ADULT CARDIAC SURGERY

in New York State

2008 – 2010

New York State Department of Health
August 2012

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INTRODUCTION

The information contained in this booklet is intended for health care providers, patients and families of patients who are considering cardiac surgery. It provides data on risk factors associated with death following coronary artery bypass graft surgery (CABG) and heart valve surgery, and lists hospital and physician-specific mortality rates which have been risk-adjusted to account for differences in patient severity of illness.

New York State (NYS) has taken a leadership role in setting standards for cardiac services, monitoring outcomes and sharing performance data with patients, hospitals and physicians. Hospitals and doctors involved in cardiac care have worked in cooperation with the NYS Department of Health (Department of Health) and the NYS Cardiac Advisory Committee (Cardiac Advisory Committee) to compile accurate and meaningful data that can and have been used to enhance quality of care. We believe that this process has been instrumental in achieving the excellent outcomes that are evidenced in this report for centers across NYS.

We are pleased to be able to continue to provide information in this year's report that encompasses outcomes for isolated CABG, valve surgery and the two procedures done in combination. Isolated CABG, CABG without any other major cardiac procedure done at the same time, is the most common of the many types of cardiac surgery performed on adults. We have reported risk-adjusted outcomes for isolated CABG surgery for over twenty years. However, many additional patients undergo procedures each year to repair or replace heart valves or undergo valve surgery done in combination with CABG. This report provides important information on the risk factors and outcomes for both CABG and valve surgery. In addition, this report includes information on mortality outside the hospital but within 30 days following surgery. We believe this to be an important quality indicator that will provide useful information to patients and providers.

As they develop treatment plans, we encourage doctors to discuss this information with their patients and colleagues. While these statistics are an important tool in making informed health care choices, individual treatment plans must be made by doctors and patients together after careful consideration of all pertinent factors. It is important to recognize that many factors can influence the outcome of cardiac surgery. These include the patient's health before the procedure, the skill of the operating team and general after-care. In addition, keep in mind that the information in this booklet does not include data after 2010. Important changes may have taken place in some hospitals during that time period.

In developing treatment plans, it is important that patients and physicians alike give careful consideration to the importance of healthy lifestyles for all those affected by heart disease. While some risk factors, such as heredity, gender and age cannot be controlled, others certainly can. Controllable risk factors that contribute to a higher likelihood of developing coronary artery disease are high cholesterol levels, cigarette smoking, high blood pressure, obesity and lack of exercise. Limiting these risk factors after surgery will continue to be important in minimizing the occurrence of new blockages.

Providers of this state and the Cardiac Advisory Committee are to be commended for the excellent results that have been achieved through this cooperative quality improvement system. The Department of Health will continue to work in partnership with hospitals and physicians to ensure continued high-quality cardiac surgery is available to NYS residents.

CORONARY ARTERY BYPASS GRAFT SURGERY (CABG)

Heart disease is, by far, the leading cause of death in NYS, and the most common form of heart disease is atherosclerotic coronary artery disease. Different treatments are recommended for patients with coronary artery disease. For some people, changes in lifestyle, such as dietary changes, not smoking and regular exercise, can result in great improvements in health. In other cases, medication prescribed for high blood pressure or other conditions can make a significant difference.

Sometimes, however, an interventional procedure is recommended. The two common procedures performed on patients with coronary artery disease are CABG surgery and percutaneous coronary intervention (PCI).

CABG surgery is an operation in which a vein or artery from another part of the body is used to create an alternate path for blood to flow to the heart muscle, bypassing the arterial blockage. Typically, a section of one of the large (saphenous) veins in the leg, the radial artery in the arm or the mammary artery in the chest is used to construct the bypass. One or more bypasses may be performed during a single operation, since providing several routes for the blood supply to travel is believed to improve long-term success for the procedure. Triple and quadruple bypasses are often done for this reason, not necessarily because the patient's condition is more severe. CABG surgery is one of the most common, successful major operations currently performed in the United States.

