	**2.71**	**1.55**	**4.74**	**0.0005**
Age		**0.03**	**1.03**	**1.01**	**1.05**	**0.0038**
Gender	Male	Reference				
	Female	**0.51**	**1.66**	**1.17**	**2.34**	**0.0042**
Race	White	Reference				
	Others	0.24	1.27	0.91	1.78	0.1613
Body Mass Index	Normal 18.5 - < 30.0	Reference				
	< 18.5	0.85	2.34	0.89	6.17	0.0862
	30.0 - 40.0	0.30	1.35	0.95	1.92	0.0937
	> 40.0	**0.80**	**2.23**	**1.06**	**4.66**	**0.0336**
Status of Procedure	Elective	Reference				
	Urgent	0.33	1.39	0.97	2.00	0.0750
	Emergent	**1.68**	**5.38**	**2.20**	**13.15**	**0.0002**
Hypertension	No	Reference				
	Yes	0.58	1.79	0.92	3.47	0.0858
Cerebrovascular Disease	No	Reference				
	Yes	0.29	1.34	0.95	1.90	0.0992
Pneumonia	No	Reference				
	Yes	0.08	1.09	0.61	1.94	0.7792
Chronic Lung Disease	None/Mild/Moderate	Reference				
	Severe	0.06	1.06	0.64	1.74	0.8250
Heart Failure	No	Reference				
	Yes	0.21	1.23	0.85	1.78	0.2709
Ejection Fraction (EF)	EF >=50%	Reference				
	EF less than 20%	**1.47**	**4.35**	**1.34**	**14.15**	**0.0146**
	EF 20- <30%	**0.78**	**2.19**	**1.23**	**3.90**	**0.0077**
	EF 30- <40%	**0.62**	**1.85**	**1.17**	**2.92**	**0.0081**
	EF 40- <50%	0.30	1.35	0.85	2.15	0.2039
Cardiogenic Shock	No	Reference				
	Yes	0.24	1.27	0.53	3.07	0.5940
Arrhythmia	No	Reference				
	Yes	0.18	1.20	0.85	1.69	0.2964
Left Main Disease	No	Reference				
	Yes	0.34	1.408	0.984	2.015	0.0614
Diabetes	No Diabetes/Non-Insulin	Reference				
	Insulin	0.33	1.40	0.95	2.06	0.0938
MELD Score	<10	Reference				
	>=10	**0.63**	**1.88**	**1.32**	**2.67**	**0.0004**

Appendix B-1 : Logistic Regression Risk Model for CABG+Valve Operative Mortality, 2022-2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Dialysis	No	Reference				
	Yes	**0.63**	**1.88**	**1.17**	**3.03**	**0.0097**
Peripheral Arterial Disease	No	Reference				
	Yes	0.39	1.47	0.98	2.21	0.0614
Immunocompromise	No	Reference				
	Yes	0.23	1.26	0.67	2.38	0.4672
Prior Valve	No	Reference				
	Yes	0.58	1.79	0.92	3.48	0.0867

Bolded text indicates statistically significant (p≤0.05).

C Statistic =0.804

Hosmer-Lemeshow test: p-value=0.5419

Appendix B-2: Hospital Risk-Adjusted CABG + Valve Operative Mortality Results by Region, 2022-2023

	Hospital	All CABG Cases	CABG + Valve Cases	CABG + Valve Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
State		**31,086**	**3,422**	**183**	**5.35**					
Sacramento Valley & Northern California Region	Adventist Health and Rideout	111	2	1	50.00	22.05	12.13	0.31	67.57	Average
	Enloe Medical Center - Esplanade	229	23	1	4.35	3.90	5.97	0.15	33.24	Average
	Mercy General Hospital	1397	192	7	3.65	5.35	3.64	1.47	7.51	Average
	Mercy Medical Center - Redding	158	17	0	0.00	4.09	0.00	0.00	28.39	Average
	Mercy San Juan Medical Center	246	47	3	6.38	7.96	4.29	0.88	12.53	Average
	Providence St. Joseph Hospital - Eureka	43	6	0	0.00	13.82	0.00	0.00	23.79	Average
	Shasta Regional Medical Center	173	23	1	4.35	5.40	4.31	0.11	23.99	Average
	Sutter Medical Center - Sacramento	959	144	5	3.47	4.94	3.76	1.22	8.77	Average
	UC Davis Medical Center	192	17	1	5.88	7.00	4.49	0.11	25.04	Average
San Francisco Bay Area & San Jose	AHMC Seton Medical Center	53	.	.	.	.	.	.	.	Not Appplicable
	Adventist Health St. Helena	180	23	2	8.70	6.78	6.85	0.83	24.76	Average
	Alta Bates Summit Medical Center	288	36	8	22.22	12.89	9.22	3.98	18.17	Average
	California Pacific Medical Center - Van Ness Campus	196	25	0	0.00	5.80	0.00	0.00	13.60	Average
	Community Hospital of the Monterey Peninsula	179	33	0	0.00	4.24	0.00	0.00	14.11	Average
	Dominican Hospital	152	24	4	16.67	8.82	10.10	2.75	25.87	Average
	El Camino Hospital	231	20	1	5.00	4.46	6.00	0.15	33.44	Average
	Good Samaritan Hospital - San Jose	125	15	1	6.67	4.11	8.67	0.22	48.30	Average
	John Muir Medical Center - Concord Campus	561	56	3	5.36	4.73	6.06	1.25	17.70	Average
	Kaiser Foundation Hospital - San Francisco	1225	94	1	1.06	2.69	2.12	0.05	11.79	Average
	Kaiser Foundation Hospital - Santa Clara	1107	139	2	1.44	3.66	2.10	0.25	7.59	Average
	Marinhealth Medical Center	69	12	0	0.00	5.02	0.00	0.00	32.76	Average
	Mills-Peninsula Medical Center	139	18	0	0.00	6.36	0.00	0.00	17.24	Average
	North Bay Medical Center	114	5	0	0.00	2.65	0.00	0.00	100.00	Average
	O'Connor Hospital	153	7	1	14.29	3.32	23.04	0.58	100.00	Average
	Providence Queen of the Valley Medical Center	97	7	2	28.57	3.05	50.05	6.06	100.00	**Worse**
	Providence Santa Rosa Memorial Hospital - Montgomery	134	20	2	10.00	5.70	9.38	1.14	33.88	Average
	Regional Medical Center of San Jose	48	.	.	.	.	.	.	.	Not Appplicable
	Salinas Valley Memorial Hospital	250	12	0	0.00	2.83	0.00	0.00	58.13	Average
	San Ramon Regional Medical Center	36	1	0	0.00	0.87	0.00	0.00	100.00	Average
	Santa Clara Valley Medical Center	120	19	1	5.26	5.26	5.35	0.14	29.81	Average
	Sequoia Hospital	190	37	3	8.11	5.72	7.59	1.56	22.17	Average
	Stanford Health Care	592	88	7	7.95	6.02	7.07	2.84	14.57	Average
	Stanford Health Care Tri-Valley	178	26	2	7.69	4.17	9.86	1.19	35.63	Average
	UC San Francisco Medical Center	346	37	1	2.70	4.95	2.92	0.07	16.28	Average
	Washington Hospital - Fremont	164	8	0	0.00	2.14	0.00	0.00	100.00	Average

Appendix B-2: Hospital Risk-Adjusted CABG + Valve Operative Mortality Results by Region, 2022-2023

