Executive Summary

The California Coronary Artery Bypass Graft (CABG) Outcomes Reporting Program (CCORP) is the largest public reporting program on CABG surgery outcomes in the United States.

The *California Report on Coronary Artery Bypass Graft Surgery, 2009-2010: A Measurement of Hospital and Surgeon Performance* presents findings from analyses of data collected from 120 California-licensed hospitals where 271 surgeons performed adult isolated CABG[1] surgery during 2009 and 2010. Surgeon results for risk-adjusted mortality and hospital results for risk-adjusted post-operative stroke are based on combined 2009 and 2010 data. The hospital results for risk-adjusted mortality, risk-adjusted readmissions and internal mammary artery utilization are based only on 2010 data.

The three outcome measures (operative mortality, post-operative stroke, and readmission) help hospitals, physicians, patients, and payers evaluate hospital performance. These measures are risk-adjusted, which is a statistical technique that enables fair comparison of hospital and surgeon outcomes even though some hospitals and surgeons treat sicker patients. In this report, operative mortality includes all deaths that occurred during the hospitalization in which the CABG surgery was performed (regardless of length of stay) and any deaths within 30 days after the surgery (no matter where they occurred). Post-operative stroke is defined as a post-operative, central neurologic deficit that did not resolve within 24 hours. A readmission was counted only if the patient, within 30 days of being discharged from the hospital where the CABG was performed, was readmitted with a condition that was likely related to the CABG surgery. Readmissions for other reasons were excluded.

Additionally, this report provides 2010 hospital-level data on internal mammary artery (IMA)[2] usage, which is an important process measure of surgical quality. This report also contrasts statewide volume and mortality outcomes for two types of cardiac revascularization procedures: percutaneous coronary interventions (PCI) and CABG surgery. PCI is also known as angioplasty or balloon catheterization.

Key Findings

2010 Hospital Operative Mortality Findings:

- There were 251 operative deaths among 12,548 isolated CABG surgeries performed in 2010.
- The operative mortality rate for isolated CABG surgery in California was 2.00% in 2010 compared to 1.90% in 2009 and 2.24% in 2008. This represents a 31% reduction in the operative mortality rate since 2003 (2.91%), the first year of mandated public reporting.

[1] Isolated CABG surgery refers to heart bypass surgery without other major surgery, such as heart or lung transplantation, valve repair, etc., performed concurrently with the bypass procedure.

[2] The internal mammary artery (IMA) supplies blood to the front chest wall and the breasts. It is a paired artery, with one running on each side of the inner chest. Evidence shows that the IMA, when grafted to a coronary artery, is less susceptible to obstruction over time and remains fully open longer than vein grafts.

- There was significant variation, from 0% to 32.65%, in hospital operative mortality rates after adjusting for patients' pre-operative health. Despite such variation, 115 of 120 hospitals (96%) performed at a rate that did not differ significantly from the statewide average.

- One hospital performed statistically significantly **"Better"** than the state average in terms of risk-adjusted operative mortality (Table 1), and four hospitals performed **"Worse"** than the state average (Table 2).

2009-2010 Hospital Post-Operative Stroke Findings:

- 337 of the 25,808 patients (1.31%) who underwent isolated CABG surgery in 2009-2010 experienced a post-operative stroke; this is slightly below the national rate of 1.4% reported by the Society of Thoracic Surgeons.[3] This is a slight reduction since 2006-2007 (1.33%).

- There was wide variation in post-operative stroke rates among hospitals after adjusting for patients' pre-operative health. Hospital risk-adjusted post-operative stroke rates ranged from 0% to 6.29% and 116 of 120 hospitals (97%) performed at a rate that did not differ significantly from the statewide average.

- No hospital performed **"Better"** than the state average, but four hospitals performed **"Worse"** than the state average (Table 2).

2010 Hospital Readmission Findings:

- 1,487 of the 11,304 patients (13.15%) who underwent isolated CABG surgery in 2010 and were discharged alive experienced a hospital readmission within 30 days of the surgery. This is a slight reduction from the 2009 rate of 13.24%.

- There was wide variation in the readmission rates among hospitals performing CABG surgery after adjusting for patients' pre-operative conditions. Hospital risk-adjusted readmission rates ranged from 0% to 29.95% and 116 of 120 hospitals (97%) performed at a rate that did not differ significantly from the statewide average.

- Two hospitals performed **"Better"** than the state average on hospital readmissions (Table 1), and two hospitals performed **"Worse"** than the state average (Table 2).