As is true of all major surgery, risks must be considered. The patient is totally anesthetized and there is generally a substantial recovery period in the hospital followed by several weeks of recuperation at home. Even in successful cases, there is a risk of relapse causing the need for another operation.

Those who have CABG surgery are not cured of coronary artery disease; the disease can still occur in the grafted blood vessels or other coronary arteries. In order to minimize new blockages, patients should continue to reduce their risk factors for heart disease.

CARDIAC VALVE PROCEDURES

Heart valves control the flow of blood as it enters the heart and is pumped from the chambers of the heart to the lungs for oxygenation and back to the body. There are four valves: the tricuspid, mitral, pulmonic and aortic valves. Heart valve disease occurs when a valve cannot open all the way because of disease or injury, thus causing a decrease in blood flow to the next heart chamber. Another type of valve problem occurs when the valve does not close completely, which leads to blood leaking backward into the previous chamber. Either of these problems causes the heart to work harder to pump blood or causes blood to back up in the lungs or lower body.

When a valve is stenotic (too narrow to allow enough blood to flow through the valve opening) or incompetent (cannot close tightly enough to prevent the backflow of blood), one of the treatment options is to repair the valve. Repair of a stenotic valve typically involves widening the valve opening, whereas repair of an incompetent valve is typically achieved by narrowing or tightening the supporting structures of the valve. The mitral valve is particularly amenable to valve repairs because its parts can frequently be repaired without having to be replaced.

In many cases, defective valves are replaced rather than repaired, using either a mechanical or biological valve. Mechanical valves are built using durable materials that generally last a lifetime. Biological valves are made from tissue taken from pigs, cows or humans. Mechanical and biological valves each have advantages and disadvantages that can be discussed with referring physicians.

The most common heart valve surgeries involve the aortic and mitral valves. Patients undergoing heart surgery are totally anesthetized and are usually placed on a heart-lung machine, whereby the heart is stopped for a short period of time using special drugs. As is the case for CABG surgery, there is a recovery period of several weeks at home after being discharged from the hospital. Some patients require replacement of more than one valve and some patients with both coronary artery disease and valve disease require valve replacement and CABG surgery. This report contains outcomes for the following valve procedures when done alone or in combination with CABG: Aortic Valve Replacement, Mitral Valve Repair, Mitral Valve Replacement and Multiple Valve Surgery.

THE DEPARTMENT OF HEALTH PROGRAM

For many years, the Department of Health has been studying the effects of patient and treatment characteristics (called risk factors) on outcomes for patients with heart disease. Detailed statistical analyses of the information received from the study have been conducted under the guidance of the Cardiac Advisory Committee, a group of independent practicing cardiac surgeons, cardiologists and other professionals in related fields.

The results have been used to create a cardiac profile system which assesses the performance of hospitals and surgeons over time, independent of the severity of each individual patient's pre-operative conditions.

Designed to improve health in people with heart disease, this program is aimed at:

- understanding the health risks of patients that adversely affect how they will fare in coronary artery bypass surgery and/or valve surgery;
- improving the results of different treatments of heart disease;
- improving cardiac care; and
- providing information to help patients make better decisions about their own care.

PATIENT POPULATION

This report is based on data for patients discharged between January 1, 2008, and December 31, 2010, provided by all non-federal hospitals in NYS where cardiac surgery is performed. In total there were 60,286 cardiac surgical procedures performed during this time period. For various reasons, some of these cases are excluded from analysis in this report. The reasons for exclusion and number of cases affected are described below.

At the time St. Vincent's Hospital in Manhattan closed in April of 2010, the cardiac data validation process for 2009 cases was incomplete. Because the accuracy of risk factors, procedural information and outcomes for these cases cannot be verified, the 117 cases reported by this hospital with a discharge in 2009 are excluded from all analyses involving risk factors or mortality rates. These cases are included in Table 7 which presents volume by hospital and surgeon. No 2010 discharges were reported by this hospital.