	Hospital	All CABG Cases	CABG + Valve Cases	CABG + Valve Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Central California	Adventist Health Bakersfield	103	8	1	12.50	5.19	12.89	0.33	71.81	Average
	Bakersfield Heart Hospital	89	1	1	100.00	5.48	97.55	2.47	100.00	Average
	Bakersfield Memorial Hospital	153	7	0	0.00	4.45	0.00	0.00	63.34	Average
	Clovis Community Medical Center	97	11	1	9.09	3.50	13.89	0.35	77.39	Average
	Community Regional Medical Center - Fresno	105	12	1	8.33	15.13	2.95	0.07	16.41	Average
	Dameron Hospital	116	8	0	0.00	2.52	0.00	0.00	97.67	Average
	Doctors Medical Center	481	36	3	8.33	5.12	8.70	1.79	25.43	Average
	Fresno Heart and Surgical Hospital	742	82	2	2.44	6.89	1.89	0.23	6.84	Average
	Kaweah Health Medical Center	440	33	2	6.06	5.21	6.22	0.75	22.46	Average
	Marian Regional Medical Center	201	20	1	5.00	4.02	6.65	0.17	37.07	Average
	Memorial Medical Center - Modesto	283	31	2	6.45	4.09	8.43	1.02	30.47	Average
	Saint Agnes Medical Center	501	72	8	11.11	6.30	9.43	4.07	18.59	Average
	St. Joseph's Medical Center of Stockton	535	52	7	13.46	5.69	12.65	5.08	26.05	Average
San Fernando Valley, Antelope Valley, Ventura & Santa Barbara	Adventist Health Glendale	187	16	0	0.00	4.83	0.00	0.00	25.55	Average
	Antelope Valley Hospital	89	3	1	33.33	4.84	36.85		100.00	Average
	Community Memorial Hospital - San Buenaventura	214	23	1	4.35	5.09	4.57	0.12	25.46	Average
	French Hospital Medical Center	168	34	1	2.94	4.24	3.71	0.09	20.69	Average
	Glendale Memorial Hospital and Health Center	147	6	0	0.00	4.37	0.00	0.00	75.15	Average
	Los Robles Hospital and Medical Center	158	18	1	5.56	6.02	4.93	0.12	27.48	Average
	Northridge Hospital Medical Center	142	9	1	11.11	3.14	18.89	0.48	100.00	Average
	Providence Cedars-Sinai Tarzana Medical Center	134	12	0	0.00	3.07	0.00	0.00	53.52	Average
	Providence Holy Cross Medical Center	108	6	0	0.00	3.32	0.00	0.00	99.01	Average
	Providence Saint Joseph Medical Center	93	8	0	0.00	2.74	0.00	0.00	89.85	Average
	Santa Barbara Cottage Hospital	193	24	0	0.00	3.82	0.00	0.00	21.51	Average
	St. John's Regional Medical Center	98	4	0	0.00	2.79	0.00	0.00	100.00	Average
	Valley Presbyterian Hospital	73	2	0	0.00	1.73	0.00	0.00	100.00	Average
	West Hills Hospital and Medical Center	116	15	2	13.33	5.78	12.34	1.49	44.57	Average

Appendix B-2: Hospital Risk-Adjusted CABG + Valve Operative Mortality Results by Region, 2022-2023

	Hospital	All CABG Cases	CABG + Valve Cases	CABG + Valve Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Greater Los Angeles	Adventist Health White Memorial	79	5	1	20.00	9.07	11.80	0.30	65.73	Average
	Adventist Health White Memorial Montebello	14	1	0	0.00	5.28	0.00	0.00	100.00	Average
	California Hospital Medical Center - Los Angeles	107	8	0	0.00	3.85	0.00	0.00	64.09	Average
	Cedars Sinai Medical Center	550	60	1	1.67	4.70	1.90	0.05	10.57	Average
	Centinela Hospital Medical Center	81	2	0	0.00	26.24	0.00	0.00	37.59	Average
	Emanate Health Inter-Community Hospital	274	15	2	13.33	6.52	10.93	1.32	39.50	Average
	Garfield Medical Center	325	18	1	5.56	6.35	4.68	0.12	26.06	Average
	Henry Mayo Newhall Hospital	80	5	1	20.00	7.96	13.44	0.34	74.86	Average
	Hollywood Presbyterian Medical Center	49	1	0	0.00	5.64	0.00	0.00	100.00	Average
	Huntington Hospital	233	29	1	3.45	4.06	4.54	0.11	25.30	Average
	Kaiser Foundation Hospital - Los Angeles	1550	232	7	3.02	4.61	3.50	1.41	7.21	Average
	Keck Hospital of USC	300	65	6	9.23	9.83	5.02	1.84	10.93	Average
	Lakewood Regional Medical Center	189	10	0	0.00	4.07	0.00	0.00	48.51	Average
	Los Angeles County + USC Medical Center	89	4	0	0.00	4.07	0.00	0.00	100.00	Average
	Los Angeles County/Harbor - UCLA Medical Center	115	8	0	0.00	3.54	0.00	0.00	69.71	Average
	Memorialcare Long Beach Medical Center	298	37	2	5.41	7.80	3.70	0.45	13.38	Average
	PIH Health Good Samaritan Hospital	174	18	2	11.11	5.40	11.00	1.33	39.73	Average
	PIH Health Hospital - Downey	35	1	0	0.00	0.95	0.00	0.00	100.00	Average
	PIH Health Hospital - Whittier	200	44	5	11.36	11.87	5.12	1.66	11.95	Average
	Providence Little Company of Mary Medical Center - Torrance	152	14	0	0.00	4.79	0.00	0.00	29.42	Average
	Providence St. John's Health Center	66	4	0	0.00	2.27	0.00	0.00	100.00	Average
	Ronald Reagan UCLA Medical Center	465	71	1	1.41	5.52	1.36	0.03	7.60	Average
	St. Francis Medical Center	42	2	0	0.00	2.52	0.00	0.00	100.00	Average
	St. Mary Medical Center - Long Beach	99	4	0	0.00	8.57	0.00	0.00	57.57	Average
	Torrance Memorial Medical Center	133	14	3	21.43	5.96	19.23	3.97	56.20	Average
	USC Arcadia Hospital	112	8	1	12.50	3.07	21.77	0.55	100.00	Average
Inland Empire, Riverside & San Bernardino	Arrowhead Regional Medical Center	48	3	0	0.00	1.39	0.00	0.00	100.00	Average
	Desert Regional Medical Center	173	12	1	8.33	5.43	8.20	0.21	45.69	Average
	Eisenhower Medical Center	303	31	0	0.00	4.27	0.00	0.00	14.92	Average
	Kaiser Foundation Hospital - Fontana	672	102	4	3.92	3.99	5.26	1.43	13.46	Average
	Loma Linda University Medical Center	482	59	3	5.08	6.54	4.15	0.86	12.14	Average
	Loma Linda University Medical Center - Murrieta	179	19	1	5.26	3.34	8.42	0.21	46.89	Average
	Pomona Valley Hospital Medical Center	258	14	2	14.29	3.11	24.55	2.97	88.68	Average
	Riverside Community Hospital	426	36	1	2.78	5.45	2.72	0.07	15.17	Average
	San Antonio Regional Hospital	352	27	1	3.70	7.72	2.56	0.06	14.29	Average
	St. Bernardine Medical Center	446	48	3	6.25	4.01	8.34	1.72	24.38	Average
	St. Mary Medical Center - Apple Valley	132	8	0	0.00	3.95	0.00	0.00	62.47	Average
	Temecula Valley Hospital	343	22	0	0.00	3.92	0.00	0.00	22.89	Average

Appendix B-2: Hospital Risk-Adjusted CABG + Valve Operative Mortality Results by Region, 2022-2023

	Hospital	All CABG Cases	CABG + Valve Cases	CABG + Valve Deaths	Observed Mortality Rate (%)	Expected Mortality Rate (%)	Risk-Adjusted Mortality Rate (%, RAMR)	95% CI RAMR		Performance Rating
								Lower Limit	Upper Limit	
Orange County	AHMC Anaheim Regional Medical Center	242	25	0	0.00	4.95	0.00	0.00	15.95	Average
	Fountain Valley Regional Hospital and Medical Center - Euclid	199	9	1	11.11	3.78	15.72	0.40	87.57	Average
	Hoag Memorial Hospital Presbyterian	530	59	2	3.39	5.35	3.39	0.41	12.25	Average
	Memorialcare Orange Coast Medical Center	269	35	1	2.86	4.75	3.22	0.08	17.92	Average
	Memorialcare Saddleback Medical Center	129	9	0	0.00	2.40	0.00	0.00	91.48	Average
	Orange County Global Medical Center	164	14	0	0.00	8.64	0.00	0.00	16.30	Average
	Providence Mission Hospital	242	14	1	7.14	2.62	14.61	0.37	81.38	Average
	Providence St. Joseph Hospital	298	25	3	12.00	6.26	10.25	2.11	29.96	Average
	Providence St. Jude Medical Center	223	30	1	3.33	3.44	5.18	0.13	28.87	Average
	UC Irvine Medical Center	291	30	3	10.00	8.63	6.20	1.28	18.12	Average
	West Anaheim Medical Center	82	3	0	0.00	3.09	0.00	0.00	100.00	Average
Greater San Diego	Grossmont Hospital	231	29	3	10.34	7.25	7.63	1.57	22.31	Average
	Palomar Medical Center	130	10	1	10.00	5.14	10.41	0.26	57.98	Average
	Scripps Memorial Hospital - La Jolla	866	121	7	5.79	4.45	6.96	2.80	14.34	Average
	Scripps Mercy Hospital	183	16	1	6.25	6.52	5.12	0.13	28.55	Average
	Sharp Chula Vista Medical Center	338	22	2	9.09	4.71	10.33	1.25	37.32	Average
	Sharp Memorial Hospital	285	56	5	8.93	4.99	9.57	3.11	22.34	Average
	Tri-City Medical Center	88	8	1	12.50	7.43	8.99	0.23	50.11	Average
	UC San Diego Health La Jolla - Jacobs Medical Center & Sulpizio Cardiovascular Center	470	60	5	8.33	3.85	11.56	3.75	26.98	Average