2010 Hospital Internal Mammary Artery (IMA) Usage Findings:

- The IMA is the preferred conduit for CABG surgery of the left anterior descending (LAD) artery. Hospitals with high rates of IMA use are providing high quality care to their patients. California hospitals had a 96.0% IMA usage rate in 2010 compared to 89.6% in 2003.[4] Five California hospitals had IMA usage rates that were significantly lower than the state average and were given **"Low"** performance ratings (Table 2). There is no consensus on what

[3] Shahian DM, O'Brien SM, Filardo G, et al. The Society of Thoracic Surgeons 2008 cardiac surgery risk models: part 1—coronary artery bypass grafting surgery. *Ann Thorac Surg* 2009; 88:S2-22.

[4] The increase in the statewide IMA usage rate from 93.7% in 2007 to 95.9% in 2008, 96.2% in 2009, and 96.0% in 2010 is partly due to a change in the IMA measure. Beginning in 2008, patients who did not have LAD bypassed were excluded from the denominator. If this exclusion were not used, the statewide IMA usage rate would be 94.4% for 2008, 94.8% for 2009, and 94.7% for 2010.

an optimal usage rate should be, so **"Better"** performance ratings were not given for very high rates of IMA usage. Those hospitals with **"Low"** performance ratings are listed in Table 2.

Table 1: Hospitals with **"Better"** Performance Ratings

Hospitals with "Better" Risk-Adjusted Operative Mortality Rates, 2010	
Mercy General Hospital	Sacramento Valley & Northern California Region
Hospitals with "Better" Risk-Adjusted 30-Day Readmission Rates, 2010	
Doctors Medical Center – Modesto Campus	Central California
Mercy General Hospital	Sacramento Valley & Northern California Region

Table 2: Hospitals with **"Worse"** or **"Low"** Performance Ratings

Hospital	Region
Hospitals with "Worse" Risk-Adjusted Operative Mortality Rates, 2010	
Antelope Valley Hospital Medical Center	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Bakersfield Heart Hospital	Central California
Kaweah Delta Hospital	Central California
Palomar Health Downtown Campus	Greater San Diego
Hospitals with "Worse" Risk-Adjusted Post-Operative Stroke Rates, 2009-2010	
Hoag Memorial Hospital Presbyterian	Orange County
Providence Tarzana Regional Medical Center – Tarzana	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Grossmont Hospital	Greater San Diego
Sharp Memorial Hospital	Greater San Diego
Hospitals with "Worse" Risk-Adjusted 30-Day Readmission Rates, 2010	
Long Beach Memorial Medical Center	Greater Los Angeles
St. Helena Hospital	San Francisco Bay Area & San Jose
Hospitals with "Low" Internal Mammary Artery (IMA) Use Rates, 2010	
Antelope Valley Hospital Medical Center	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Shasta Regional Medical Center	Sacramento Valley & Northern California Region
Sutter Medical Center of Santa Rosa	San Francisco Bay Area & San Jose
St. John's Regional Medical Center	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
West Anaheim Medical Center	Orange County

2009-2010 Surgeon Operative Mortality Findings:

- There were 502 operative deaths among 25,808 isolated CABG surgeries in 2009-2010.
- There was significant variation, from 0% to 16.98%, in surgeon operative mortality rates after adjusting for patients' pre-operative health. Despite such variation, 264 of 271 surgeons (97%) performed at a rate that did not differ significantly from the statewide average. No surgeon performed **"Better"** than the state average and seven surgeons performed **"Worse"** than the state average (Table 3).

Table 3: Surgeon Performance Ratings

Surgeon	Region
Surgeons with "Worse" Risk-Adjusted Operative Mortality Rates Overall, 2009-2010	
Chaudhry, Pervaiz	Central California
Freyaldenhoven, Stephen J	Central California and San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Mahendra, Tom	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Petrik, Pavel	San Fernando Valley, Antelope Valley, Ventura & Santa Barbara
Purewal, Sarabjit S	Central California
Reichman, Robert T	Greater San Diego
Salem, Fakhri M	Greater San Diego

Percutaneous Coronary Intervention (PCI) vs. CABG Utilization and Outcomes Findings:

- **Volume**: Between 1997 and 2011, PCI (angioplasty/balloon catheterization) volume *increased* by 6% (from 44,350 to 46,830) while isolated CABG surgeries decreased by 55% (from 28,178 to 12,579) and non-isolated CABG surgery decreased by 13% (from 4,276 to 3,707). For the same time period, valve-only procedures increased by 69% (from 4,473 to 7,538).
- **Mortality**: Between 1997 and 2011, observed in-hospital mortality rates for isolated and non-isolated CABG surgeries decreased from 3.08% to 1.57% and from 9.66% to 5.18%, respectively. The observed in-hospital mortality for valve-only procedures decreased from 5.28% to 2.71%. However, the observed in-hospital mortality rate for PCIs increased from 1.70% to 2.28%, surpassing the in-hospital mortality rate for isolated CABG surgeries. The increase in the PCI mortality rate may be due, in part, to changes in selection criteria for certain high-risk patients getting PCIs.