In addition, 110 records were excluded from the 2008-2010 data because they belong to patients residing outside the United States, and these patients could not be followed after hospital discharge. There were 13 cases excluded from analysis because each 30-day mortality can only be associated with a single cardiac surgery. An additional 38 records belonging to patients enrolled in a clinical trial (PARTNER) comparing outcomes for two kinds of valve replacement procedures were excluded as well.

Beginning with patients discharged in 2006, the Department of Health, with the advice of the Cardiac Advisory Committee, began a trial period of excluding from publicly released reports any patients meeting the Cardiac Data System definition of pre-operative cardiogenic shock. Cardiogenic shock is a condition associated with severe hypotension (very low blood pressure). [The technical definition used in this report can be found on page 42.] Patients in cardiogenic shock are extremely high-risk, but for some, cardiac surgery may be their best chance for survival. Furthermore, the magnitude of the risk is not always easily determined using registry data. These cases were excluded after careful deliberation and input from NYS providers and others in an effort to ensure that physicians could accept these cases where appropriate without concern over a detrimental impact on their reported outcomes.

In total, 375 cases with cardiogenic shock were removed from 2008-2010 data. This accounts for 0.62 percent of all cardiac surgeries (CABG, valve surgery and other cardiac surgery reported in this data system) in the three years.

After all of the above exclusions, there were 59,633 cardiac surgeries analyzed in this report. Isolated CABG surgery represented 50.77 percent of all adult cardiac surgery for the three-year period covered by this report. Valve or combined valve/CABG surgery represented 37.29 percent of all adult cardiac surgery for the same period. Total cardiac surgery, isolated CABG, valve or valve/CABG surgery and other cardiac surgery volumes are tabulated in Table 7 by hospital and surgeon for the period 2008 through 2010.

RISK ADJUSTMENT FOR ASSESSING PROVIDER PERFORMANCE

Provider performance is directly related to patient outcomes. Whether patients recover quickly, experience complications or die following a procedure is, in part, a result of the kind of medical care they receive. It is difficult, however, to compare outcomes across hospitals when assessing provider performance because different hospitals treat different types of patients. Hospitals with sicker patients may have higher rates of complications and death than other hospitals in the state. The following describes how the Department of Health adjusts for patient risk in assessing provider outcomes.

Data Collection, Data Validation and Identifying In-Hospital/30-Day Deaths

As part of the risk-adjustment process, NYS hospitals where cardiac surgery is performed provide information to the Department of Health for each patient undergoing that procedure. Cardiac surgery departments collect data concerning patients' demographic and clinical characteristics. Approximately 40 of these characteristics (called risk factors) are collected for each patient. Along with information about the procedure, physician and the patient's status at discharge, these data are entered into a computer and sent to the Department of Health for analysis.

Data are verified through review of unusual reporting frequencies, cross-matching of cardiac surgery data with other Department of Health databases and a review of medical records for a selected sample of cases. These activities are extremely helpful in ensuring consistent interpretation of data elements across hospitals.

The analyses in this report base mortality on deaths occurring during the same hospital stay in which a patient underwent cardiac surgery and on deaths that occur after discharge but within 30 days of surgery.

An in-hospital death is defined as a patient who died subsequent to CABG or valve surgery during the same admission or was discharged to hospice care and expired within 30 days.

Deaths that occur after hospital discharge but within 30 days of surgery are also counted in the risk-adjusted mortality analyses. This is done because hospital length of stay has been decreasing and, in the opinion of the Cardiac Advisory Committee, most deaths that occur after hospital discharge but within 30 days of surgery are related to complications of surgery.

Data on deaths occurring after discharge from the hospital are obtained from the Social Security Administration Death Master File, the Department of Health and the New York City Department of Health and Mental Hygiene Bureau of Vital Statistics.