Appendix C-1: Logistic Regression Risk Model for Post-Operative Stroke after Isolated CABG Surgery, 2022-2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Intercept		-5.88				<.0001
Age (Years)	Age <55	Reference				
	55 <= Age <65	-0.25	0.78	0.55	1.11	0.1607
	65<=Age <75	-0.18	0.83	0.59	1.17	0.2922
	Age >=75	-0.22	0.81	0.55	1.18	0.2686
Gender	Male	Reference				
	Female	**0.29**	**1.34**	**1.05**	**1.71**	**0.0188**
Race	White	Reference				
	Asian	**0.36**	**1.43**	**1.08**	**1.90**	**0.0133**
	Black	**0.52**	**1.68**	**1.07**	**2.67**	**0.0259**
	Hispanic	-0.04	0.96	0.73	1.26	0.7673
	American Indian	0.44	1.56	0.38	6.48	0.5402
	Pacific Islander	0.14	1.15	0.42	3.15	0.7930
Body Mass Index	Normal 18.5 - < 30.0	Reference				
	< 18.5	0.45	1.57	0.63	3.91	0.3379
	30.0 - 40.0	-0.20	0.82	0.64	1.05	0.1127
	> 40.0	0.09	1.10	0.65	1.86	0.7305
Status of Procedure	Elective	Reference				
	Urgent	**0.57**	**1.77**	**1.32**	**2.37**	**0.0002**
	Emergent	**0.85**	**2.33**	**1.20**	**4.55**	**0.0128**
Hypertension	No	Reference				
	Yes	0.11	1.12	0.75	1.68	0.5801
Cerebrovascular Disease	No	Reference				
	Yes	**0.88**	**2.42**	**1.93**	**3.03**	**<.0001**
Pneumonia	No	Reference				
	Yes	0.40	1.49	0.94	2.34	0.0883
Myocardial Infarction (MI)	No MI	Reference				
	< 24 hours	**0.79**	**2.21**	**1.23**	**3.97**	**0.0081**
	1 - 7 days ago	0.14	1.15	0.90	1.47	0.2754
Heart Failure	No	Reference				
	Yes	0.16	1.17	0.90	1.51	0.2406
Ejection Fraction (EF)	EF >=50%	Reference				
	EF less than 20%	0.16	1.17	0.42	3.28	0.7684
	EF 20- <30%	0.09	1.09	0.69	1.74	0.7124
	EF 30- <40%	0.04	1.05	0.73	1.49	0.8063
	EF 40- <50%	0.16	1.18	0.88	1.58	0.2728
Mitral Insufficiency	No	Reference				
	Yes	0.30	1.36	0.98	1.87	0.0641
Number of Diseased Coronary Vessels	None, One, or Two	Reference				
	3 or more	**0.47**	**1.60**	**1.19**	**2.16**	**0.0022**
Infectious Endocarditis	No	Reference				
	Yes	1.40	4.06	0.92	17.84	0.0637
Diabetes	No Diabetes	Reference				
	Non-Insulin	**0.37**	**1.45**	**1.13**	**1.87**	**0.0037**
	Insulin	**0.35**	**1.42**	**1.05**	**1.92**	**0.0227**

Appendix C-1: Logistic Regression Risk Model for Post-operative Stroke after Isolated CABG Surgery, 2022-2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
MELD	<10	Reference				
	>=10	0.24	1.27	0.98	1.65	0.0695
Dialysis	No	Reference				
	Yes	0.20	1.22	0.82	1.80	0.3235
Prior CABG	No	Reference				
	Yes	0.81	2.25	0.97	5.21	0.0593
Previous PCI	No PCI or PCI > 6 hrs	Reference				
	< = 6 hours	0.49	1.63	0.67	3.98	0.2849

Bolded text indicates statistically significant (p≤0.05).

C Statistic =0.711

Hosmer-Lemeshow test: p-value=0.5376

Appendix C-2: Hospital Risk-Adjusted Post-Operative Stroke After Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Post-Op Stroke	Observed Post-Op Stroke Rate (%)	Expected Post-Op Stroke Rate (%)	Risk-Adjusted Post-Op Stroke Rate (%, RASR)	95% CI RASR		Performance Rating
								Lower Limit	Upper Limit	
State		**31,086**	**25,607**	**354**	**1.38**					
Sacramento Valley & Northern California Region	Adventist Health and Rideout	111	98	2	2.04	1.97	1.43	0.17	5.17	Average
	Enloe Medical Center - Esplanade	229	174	5	2.87	1.35	2.94	0.95	6.86	Average
	Mercy General Hospital	1397	1083	14	1.29	1.37	1.31	0.72	2.19	Average
	Mercy Medical Center - Redding	158	140	5	3.57	1.62	3.05	0.99	7.13	Average
	Mercy San Juan Medical Center	246	171	2	1.17	1.42	1.14	0.14	4.11	Average
	Providence St. Joseph Hospital - Eureka	43	34	0	0.00	1.84	0.00	0.00	8.13	Average
	Shasta Regional Medical Center	173	144	1	0.69	1.23	0.78	0.02	4.34	Average
	Sutter Medical Center - Sacramento	959	744	10	1.34	1.20	1.55	0.75	2.86	Average
	UC Davis Medical Center	192	170	2	1.18	1.10	1.48	0.18	5.34	Average
San Francisco Bay Area & San Jose	AHMC Seton Medical Center	53	53	3	5.66	2.64	2.96	0.61	8.66	Average
	Adventist Health St. Helena	180	107	2	1.87	1.51	1.71	0.21	6.18	Average
	Alta Bates Summit Medical Center	288	244	7	2.87	1.78	2.23	0.89	4.59	Average
	California Pacific Medical Center - Van Ness Campus	196	152	1	0.66	1.29	0.70	0.02	3.92	Average
	Community Hospital of the Monterey Peninsula	179	128	1	0.78	1.05	1.03	0.03	5.73	Average
	Dominican Hospital	152	99	2	2.02	1.09	2.57	0.31	9.29	Average
	El Camino Hospital	231	193	0	0.00	1.18	0.00	0.00	2.25	Average
	Good Samaritan Hospital - San Jose	125	97	8	8.25	1.45	7.85	3.39	15.47	**Worse**
	John Muir Medical Center - Concord Campus	561	469	3	0.64	1.44	0.61	0.13	1.79	Average
	Kaiser Foundation Hospital - San Francisco	1225	1075	9	0.84	1.15	1.01	0.46	1.91	Average
	Kaiser Foundation Hospital - Santa Clara	1107	932	15	1.61	1.32	1.68	0.94	2.77	Average
	Marinhealth Medical Center	69	53	2	3.77	1.05	4.97	0.60	17.97	Average
	Mills-Peninsula Medical Center	139	117	2	1.71	1.55	1.53	0.19	5.52	Average
	North Bay Medical Center	114	105	1	0.95	1.50	0.88	0.02	4.91	Average
	O'Connor Hospital	153	140	1	0.71	1.51	0.66	0.02	3.65	Average
	Providence Queen of the Valley Medical Center	97	89	1	1.12	1.30	1.19	0.03	6.65	Average
	Providence Santa Rosa Memorial Hospital - Montgomery	134	108	1	0.93	1.26	1.01	0.03	5.65	Average
	Regional Medical Center of San Jose	48	47	3	6.38	1.88	4.70	0.97	13.74	Average
	Salinas Valley Memorial Hospital	250	236	9	3.81	1.65	3.20	1.46	6.08	**Worse**
	San Ramon Regional Medical Center	36	34	0	0.00	1.27	0.00	0.00	11.78	Average
	Santa Clara Valley Medical Center	120	88	1	1.14	1.57	1.00	0.03	5.58	Average
	Sequoia Hospital	190	121	3	2.48	1.25	2.73	0.56	7.98	Average
	Stanford Health Care	592	422	12	2.84	1.27	3.10	1.60	5.42	**Worse**
	Stanford Health Care Tri-Valley	178	130	1	0.77	1.33	0.80	0.02	4.45	Average
	UC San Francisco Medical Center	346	284	5	1.76	1.29	1.88	0.61	4.39	Average
	Washington Hospital - Fremont	164	147	0	0.00	1.51	0.00	0.00	2.30	Average

Appendix C-2: Hospital Risk-Adjusted Post-Operative Stroke After Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Post-Op Stroke	Observed Post-Op Stroke Rate (%)	Expected Post-Op Stroke Rate (%)	Risk-Adjusted Post-Op Stroke Rate (%, RASR)	95% CI RASR		Performance Rating
								Lower Limit	Upper Limit	
Central California	Adventist Health Bakersfield	103	94	0	0.00	1.66	0.00	0.00	3.26	Average
	Bakersfield Heart Hospital	89	86	1	1.16	0.90	1.78	0.05	9.91	Average
	Bakersfield Memorial Hospital	153	138	4	2.90	1.10	3.66	1.00	9.36	Average
	Clovis Community Medical Center	97	84	0	0.00	1.04	0.00	0.00	5.85	Average
	Community Regional Medical Center - Fresno	105	91	1	1.10	2.10	0.72	0.02	4.03	Average
	Dameron Hospital	116	104	1	0.96	1.51	0.88	0.02	4.91	Average
	Doctors Medical Center	481	414	9	2.17	1.61	1.87	0.86	3.55	Average
	Fresno Heart and Surgical Hospital	742	613	7	1.14	1.41	1.12	0.45	2.31	Average
	Kaweah Health Medical Center	440	398	2	0.50	1.62	0.43	0.05	1.55	Average
	Marian Regional Medical Center	201	180	2	1.11	1.39	1.10	0.13	3.99	Average
	Memorial Medical Center - Modesto	283	234	3	1.28	1.45	1.22	0.25	3.56	Average
	Saint Agnes Medical Center	501	408	2	0.49	1.31	0.52	0.06	1.88	Average
	St. Joseph's Medical Center of Stockton	535	460	2	0.43	1.63	0.37	0.04	1.33	**Better**
San Fernando Valley, Antelope Valley, Ventura & Santa Barbara	Adventist Health Glendale	187	166	1	0.60	1.13	0.74	0.02	4.11	Average
	Antelope Valley Hospital	89	86	2	2.33	1.68	1.92	0.23	6.93	Average
	Community Memorial Hospital - San Buenaventura	214	179	6	3.35	1.27	3.64	1.34	7.93	Average
	French Hospital Medical Center	168	125	1	0.80	1.02	1.08	0.03	6.03	Average
	Glendale Memorial Hospital and Health Center	147	132	5	3.79	1.33	3.94	1.28	9.20	Average
	Los Robles Hospital and Medical Center	158	131	5	3.82	1.51	3.49	1.13	8.16	Average
	Northridge Hospital Medical Center	142	132	7	5.30	1.62	4.52	1.82	9.31	**Worse**
	Providence Cedars-Sinai Tarzana Medical Center	134	119	2	1.68	1.25	1.85	0.22	6.69	Average
	Providence Holy Cross Medical Center	108	97	4	4.12	1.56	3.65	0.99	9.34	Average
	Providence Saint Joseph Medical Center	93	85	2	2.35	1.05	3.10	0.38	11.21	Average
	Santa Barbara Cottage Hospital	193	159	0	0.00	1.20	0.00	0.00	2.68	Average
	St. John's Regional Medical Center	98	91	1	1.10	1.43	1.06	0.03	5.90	Average
	Valley Presbyterian Hospital	73	71	2	2.82	1.57	2.49	0.30	8.98	Average
	West Hills Hospital and Medical Center	116	95	1	1.05	1.40	1.04	0.03	5.81	Average

Appendix C-2: Hospital Risk-Adjusted Post-Operative Stroke After Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Post-Op Stroke	Observed Post-Op Stroke Rate (%)	Expected Post-Op Stroke Rate (%)	Risk-Adjusted Post-Op Stroke Rate (%, RASR)	95% CI RASR		Performance Rating
								Lower Limit	Upper Limit	
Greater Los Angeles	Adventist Health White Memorial	79	74	1	1.35	1.06	1.77	0.04	9.85	Average
	Adventist Health White Memorial Montebello	14	13	0	0.00	1.05	0.00	0.00	37.42	Average
	California Hospital Medical Center - Los Angeles	107	94	1	1.06	1.62	0.91	0.02	5.05	Average
	Cedars Sinai Medical Center	550	433	8	1.85	1.16	2.21	0.95	4.35	Average
	Centinela Hospital Medical Center	81	79	1	1.27	2.56	0.68	0.02	3.82	Average
	Emanate Health Inter-Community Hospital	274	252	5	1.98	1.44	1.91	0.62	4.45	Average
	Garfield Medical Center	325	290	1	0.34	1.35	0.35	0.01	1.97	Average
	Henry Mayo Newhall Hospital	80	69	1	1.45	1.58	1.27	0.03	7.05	Average
	Hollywood Presbyterian Medical Center	49	47	0	0.00	2.62	0.00	0.00	4.14	Average
	Huntington Hospital	233	184	1	0.54	1.10	0.68	0.02	3.80	Average
	Kaiser Foundation Hospital - Los Angeles	1550	1285	6	0.47	1.44	0.45	0.16	0.98	**Better**
	Keck Hospital of USC	300	153	5	3.27	1.27	3.56	1.16	8.31	Average
	Lakewood Regional Medical Center	189	179	0	0.00	1.61	0.00	0.00	1.76	Average
	Los Angeles County + USC Medical Center	89	82	0	0.00	1.05	0.00	0.00	5.92	Average
	Los Angeles County/Harbor - UCLA Medical Center	115	97	0	0.00	1.24	0.00	0.00	4.24	Average
	Memorialcare Long Beach Medical Center	298	233	7	3.00	1.55	2.69	1.08	5.53	Average
	PIH Health Good Samaritan Hospital	174	140	4	2.86	1.27	3.10	0.85	7.95	Average
	PIH Health Hospital - Downey	35	34	0	0.00	1.31	0.00	0.00	11.46	Average
	PIH Health Hospital - Whittier	200	141	1	0.71	1.69	0.58	0.01	3.22	Average
	Providence Little Company of Mary Medical Center - Torrance	152	136	2	1.47	1.47	1.38	0.17	4.99	Average
	Providence St. John's Health Center	66	59	1	1.69	1.28	1.83	0.05	10.20	Average
	Ronald Reagan UCLA Medical Center	465	317	4	1.26	1.20	1.46	0.40	3.73	Average
	St. Francis Medical Center	42	40	0	0.00	1.38	0.00	0.00	9.24	Average
	St. Mary Medical Center - Long Beach	99	95	2	2.11	1.65	1.77	0.21	6.38	Average
	Torrance Memorial Medical Center	133	113	3	2.65	1.23	2.98	0.61	8.71	Average
	USC Arcadia Hospital	112	100	4	4.00	1.64	3.38	0.92	8.65	Average

Appendix C-2: Hospital Risk-Adjusted Post-Operative Stroke After Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases	Isolated CABG Post-Op Stroke	Observed Post-Op Stroke Rate (%)	Expected Post-Op Stroke Rate (%)	Risk-Adjusted Post-Op Stroke Rate (%, RASR)	95% CI RASR		Performance Rating
								Lower Limit	Upper Limit	
Inland Empire, Riverside & San Bernardino	Arrowhead Regional Medical Center	48	45	0	0.00	1.36	0.00	0.00	8.34	Average
	Desert Regional Medical Center	173	159	0	0.00	1.18	0.00	0.00	2.72	Average
	Eisenhower Medical Center	303	258	0	0.00	1.03	0.00	0.00	1.92	Average
	Kaiser Foundation Hospital - Fontana	672	560	3	0.54	1.23	0.60	0.12	1.76	Average
	Loma Linda University Medical Center	482	378	4	1.06	1.61	0.91	0.25	2.32	Average
	Loma Linda University Medical Center - Murrieta	179	151	0	0.00	1.18	0.00	0.00	2.87	Average
	Pomona Valley Hospital Medical Center	258	239	4	1.67	1.81	1.28	0.35	3.27	Average
	Riverside Community Hospital	426	307	2	0.65	1.36	0.66	0.08	2.39	Average
	San Antonio Regional Hospital	352	274	3	1.09	1.36	1.11	0.23	3.26	Average
	St. Bernardine Medical Center	446	394	3	0.76	1.24	0.85	0.17	2.48	Average
	St. Mary Medical Center - Apple Valley	132	123	0	0.00	1.56	0.00	0.00	2.65	Average
	Temecula Valley Hospital	343	297	3	1.01	1.26	1.11	0.23	3.25	Average
Orange County	AHMC Anaheim Regional Medical Center	242	204	5	2.45	1.17	2.91	0.94	6.78	Average
	Fountain Valley Regional Hospital and Medical Center - Euclid	199	190	2	1.05	1.73	0.84	0.10	3.04	Average
	Hoag Memorial Hospital Presbyterian	530	396	0	0.00	1.31	0.00	0.00	0.98	**Better**
	Memorialcare Orange Coast Medical Center	269	223	1	0.45	1.41	0.44	0.01	2.46	Average
	Memorialcare Saddleback Medical Center	129	118	4	3.39	1.09	4.31	1.17	11.03	Average
	Orange County Global Medical Center	164	144	1	0.69	1.63	0.59	0.01	3.29	Average
	Providence Mission Hospital	242	198	0	0.00	1.22	0.00	0.00	2.11	Average
	Providence St. Joseph Hospital	298	253	2	0.79	1.25	0.87	0.11	3.15	Average
	Providence St. Jude Medical Center	223	179	1	0.56	1.44	0.54	0.01	2.99	Average
	UC Irvine Medical Center	291	228	15	6.58	1.95	4.67	2.61	7.70	**Worse**
	West Anaheim Medical Center	82	78	3	3.85	2.52	2.11	0.44	6.17	Average
Greater San Diego	Grossmont Hospital	231	192	6	3.13	1.64	2.63	0.97	5.73	Average
	Palomar Medical Center	130	116	2	1.72	1.43	1.67	0.20	6.03	Average
	Scripps Memorial Hospital - La Jolla	866	695	6	0.86	1.20	0.99	0.36	2.16	Average
	Scripps Mercy Hospital	183	156	5	3.21	1.18	3.76	1.22	8.77	Average
	Sharp Chula Vista Medical Center	338	307	6	1.95	1.73	1.57	0.57	3.41	Average
	Sharp Memorial Hospital	285	195	5	2.56	1.15	3.08	1.00	7.18	Average
	Tri-City Medical Center	88	67	1	1.49	1.43	1.44	0.04	8.02	Average
	UC San Diego Health La Jolla - Jacobs Medical Center & Sulpizio Cardiovascular Center	470	344	2	0.58	1.32	0.61	0.07	2.19	Average