Assessing Patient Risk

Each person who develops heart disease has a unique health history. A cardiac profile system has been developed to evaluate the risk of treatment for each individual patient based on his or her history, weighing the important health factors for that person based on the experiences of thousands of patients who have undergone the same procedures in recent years. All important risk factors for each patient are combined to create a risk profile. For example, an 80-year-old patient with renal failure requiring dialysis has a very different risk profile than a 40-year-old with no renal failure.

The statistical analyses conducted by the Department of Health consist of determining which of the risk factors collected are significantly related to death following CABG and/or valve surgery and determining how to weigh the significant risk factors to predict the chance each patient will have of dying, given his or her specific characteristics.

Doctors and patients should review individual risk profiles together. Treatment decisions must be made by doctors and patients together after consideration of all the information.

Predicting Patient Mortality Rates for Providers

The statistical methods used to predict mortality on the basis of the significant risk factors are tested to determine whether they are sufficiently accurate in predicting mortality for patients who are extremely ill prior to undergoing the procedure as well as for patients who are relatively healthy. These tests have confirmed that the models are reasonably accurate in predicting how patients of all different risk levels will fare when undergoing cardiac surgery.

The mortality rate for each hospital and surgeon is also predicted using the relevant statistical models. This is accomplished by summing the predicted probabilities of death for each of the provider's patients and dividing by the number of patients. The resulting rate is an estimate of what the provider's mortality rate would have been if the provider's performance were

identical to the state performance. The percentage is called the predicted or expected mortality rate (EMR). A hospital's EMR is contrasted with its observed mortality rate (OMR), which is the number of patients who died divided by the total number of patients.

Computing the Risk-Adjusted Mortality Rate

The risk-adjusted mortality rate (RAMR) represents the best estimate, based on the associated statistical model, of what the provider's mortality rate would have been if the provider had a mix of patients identical to the statewide mix. Thus, the RAMR has, to the extent possible, ironed out differences among providers in patient severity of illness, since it arrives at a mortality rate for each provider for an identical group of patients.

To calculate the RAMR, the OMR is first divided by the provider's EMR. If the resulting ratio is larger than one, the provider has a higher mortality rate than expected on the basis of its patient mix; if it is smaller than one, the provider has a lower mortality rate than expected from its patient mix. For isolated CABG patients the ratio is then multiplied by the overall statewide mortality rate of 1.58 percent (in-hospital/30-day mortality in 2010) to obtain the provider's RAMR. For the three-year period 2008-2010, the ratio is multiplied by 1.73 percent (in-hospital/30-day mortality rate) for isolated CABG patients or 4.59 percent (in-hospital/30-day mortality rate) for valve or valve/CABG patients.

There is no Statewide EMR or RAMR, because the statewide data is not risk-adjusted. The Statewide OMR (number of total cases divided by number of total deaths) serves as the basis for comparison for each hospital's EMR and RAMR.

Interpreting the Risk-Adjusted Mortality Rate

If the RAMR is significantly lower than the statewide mortality rate, the provider has a significantly better performance than the state as a whole; if the RAMR is significantly higher than the statewide mortality rate, the provider has a significantly worse performance than the state as a whole.

The RAMR is used in this report as a measure of quality of care provided by hospitals and surgeons. However, there are reasons that a provider's RAMR may not be indicative of its true quality. For example, extreme outcome rates may occur due to chance alone. This is particularly true for low-volume providers, for whom very high or very low mortality rates are more likely to occur than for high-volume providers. To prevent misinterpretation of differences caused by chance variation, confidence intervals are reported in the results. The interpretations of those terms are provided later when the data are presented.

Differences in hospital coding of risk factors could be an additional reason that a provider's RAMR may not be reflective of quality of care. The Department of Health monitors the quality of coded data by reviewing samples of patients' medical records to ascertain the presence of key risk factors. When significant coding problems are discovered, hospitals are required to correct these data and are subjected to subsequent monitoring.