Appendix D-1 : Logistic Regression Risk Model for Hospital 30-Day Readmission, 2022−2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Intercept		-4.46				<.0001
Age (Years)		**0.01**	**1.01**	**1.01**	**1.02**	**<.0001**
Gender	Male	Reference				
	Female	**0.38**	**1.46**	**1.32**	**1.62**	**<.0001**
Race	White	Reference				
	Asian	0.09	1.09	0.96	1.24	0.1789
	Black	0.07	1.07	0.87	1.33	0.5209
	Hispanic	-0.02	0.98	0.87	1.10	0.7032
	American Indian	0.24	1.28	0.70	2.32	0.4279
	Pacific Islander	-0.06	0.94	0.60	1.48	0.7795
Body Mass Index	Normal 18.5 - < 30.0	Reference				
	< 18.5	**0.53**	**1.70**	**1.07**	**2.70**	**0.0239**
	30.0 - 40.0	**0.17**	**1.19**	**1.08**	**1.31**	**0.0006**
	> 40.0	**0.57**	**1.76**	**1.43**	**2.17**	**<.0001**
Status of Procedure	Elective	Reference				
	Urgent	**0.22**	**1.25**	**1.12**	**1.40**	**<.0001**
	Emergent	**0.36**	**1.44**	**1.03**	**1.99**	**0.0306**
Hypertension	No	Reference				
	Yes	0.02	1.02	0.86	1.20	0.8367
Cerebrovascular Disease	No	Reference				
	Yes	**0.17**	**1.18**	**1.06**	**1.32**	**0.0025**
Chronic Lung Disease	None/Mild/Moderate	Reference				
	Severe	**0.35**	**1.42**	**1.22**	**1.66**	**<.0001**
Myocardial Infarction (MI)	No MI	Reference				
	< 24 hours	0.08	1.08	0.77	1.52	0.6481
	1 - 7 days ago	**0.13**	**1.14**	**1.03**	**1.27**	**0.0139**
Heart Failure	No	Reference				
	Yes	**0.19**	**1.21**	**1.08**	**1.35**	**0.0007**
Ejection Fraction (EF)	EF >=50%	Reference				
	EF less than 20%	0.08	1.08	0.64	1.84	0.7657
	EF 20- <30%	0.04	1.04	0.84	1.29	0.7254
	EF 30- <40%	**0.16**	**1.18**	**1.01**	**1.37**	**0.0381**
	EF 40- <50%	**0.16**	**1.17**	**1.03**	**1.33**	**0.0138**
Cardiogenic Shock	No	Reference				
	Yes	**0.57**	**1.77**	**1.20**	**2.61**	**0.0041**
Atrial Fibrillation	No	Reference				
	Yes	**0.27**	**1.31**	**1.15**	**1.50**	**<.0001**
Mitral Insufficiency	None, Trival, Mild	Reference				
	Moderate/Severe	0.10	1.10	0.94	1.28	0.2223
Infectious Endocarditis	No	Reference				
	Yes	**1.07**	**2.91**	**1.16**	**7.28**	**0.0225**

Appendix D-1 : Logistic Regression Risk Model for Hospital 30-Day Readmission, 2022−2023

Risk Factor		Coefficient	Odds Ratio (OR)	95% Confidence Limits		p-value
				Lower Level	Upper Level	
Left Main Disease	No	Reference				
	Yes	0.03	1.04	0.94	1.14	0.4763
Number of Diseased Coronary Vessels	None, One, or Two	Reference				
	3 or more	0.07	1.08	0.97	1.20	0.1815
Diabetes	No Diabetes	Reference				
	Non-Insulin	**0.18**	**1.19**	**1.07**	**1.33**	**0.0010**
	Insulin	**0.36**	**1.43**	**1.27**	**1.62**	**<.0001**
MELD Score	<10	Reference				
	>=10	**0.19**	**1.21**	**1.06**	**1.39**	**0.0046**
Creatinine (mg/dL)		**0.56**	**1.75**	**1.47**	**2.08**	**<.0001**
Peripheral Arterial Disease	No	Reference				
	Yes	**0.35**	**1.42**	**1.25**	**1.62**	**<.0001**
Immunocompromise	No	Reference				
	Yes	**0.35**	**1.42**	**1.15**	**1.76**	**0.0013**
Cancer Within 5 years	No	Reference				
	Yes	0.06	1.06	0.86	1.30	0.5731
Prior Valve	No	Reference				
	Yes	0.48	1.62	0.85	3.06	0.1404
Prior Carotid Surgery	No	Reference				
	Yes	0.12	1.13	0.85	1.50	0.4056
Dual Payer Status*	No	Reference				
	Yes	**0.19**	**1.21**	**1.07**	**1.37**	**0.0020**

Bolded text indicates statistically significant (p≤0.05).

C Statistic =0.663

Hosmer-Lemeshow test: p-value=0.3329

Dual Payer Status indicates patients have coverage from both Medicare and Medi-Cal.

Appendix D-2: Hospital Risk-Adjusted CABG 30-Day Readmission after Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases, Discharged Alive	Isolated CABG Readmission	Observed Readmission Rate (%)	Expected Readmission Rate (%)	Risk-Adjusted Readmission Rate (%, RARR)	95% CI RARR		Performance Rating
								Lower Limit	Upper Limit	
State		**31,086**	**20,825**	**2,324**	**11.16**					
Sacramento Valley & Northern California Region	Adventist Health and Rideout	111	83	12	14.46	12.32	13.09	6.77	22.87	Average
	Enloe Medical Center - Esplanade	229	158	15	9.49	11.85	8.94	5.01	14.75	Average
	Mercy General Hospital	1397	966	85	8.80	11.67	8.41	6.72	10.40	**Better**
	Mercy Medical Center - Redding	158	118	23	19.49	12.84	16.93	10.73	25.41	Average
	Mercy San Juan Medical Center	246	159	21	13.21	11.60	12.71	7.87	19.42	Average
	Providence St. Joseph Hospital - Eureka	43	32	4	12.50	11.96	11.66	3.18	29.85	Average
	Shasta Regional Medical Center	173	141	16	11.35	11.39	11.12	6.35	18.06	Average
	Sutter Medical Center - Sacramento	959	626	70	11.18	11.15	11.19	8.72	14.14	Average
	UC Davis Medical Center	192	140	11	7.86	11.11	7.89	3.94	14.12	Average
San Francisco Bay Area & San Jose	AHMC Seton Medical Center	53	37	8	21.62	14.46	16.68	7.20	32.87	Average
	Adventist Health St. Helena	180	81	12	14.81	12.85	12.86	6.65	22.47	Average
	Alta Bates Summit Medical Center	288	182	13	7.14	14.01	5.69	3.03	9.73	**Better**
	California Pacific Medical Center - Van Ness Campus	196	115	12	10.43	10.68	10.90	5.63	19.04	Average
	Community Hospital of the Monterey Peninsula	179	108	19	17.59	9.26	21.20	12.77	33.11	**Worse**
	Dominican Hospital	152	88	11	12.50	10.56	13.22	6.60	23.65	Average
	El Camino Hospital	231	127	8	6.30	11.37	6.18	2.67	12.18	Average
	Good Samaritan Hospital - San Jose	125	71	13	18.31	10.25	19.94	10.62	34.10	Average
	John Muir Medical Center - Concord Campus	561	372	30	8.06	11.85	7.59	5.12	10.84	**Better**
	Kaiser Foundation Hospital - San Francisco	1225	1037	64	6.17	9.38	7.34	5.66	9.38	**Better**
	Kaiser Foundation Hospital - Santa Clara	1107	893	64	7.17	10.30	7.77	5.98	9.92	**Better**
	Marinhealth Medical Center	69	47	3	6.38	9.38	7.59	1.57	22.18	Average
	Mills-Peninsula Medical Center	139	88	5	5.68	10.86	5.84	1.90	13.62	Average
	North Bay Medical Center	114	84	9	10.71	11.19	10.68	4.88	20.28	Average
	O'Connor Hospital	153	105	20	19.05	12.20	17.42	10.64	26.91	Average
	Providence Queen of the Valley Medical Center	97	66	9	13.64	11.75	12.95	5.92	24.59	Average
	Providence Santa Rosa Memorial Hospital - Montgomery	134	99	12	12.12	11.55	11.71	6.05	20.46	Average
	Regional Medical Center of San Jose	48	36	6	16.67	11.99	15.51	5.69	33.77	Average
	Salinas Valley Memorial Hospital	250	216	14	6.48	12.54	5.77	3.15	9.68	**Better**
	San Ramon Regional Medical Center	36	27	1	3.70	9.60	4.31	0.11	23.99	Average
	Santa Clara Valley Medical Center	120	63	2	3.17	10.98	3.23	0.39	11.66	Average
	Sequoia Hospital	190	93	12	12.90	9.99	14.41	7.44	25.17	Average
	Stanford Health Care	592	263	27	10.27	11.59	9.88	6.51	14.38	Average
	Stanford Health Care Tri-Valley	178	86	12	13.95	10.90	14.29	7.38	24.95	Average
	UC San Francisco Medical Center	346	200	33	16.50	10.46	17.60	12.12	24.72	**Worse**
	Washington Hospital - Fremont	164	111	14	12.61	9.93	14.17	7.75	23.78	Average

Appendix D-2: Hospital Risk-Adjusted CABG 30-Day Readmission after Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases, Discharged Alive	Isolated CABG Readmission	Observed Readmission Rate (%)	Expected Readmission Rate (%)	Risk-Adjusted Readmission Rate (%, RARR)	95% CI RARR		Performance Rating
								Lower Limit	Upper Limit	
Central California	Adventist Health Bakersfield	103	69	9	13.04	11.71	12.43	5.69	23.60	Average
	Bakersfield Heart Hospital	89	74	4	5.41	9.22	6.54	1.78	16.76	Average
	Bakersfield Memorial Hospital	153	120	9	7.50	10.00	8.37	3.83	15.89	Average
	Clovis Community Medical Center	97	77	6	7.79	11.08	7.85	2.88	17.09	Average
	Community Regional Medical Center - Fresno	105	76	19	25.00	13.53	20.62	12.42	32.21	**Worse**
	Dameron Hospital	116	74	4	5.41	11.31	5.33	1.45	13.65	Average
	Doctors Medical Center	481	290	54	18.62	12.50	16.62	12.48	21.68	**Worse**
	Fresno Heart and Surgical Hospital	742	552	59	10.69	12.05	9.90	7.54	12.77	Average
	Kaweah Health Medical Center	440	353	49	13.88	12.35	12.54	9.28	16.58	Average
	Marian Regional Medical Center	201	156	22	14.10	11.41	13.79	8.64	20.88	Average
	Memorial Medical Center - Modesto	283	204	29	14.22	11.58	13.70	9.18	19.68	Average
	Saint Agnes Medical Center	501	317	43	13.56	11.41	13.27	9.61	17.88	Average
	St. Joseph's Medical Center of Stockton	535	388	69	17.78	13.41	14.80	11.51	18.73	**Worse**
San Fernando Valley, Antelope Valley, Ventura & Santa Barbara	Adventist Health Glendale	187	97	12	12.37	10.52	13.13	6.78	22.93	Average
	Antelope Valley Hospital	89	80	12	15.00	11.67	14.34	7.41	25.06	Average
	Community Memorial Hospital - San Buenaventura	214	115	7	6.09	10.54	6.44	2.59	13.27	Average
	French Hospital Medical Center	168	111	5	4.50	9.78	5.14	1.67	11.99	Average
	Glendale Memorial Hospital and Health Center	147	106	15	14.15	11.51	13.72	7.68	22.63	Average
	Los Robles Hospital and Medical Center	158	106	20	18.87	11.49	18.32	11.19	28.30	**Worse**
	Northridge Hospital Medical Center	142	100	19	19.00	10.56	20.07	12.08	31.34	**Worse**
	Providence Cedars-Sinai Tarzana Medical Center	134	77	12	15.58	9.47	18.37	9.49	32.09	Average
	Providence Holy Cross Medical Center	108	80	10	12.50	11.96	11.66	5.59	21.45	Average
	Providence Saint Joseph Medical Center	93	75	8	10.67	9.65	12.33	5.32	24.30	Average
	Santa Barbara Cottage Hospital	193	137	13	9.49	10.62	9.97	5.31	17.05	Average
	St. John's Regional Medical Center	98	76	9	11.84	11.53	11.46	5.24	21.75	Average
	Valley Presbyterian Hospital	73	46	8	17.39	11.19	17.34	7.49	34.17	Average
	West Hills Hospital and Medical Center	116	71	11	15.49	10.21	16.94	8.46	30.31	Average

Appendix D-2: Hospital Risk-Adjusted CABG 30-Day Readmission after Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases, Discharged Alive	Isolated CABG Readmission	Observed Readmission Rate (%)	Expected Readmission Rate (%)	Risk-Adjusted Readmission Rate (%, RARR)	95% CI RARR		Performance Rating
								Lower Limit	Upper Limit	
Greater Los Angeles	Adventist Health White Memorial	79	47	3	6.38	9.39	7.58	1.56	22.16	Average
	Adventist Health White Memorial Montebello	14	6	0	0.00	11.02	0.00	0.00	62.27	Average
	California Hospital Medical Center - Los Angeles	107	74	11	14.86	10.75	15.42	7.70	27.60	Average
	Cedars Sinai Medical Center	550	268	35	13.06	9.79	14.89	10.37	20.71	Average
	Centinela Hospital Medical Center	81	57	17	29.82	14.59	22.81	13.29	36.52	**Worse**
	Emanate Health Inter-Community Hospital	274	219	26	11.87	11.01	12.03	7.86	17.63	Average
	Garfield Medical Center	325	142	25	17.61	10.76	18.26	11.82	26.95	**Worse**
	Henry Mayo Newhall Hospital	80	55	7	12.73	10.51	13.51	5.43	27.84	Average
	Hollywood Presbyterian Medical Center	49	28	3	10.71	10.10	11.84	2.44	34.59	Average
	Huntington Hospital	233	129	19	14.73	10.76	15.28	9.20	23.87	Average
	Kaiser Foundation Hospital - Los Angeles	1550	1238	113	9.13	11.03	9.24	7.61	11.11	**Better**
	Keck Hospital of USC	300	54	12	22.22	12.38	20.04	10.35	35.00	Average
	Lakewood Regional Medical Center	189	125	15	12.00	11.58	11.56	6.47	19.07	Average
	Los Angeles County + USC Medical Center	89	48	12	25.00	8.68	32.14	16.61	56.14	**Worse**
	Los Angeles County/Harbor - UCLA Medical Center	115	53	13	24.53	11.06	24.75	13.18	42.33	**Worse**
	Memorialcare Long Beach Medical Center	298	176	24	13.64	12.29	12.38	7.93	18.43	Average
	PIH Health Good Samaritan Hospital	174	84	12	14.29	11.85	13.46	6.95	23.51	Average
	PIH Health Hospital - Downey	35	29	6	20.69	10.06	22.96	8.43	49.97	Average
	PIH Health Hospital - Whittier	200	125	14	11.20	15.25	8.20	4.48	13.75	Average
	Providence Little Company of Mary Medical Center - Torrance	152	109	16	14.68	10.38	15.78	9.02	25.63	Average
	Providence St. John's Health Center	66	50	2	4.00	9.45	4.72	0.57	17.06	Average
	Ronald Reagan UCLA Medical Center	465	203	22	10.84	10.45	11.57	7.25	17.51	Average
	St. Francis Medical Center	42	25	3	12.00	10.11	13.25	2.73	38.72	Average
	St. Mary Medical Center - Long Beach	99	77	17	22.08	12.85	19.17	11.17	30.69	**Worse**
	Torrance Memorial Medical Center	133	88	17	19.32	10.82	19.93	11.61	31.91	**Worse**
	USC Arcadia Hospital	112	88	8	9.09	10.91	9.30	4.02	18.33	Average