Although there are reasons that RAMRs presented here may not be a perfect reflection of quality of care, the Department of Health feels that this information is a valuable aid in choosing providers for cardiac surgery.

How This Initiative Contributes to Quality Improvement

The goal of the Department of Health and the Cardiac Advisory Committee is to improve the quality of care related to cardiac surgery in NYS. Providing the hospitals and cardiac surgeons in NYS with data about their own outcomes for these procedures allows them to examine the quality of the care they provide and to identify areas that need improvement.

The data collected and analyzed in this program are reviewed by the Cardiac Advisory Committee. Committee members assist with interpretation and advise the Department of Health regarding hospitals and surgeons that may need special attention. Committee members have also conducted site visits to particular hospitals and have recommended that some hospitals obtain the expertise of outside consultants to design improvements for their programs.

The overall results of this program of ongoing review show that significant progress is being made. In response to the program's results for surgery, facilities have refined patient criteria, evaluated patients more closely for pre-operative risks and directed them to the appropriate surgeon. More importantly, many hospitals have identified medical care process problems that have led to less than optimal outcomes, and have altered those processes to achieve improved results.

RESULTS

2010 Risk Factors for CABG Surgery

The significant pre-operative risk factors for death in the hospital during the same admission as the surgery or after hospital discharge but within 30 days of surgery (in-hospital/30-day mortality) for CABG in 2010 are presented in Table 1.

Roughly speaking, the odds ratio for a risk factor represents the number of times a patient with that risk factor is more likely to die in the hospital during or after CABG or after discharge but within 30 days of the surgery than a patient without the risk factor, all other risk factors being the same. For example, the odds ratio for the risk factor Peripheral Vascular Disease is 2.353. This means that a patient who has Peripheral Vascular Disease prior to surgery is approximately 2.353 times as likely to die in the hospital or after discharge within 30 days of surgery as a patient who does not have Peripheral Vascular Disease but who has the same other significant risk factors.

For some of the risk factors in the table, there are only two possibilities: having the risk factor and not having it. For example, a patient either has Peripheral Vascular Disease or does not have Peripheral Vascular Disease. Unstable and Cerebrovascular Disease are interpreted in this way as well.

For age, the odds ratio roughly represents the number of times a patient who is older than 55 is more likely to die in the hospital or after discharge but within 30 days than a patient who is one year younger. Thus, the chance of in-hospital/30-day mortality for a patient undergoing CABG who is 56 years old is approximately 1.046 times that of a patient 55 years old undergoing CABG, if all other risk factors are the same. All patients age 55 and younger have roughly the same odds of dying in the hospital or after discharge but within 30 days if their other risk factors are identical.

Body surface area (BSA) is a function of height and weight and increases for larger heights and weights. This model includes terms for both BSA and BSA-squared , reflecting the complex relationship between BSA and in-hospital/ 30-day mortality. The quadratic function of BSA (BSA-squared) used in this statistical model reflects the fact that patients with very high and very low BSAs tend to have higher risks of in-hospital/30-day mortality than patients with intermediate levels of BSA. This functional form is used to improve the model's ability to predict mortality, but it means that the odds ratios for these terms do not have a straightforward interpretation

The odds ratios for the categories for Ejection Fraction are relative to the reference category (40 percent and higher). Thus, patients with an ejection fraction of less than 20 percent have odds of in-hospital/30-day mortality that are 2.759 times the odds of a person with an ejection fraction of 40 percent or higher, all other risk factors being the same.

Previous MI is subdivided into three groups: occurring less than one day prior to surgery, one to twenty days prior and no MI within twenty days prior to surgery. The last group is referred to as the reference category. The odds ratios for the Previous MI categories are relative to patients who have not had an MI within twenty days prior to the procedure.

Since Renal Failure is expressed in terms of renal failure with dialysis and elevated creatinine without dialysis, the odds ratios for all Renal Failure categories are relative to patients with no dialysis and no creatinine greater than 1.5 mg/dL prior to surgery.

Table 1: Multivariable Risk Factor Equation for CABG In-Hospital/30-Day Deaths in New York State in 2010

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 55	—	0.0451	<.0001	1.046
Body Surface Area (0.1 m^2)	—	-0.6268	0.0228	—
Body Surface Area – squared (0.01 m^4)	—	0.0150	0.0239	—
Hemodynamic State				
Unstable	0.66	1.3343	0.0020	3.797
Ventricular Function				
Ejection Fraction				
Ejection Fraction > 40%	81.87	— Reference —		1.000
Ejection Fraction < 20%	1.74	1.0148	0.0110	2.759
Ejection Fraction 20 – 29%	5.83	0.8051	0.0021	2.237
Ejection Fraction 30 – 39%	10.56	0.5455	0.0170	1.725
Previous MI				
No Previous MI within 20 days	74.34	— Reference —		1.000
Previous MI less than 1 day	2.24	1.3070	0.0002	3.695
Previous MI 1 – 20 days	23.42	0.4168	0.0246	1.517
Comorbidities				
Cerebrovascular Disease	19.15	0.3889	0.0381	1.475
Peripheral Vascular Disease	12.11	0.8558	<.0001	2.353
Renal Failure				
No Renal Failure	88.46	— Reference —		1.000
Renal Failure, Creatinine > 1.5 mg/dl	9.03	0.6679	0.0019	1.950
Renal Failure, Requiring Dialysis	2.51	1.3916	<.0001	4.021
Intercept = 0.8616				
C Statistic = 0.762				

2010 HOSPITAL OUTCOMES FOR CABG SURGERY

Table 2 and Figure 1 present the CABG surgery results for the 39 hospitals performing this operation in NYS in 2010. The table contains, for each hospital, the number of isolated CABG operations (CABG operations with no other major heart surgery earlier in the hospital stay) for patients discharged in 2010, the number of in-hospital/30-day deaths, the OMR, the EMR based on the statistical model presented in Table 1, the RAMR and a 95 percent confidence interval for the RAMR.

As indicated in Table 2, the overall in-hospital/30-day mortality rate for the 9,421 CABG surgeries was 1.58 percent. In-hospital/30-day OMRs ranged from 0.00 percent to 4.17 percent. The range of EMRs, which measure patient severity of illness, was 1.05 percent to 2.09 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 3.97 percent. Two hospitals (Buffalo General Hospital and NY Presbyterian at Columbia in Manhattan) had a RAMR that was significantly higher than the statewide rate. No hospitals had RAMRs that were significantly lower than the statewide rate.

The 2010 in-hospital/30-day mortality rate of 1.58 percent for Isolated CABG is lower than the 1.79 percent observed in 2009.

The in-hospital OMR for 2010 Isolated CABG discharges (not shown in Table 2) was 1.24 percent for all 9,421 patients included in the analysis.

Figures 1 and 2 provide a visual representation of the data displayed in Tables 2 and 3. For each hospital, the black dot represents the RAMR and the gray bar represents the confidence interval, or potential statistical error, for the RAMR. The black vertical line is the NYS in-hospital/30-day mortality rate. For any hospital where the gray bar crosses the state average line, the RAMR is not statistically different from the state as a whole. Hospitals that are statistical outliers will have gray bars (confidence intervals) that are either entirely above or entirely below the line for the statewide rate.

2008-2010 HOSPITAL OUTCOMES FOR VALVE SURGERY

Table 3 and Figure 2 present the combined Valve Only and Valve/CABG surgery results for the 40 hospitals performing these operations in NYS during the years 2008-2010. The table contains, for each hospital, the combined number of Valve Only and Valve/CABG operations resulting in 2008-2010 discharges, the number of in-hospital/30-day deaths, the OMR, the EMR based on the statistical models presented in Appendices 2-3, the RAMR and a 95 percent confidence interval for the RAMR.