Appendix D-2: Hospital Risk-Adjusted CABG 30-Day Readmission after Isolated CABG Results by Region, 2022-2023

Region	Hospital	All CABG Cases	Isolated CABG Cases, Discharged Alive	Isolated CABG Readmission	Observed Readmission Rate (%)	Expected Readmission Rate (%)	Risk-Adjusted Readmission Rate (%, RARR)	95% CI RARR		Performance Rating
								Lower Limit	Upper Limit	
Inland Empire, Riverside & San Bernardino	Arrowhead Regional Medical Center	48	38	6	15.79	10.15	17.36	6.37	37.80	Average
	Desert Regional Medical Center	173	134	13	9.70	10.57	10.24	5.45	17.51	Average
	Eisenhower Medical Center	303	205	20	9.76	10.56	10.31	6.30	15.92	Average
	Kaiser Foundation Hospital - Fontana	672	538	30	5.58	10.52	5.91	3.99	8.44	**Better**
	Loma Linda University Medical Center	482	319	43	13.48	11.91	12.63	9.14	17.02	Average
	Loma Linda University Medical Center - Murrieta	179	110	15	13.64	10.96	13.88	7.77	22.90	Average
	Pomona Valley Hospital Medical Center	258	206	25	12.14	12.58	10.76	6.97	15.89	Average
	Riverside Community Hospital	426	221	17	7.69	10.13	8.48	4.94	13.57	Average
	San Antonio Regional Hospital	352	250	22	8.80	11.10	8.85	5.54	13.39	Average
	St. Bernardine Medical Center	446	353	51	14.45	12.71	12.68	9.44	16.67	Average
	St. Mary Medical Center - Apple Valley	132	106	8	7.55	10.71	7.86	3.40	15.50	Average
	Temecula Valley Hospital	343	245	15	6.12	10.14	6.74	3.77	11.12	**Better**
Orange County	AHMC Anaheim Regional Medical Center	242	99	20	20.20	11.21	20.10	12.28	31.05	**Worse**
	Fountain Valley Regional Hospital and Medical Center - Euclid	199	111	10	9.01	12.80	7.86	3.77	14.45	Average
	Hoag Memorial Hospital Presbyterian	530	341	23	6.74	9.64	7.81	4.95	11.71	Average
	Memorialcare Orange Coast Medical Center	269	200	22	11.00	9.69	12.67	7.94	19.19	Average
	Memorialcare Saddleback Medical Center	129	106	9	8.49	9.44	10.04	4.59	19.06	Average
	Orange County Global Medical Center	164	92	14	15.22	11.64	14.59	7.97	24.47	Average
	Providence Mission Hospital	242	160	11	6.88	9.77	7.85	3.92	14.05	Average
	Providence St. Joseph Hospital	298	186	17	9.14	10.71	9.52	5.55	15.25	Average
	Providence St. Jude Medical Center	223	133	9	6.77	10.20	7.40	3.38	14.05	Average
	UC Irvine Medical Center	291	149	14	9.40	13.58	7.72	4.22	12.95	Average
	West Anaheim Medical Center	82	49	9	18.37	14.27	14.36	6.57	27.26	Average
Greater San Diego	Grossmont Hospital	231	163	31	19.02	12.39	17.12	11.63	24.31	**Worse**
	Palomar Medical Center	130	88	10	11.36	10.07	12.59	6.04	23.16	Average
	Scripps Memorial Hospital - La Jolla	866	557	67	12.03	10.77	12.47	9.66	15.83	Average
	Scripps Mercy Hospital	183	140	13	9.29	10.66	9.72	5.18	16.63	Average
	Sharp Chula Vista Medical Center	338	258	42	16.28	12.70	14.31	10.31	19.34	Average
	Sharp Memorial Hospital	285	180	22	12.22	10.00	13.64	8.55	20.64	Average
	Tri-City Medical Center	88	35	6	17.14	10.45	18.31	6.72	39.85	Average
	UC San Diego Health La Jolla - Jacobs Medical Center & Sulpizio Cardiovascular Center	470	311	31	9.97	11.24	9.90	6.72	14.05	Average

Appendix E-1: Hospital Internal Mammary Artery Usage Results for Isolated CABG by Region, 2023

Region	Hospital	Isolated CABGs	Percent IMA Use
State		**12,373**	**99.32%**
Sacramento Valley & Northern California Region	Adventist Health and Rideout	31	100.00%
	Enloe Medical Center - Esplanade	74	100.00%
	Mercy General Hospital	502	99.80%
	Mercy Medical Center - Redding	68	100.00%
	Mercy San Juan Medical Center	75	100.00%
	Providence St. Joseph Hospital - Eureka	14	100.00%
	Shasta Regional Medical Center	67	100.00%
	Sutter Medical Center - Sacramento	367	99.46%
	UC Davis Medical Center	79	100.00%
San Francisco Bay Area & San Jose	AHMC Seton Medical Center	28	96.43%
	Adventist Health St. Helena	20	100.00%
	Alta Bates Summit Medical Center	111	100.00%
	California Pacific Medical Center - Van Ness Campus	82	100.00%
	Community Hospital of the Monterey Peninsula	60	100.00%
	Dominican Hospital	50	100.00%
	El Camino Hospital	84	100.00%
	Good Samaritan Hospital - San Jose	40	100.00%
	John Muir Medical Center - Concord Campus	204	98.53%
	Kaiser Foundation Hospital - San Francisco	538	100.00%
	Kaiser Foundation Hospital - Santa Clara	477	99.79%
	Marinhealth Medical Center	25	100.00%
	Mills-Peninsula Medical Center	56	98.21%
	North Bay Medical Center	41	100.00%
	O'Connor Hospital	42	100.00%
	Providence Queen of the Valley Medical Center	46	100.00%
	Providence Santa Rosa Memorial Hospital - Montgomery	56	98.21%
	Regional Medical Center of San Jose	31	96.77%
	Salinas Valley Memorial Hospital	105	99.05%
	San Ramon Regional Medical Center	16	100.00%
	Santa Clara Valley Medical Center	42	100.00%
	Sequoia Hospital	54	100.00%
	Stanford Health Care	204	100.00%
	Stanford Health Care Tri-Valley	56	100.00%
	UC San Francisco Medical Center	117	100.00%
	Washington Hospital - Fremont	64	100.00%

Appendix E-1: Hospital Internal Mammary Artery Usage Results for Isolated CABG by Region, 2023

Region	Hospital	Isolated CABGs	Percent IMA Use
Central California	Adventist Health Bakersfield	60	98.33%
	Bakersfield Heart Hospital	41	100.00%
	Bakersfield Memorial Hospital	76	98.68%
	Clovis Community Medical Center	79	100.00%
	Community Regional Medical Center - Fresno	58	100.00%
	Dameron Hospital	46	100.00%
	Doctors Medical Center	191	98.43%
	Fresno Heart and Surgical Hospital	188	100.00%
	Kaweah Health Medical Center	221	99.55%
	Marian Regional Medical Center	89	100.00%
	Memorial Medical Center - Modesto	130	91.54%
	Saint Agnes Medical Center	180	100.00%
	St. Joseph's Medical Center of Stockton	227	99.56%
San Fernando Valley, Antelope Valley, Ventura & Santa Barbara	Adventist Health Glendale	89	97.75%
	Antelope Valley Hospital	46	95.65%
	Community Memorial Hospital - San Buenaventura	105	100.00%
	French Hospital Medical Center	74	98.65%
	Glendale Memorial Hospital and Health Center	58	100.00%
	Los Robles Hospital and Medical Center	63	100.00%
	Northridge Hospital Medical Center	56	100.00%
	Providence Cedars-Sinai Tarzana Medical Center	69	100.00%
	Providence Holy Cross Medical Center	44	100.00%
	Providence Saint Joseph Medical Center	40	100.00%
	Santa Barbara Cottage Hospital	88	100.00%
	St. John's Regional Medical Center	46	97.83%
	Valley Presbyterian Hospital	24	100.00%
	West Hills Hospital and Medical Center	44	100.00%

Appendix E-1: Hospital Internal Mammary Artery Usage Results for Isolated CABG by Region, 2023