As indicated in Table 3, the overall in-hospital/30-day mortality rate for the 22,233 combined Valve Only and Valve/CABG procedures performed at the 40 hospitals was 4.59 percent. The OMRs ranged from 0.83 percent to 9.09 percent. The range of EMRs, which measure patient severity of illness, was 2.74 percent to 6.06 percent.

The RAMRs, which are used to measure performance, ranged from 1.29 percent to 13.15 percent. Four hospitals (Beth Israel Medical Center in Manhattan, Champlain Valley Physicians Hospital in Plattsburgh, Lenox Hill Hospital in Manhattan, and St. Elizabeth Medical Center in Utica) had RAMRs that were significantly higher than the statewide rate. Four hospitals (Long Island Jewish Medical Center in New Hyde Park, NY Presbyterian – Weil Cornell Medical Center in Manhattan, Vassar Brothers Medical Center in Poughkeepsie and Westchester Medical Center in Valhalla) had RAMRs that were significantly lower than the statewide rate.

Table 4 presents valve procedures performed at the 40 cardiac surgery hospitals in NYS during 2008-2010. The table contains, for each hospital, the number of valve operations (as defined by eight separate groups: Aortic Valve Replacements, Aortic Valve Repair or Replacements plus CABG, Mitral Valve Replacement, Mitral Valve Replacement plus CABG, Mitral Valve Repair, Mitral Valve Repair plus CABG, Multiple Valve Surgery and Multiple Valve Surgery plus CABG) resulting in 2008-2010 discharges. In addition to the hospital volumes, the rate of in-hospital/30-day death for the state (Statewide Mortality Rate) is given for each group.

Unless otherwise specified, when the report refers to Valve or Valve/CABG procedures it is referring to the last column of Table 4.

The 2008-2010 in-hospital/30-day OMR of 4.59 percent for Valve and Valve/CABG surgeries is lower than the 5.02 percent observed for 2007-2009. The in-hospital OMR for 2008-2010 valve surgeries (not shown in Table 3) is 3.90 percent for the 22,233 patients included in this analysis.

As previously described, data for 2009 discharges at St. Vincent's hospital are excluded from these analyses due to incomplete validation and inability to confirm accuracy of risk factor and outcome information. Only cases discharged in 2008 are included in Table 3 and Table 4 for this hospital.

DEFINITIONS OF KEY TERMS

The **observed mortality rate (OMR)** is the observed number of deaths divided by the total number of cases.

The **expected mortality rate (EMR)** is the sum of the predicted probabilities of death for all patients divided by the total number of patients.

The **risk-adjusted mortality rate (RAMR)** is the best estimate, based on the statistical model, of what the provider's mortality rate would have been if the provider had a mix of patients identical to the statewide mix. It is obtained by first dividing the OMR by the EMR, and then multiplying by the relevant statewide mortality rate (for example 1.58 percent for Isolated CABG patients in 2010 or 4.59 percent for Valve or Valve/CABG patients in 2008-2010).

Confidence Intervals are used to identify which hospitals had significantly more or fewer deaths than expected given the risk factors of their patients. The confidence interval identifies the range in which the RAMR may fall. Hospitals with significantly higher rates than expected after adjusting for risk are those where the confidence interval range falls entirely above the statewide mortality rate. Hospitals with significantly lower rates than expected, given the severity of illness of their patients before surgery, have confidence intervals entirely below the statewide mortality rate.

The more cases a provider performs, the narrower their confidence interval will be. This is because as a provider performs more cases, the likelihood of chance variation in the RAMR decreases.