Region	Hospital	Isolated CABGs	Percent IMA Use
Greater Los Angeles	Adventist Health White Memorial	31	100.00%
	Adventist Health White Memorial Montebello	2	100.00%
	California Hospital Medical Center - Los Angeles	47	100.00%
	Cedars Sinai Medical Center	195	99.49%
	Centinela Hospital Medical Center	36	100.00%
	Emanate Health Inter-Community Hospital	117	99.15%
	Garfield Medical Center	140	95.71%
	Henry Mayo Newhall Hospital	28	100.00%
	Hollywood Presbyterian Medical Center	24	100.00%
	Huntington Hospital	89	98.88%
	Kaiser Foundation Hospital - Los Angeles	613	100.00%
	Keck Hospital of USC	70	100.00%
	Lakewood Regional Medical Center	92	98.91%
	Los Angeles County + USC Medical Center	37	100.00%
	Los Angeles County/Harbor - UCLA Medical Center	44	100.00%
	Memorialcare Long Beach Medical Center	115	100.00%
	PIH Health Good Samaritan Hospital	54	98.15%
	PIH Health Hospital - Downey	17	100.00%
	PIH Health Hospital - Whittier	62	96.77%
	Providence Little Company of Mary Medical Center - Torrance	79	100.00%
	Providence St. John's Health Center	30	100.00%
	Ronald Reagan UCLA Medical Center	158	100.00%
	St. Francis Medical Center	21	95.24%
	St. Mary Medical Center - Long Beach	51	100.00%
	Torrance Memorial Medical Center	60	100.00%
	USC Arcadia Hospital	72	98.61%
Inland Empire, Riverside & San Bernardino	Arrowhead Regional Medical Center	16	93.75%
	Desert Regional Medical Center	68	100.00%
	Eisenhower Medical Center	131	100.00%
	Kaiser Foundation Hospital - Fontana	284	100.00%
	Loma Linda University Medical Center	182	100.00%
	Loma Linda University Medical Center - Murrieta	78	98.72%
	Pomona Valley Hospital Medical Center	119	100.00%
	Riverside Community Hospital	145	100.00%
	San Antonio Regional Hospital	151	99.34%
	St. Bernardine Medical Center	204	99.51%
	St. Mary Medical Center - Apple Valley	57	100.00%
	Temecula Valley Hospital	167	100.00%

Appendix E-1: Hospital Internal Mammary Artery Usage Results for Isolated CABG by Region, 2023

Region	Hospital	Isolated CABGs	Percent IMA Use
Orange County	AHMC Anaheim Regional Medical Center	97	97.94%
	Fountain Valley Regional Hospital and Medical Center - Euclid	104	99.04%
	Hoag Memorial Hospital Presbyterian	180	100.00%
	Memorialcare Orange Coast Medical Center	115	100.00%
	Memorialcare Saddleback Medical Center	61	100.00%
	Orange County Global Medical Center	73	100.00%
	Providence Mission Hospital	88	100.00%
	Providence St. Joseph Hospital	145	100.00%
	Providence St. Jude Medical Center	70	100.00%
	UC Irvine Medical Center	114	100.00%
	West Anaheim Medical Center	41	92.68%
Greater San Diego	Grossmont Hospital	103	100.00%
	Palomar Medical Center	54	96.30%
	Scripps Memorial Hospital - La Jolla	338	100.00%
	Scripps Mercy Hospital	77	100.00%
	Sharp Chula Vista Medical Center	153	100.00%
	Sharp Memorial Hospital	100	99.00%
	Tri-City Medical Center	33	100.00%
	UC San Diego Health La Jolla - Jacobs Medical Center & Sulpizio Cardiovascular Center	183	100.00%

Appendix F: Definition of Terms

All CABG Cases: The total number of isolated and non-isolated CABG cases submitted to CCORP. To improve statistical reliability, some measures combine data from two years.

Hospital Operative Mortality for isolated CABG: 2023
Hospital Operative Mortality for CABG + Valve: 2022−2023
Hospital Post-Operative Stroke: 2022−2023
Hospital 30-Day Hospital Readmission: 2022−2023

Isolated CABG Cases: The number of isolated CABG cases submitted to CCORP during the time period indicated for the outcome listed above. All patients in salvage operative status are excluded from the isolated CABG cases, thus only isolated CABG cases without salvage operative status are used to calculate performance ratings.

CABG+Valve Cases: The number of CABG cases performed that included aortic valve replacement, mitral valve repair or replacement or a combination thereof.

Isolated CABG Outcomes:

Operative Mortality (hospital): The number of operative deaths for isolated CABG cases for 2023. The number of deaths includes 1) all deaths that occur during the hospitalization in which the CABG surgery was performed up to 90 days; and 2) all deaths after transfer to another acute care center up to 90 days, and 3) any deaths within 30 days after the surgery (no matter where they occurred).

Post-Operative Stroke: The number of post-operative strokes that were unresolved after 24 hours for isolated CABG cases for 2022−2023 data.

30-Day Readmission: (for Isolated CABG Cases Discharged Alive where the patient could be followed via HCAI's hospital Patient Discharge Data (PDD) file. Patients in salvage operative status, patients who were transferred to acute care, or patients who left against medical advice were excluded). The number of hospital readmissions within 30 days of being discharged from the hospital where an isolated CABG operation was performed, irrespective of the hospital to which they were readmitted for 2022−2023. All-cause unplanned readmissions that occur within 30 days of discharge to the hospital that performed the initial CABG surgery are considered an outcome. Readmission was attributed to the hospital performing the initial CABG surgery.

CABG+Valve Outcome:

Operative Mortality: The number of operative deaths for CABG+valve cases for 2022−2023. CABG+valve cases are defined as CABG surgery with aortic valve replacement, mitral valve repair or replacement or a combination thereof. The number of deaths includes 1) all deaths that occur during the hospitalization in which the CABG surgery was performed up to 90 days; and 2) all deaths after transfer to another acute care center up to 90 days, and 3) any deaths within 30 days after the surgery (no matter where they occurred).

Observed CABG Outcome Rate:

Observed Isolated CABG Mortality Rate The ratio of observed number of isolated CABG operative mortality deaths to number of isolated CABG cases multiplied by 100.

Observed CABG+valve Mortality Rate The ratio of observed number of CABG+valve operative mortality deaths to number of CABG+valve cases multiplied by 100:
Observed Post-Operative Stroke Rate The ratio of observed number of post-operative strokes to number of isolated CABG cases multiplied by 100.
Observed 30-Day Readmission Rate The ratio of observed number of 30-day readmissions to number of isolated CABG cases multiplied by 100.
Observed CABG Outcome Rate = Observed Outcomes/# of CABG Cases × 100.

Expected CABG Outcome Rate:
Expected Isolated CABG Mortality Rate The ratio of expected number of isolated CABG operative mortality deaths (predicted for a provider after risk adjusting for the provider's patient population) to number of isolated CABG cases multiplied by 100.
Expected CABG+valve Mortality Rate The ratio of expected number of CABG+valve operative mortality deaths (predicted for a provider after risk adjusting for the provider's patient population) to number of CABG+valve cases multiplied by 100.
Expected Post-Operative Stroke Rate The ratio of expected number of post-operative strokes (predicted for a provider after risk adjusting for the provider's patient population) to number of isolated CABG cases multiplied by 100.
Expected 30-Day Readmission Rate The ratio of the expected number of 30-day readmissions (predicted for a provider after risk adjusting for the provider's patient population) to number of isolated CABG cases multiplied by 100.
Expected CABG Outcome Rate = Expected Outcomes/# of CABG Cases × 100.

Risk-Adjusted Outcome Rate (95% CI): The risk-adjusted mortality rate (RAMR) is calculated by multiplying the California state average CABG mortality rate by the provider's relevant Observed/Expected ratio. The 95% confidence interval was estimated for the risk-adjusted rate. The lower and upper confidence limits are calculated using Poisson exact confidence interval calculations.

The risk-adjusted post-operative stroke rate (RASR) is calculated by multiplying the California state average CABG post-operative stroke rate by the provider's relevant Observed/Expected ratio. The 95% confidence interval was estimated for the risk-adjusted rate. The lower and upper confidence limits are calculated using Poisson exact confidence interval calculations.

The risk-adjusted 30-day readmission rate (RARR) is obtained by multiplying the California state average CABG 30-day readmission rate by the provider's relevant Observed/Expected ratio. The 95% confidence interval was estimated for the risk-adjusted rate. The lower and upper confidence limits are calculated using Poisson exact confidence interval calculations.

Performance Rating: The performance rating is based on a comparison of each provider's risk-adjusted outcome rate and the California observed outcome rate. This is a test of statistical significance. A provider is classified as **"Better"** if the upper 95% confidence limit of its rate falls below the California observed rate. A provider is classified as **"Worse"** if the lower 95% confidence limit of its outcome rate is higher than the California observed rate. A provider is classified as **"Average"** if the California outcome rate falls within the confidence interval of the provider's risk-adjusted outcome rate.

Appendix G: Acknowledgments

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