Table 2: In-hospital/30-Day Observed, Expected and Risk-Adjusted Mortality Rates for Isolated CABG Surgery in New York State, 2010 Discharges (Listed Alphabetically by Hospital)

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Medical Center	281	5	1.78	1.74	1.62	(0.52, 3.78)
Arnot Ogden Med Ctr	88	1	1.14	1.16	1.54	(0.02, 8.60)
Bellevue Hospital Ctr	125	3	2.40	1.30	2.92	(0.59, 8.54)
Beth Israel Med Ctr	198	2	1.01	1.05	1.52	(0.17, 5.48)
Buffalo General Hosp	366	11	3.01	1.20	3.97 *	(1.98, 7.10)
Champ.Valley Phys Hosp	101	2	1.98	1.22	2.57	(0.29, 9.26)
Ellis Hospital	193	3	1.55	1.54	1.60	(0.32, 4.67)
Erie County Med Ctr	92	2	2.17	1.27	2.70	(0.30, 9.76)
Good Sam - Suffern	138	1	0.72	1.69	0.68	(0.01, 3.77)
Lenox Hill Hospital	330	3	0.91	1.51	0.95	(0.19, 2.78)
Long Island Jewish	168	0	0.00	1.36	0.00	(0.00, 2.53)
M I Bassett Hospital	72	3	4.17	1.87	3.52	(0.71,10.28)
Maimonides Medical Ctr	263	7	2.66	1.69	2.49	(1.00, 5.14)
Mercy Hospital	355	3	0.85	1.47	0.91	(0.18, 2.65)
Millard Fillmore Hosp	242	1	0.41	1.43	0.46	(0.01, 2.55)
Montefiore - Moses	209	2	0.96	1.77	0.86	(0.10, 3.09)
Montefiore - Weiler	180	2	1.11	1.22	1.44	(0.16, 5.20)
Mount Sinai Hospital	321	5	1.56	1.14	2.16	(0.70, 5.05)
NY Hospital - Queens	118	1	0.85	1.60	0.84	(0.01, 4.65)
NY Methodist Hospital	101	1	0.99	1.93	0.81	(0.01, 4.51)
NYP- Columbia Presby.	310	11	3.55	1.61	3.48 *	(1.73, 6.22)
NYP- Weill Cornell	183	0	0.00	1.66	0.00	(0.00, 1.91)
NYU Hospitals Center	136	1	0.74	1.13	1.03	(0.01, 5.72)
North Shore Univ Hosp	466	7	1.50	1.96	1.21	(0.49, 2.50)
Rochester General Hosp	367	9	2.45	1.93	2.01	(0.92, 3.82)
St. Elizabeth Med Ctr	227	6	2.64	1.76	2.38	(0.87, 5.18)
St. Francis Hospital	868	16	1.84	1.59	1.83	(1.05, 2.98)
St. Josephs Hospital	506	7	1.38	1.73	1.26	(0.51, 2.61)
St. Lukes at St. Lukes	102	2	1.96	2.09	1.49	(0.17, 5.37)
St. Peters Hospital	323	4	1.24	1.32	1.48	(0.40, 3.80)
Staten Island Univ Hosp	309	6	1.94	1.66	1.85	(0.68, 4.03)
Strong Memorial Hosp	316	6	1.90	1.39	2.16	(0.79, 4.70)
UHS - Wilson Med Ctr	205	3	1.46	1.64	1.41	(0.28, 4.12)
Univ. Hosp-Brooklyn	46	0	0.00	1.61	0.00	(0.00, 7.85)
Univ. Hosp-SUNY Upstate	133	1	0.75	1.70	0.70	(0.01, 3.90)
Univ. Hosp-Stony Brook	261	3	1.15	1.77	1.02	(0.21, 2.99)
Vassar Bros. Med Ctr	200	2	1.00	1.74	0.91	(0.10, 3.28)
Westchester Med Ctr	288	3	1.04	2.05	0.80	(0.16, 2.35)
Winthrop Univ. Hosp	234	4	1.71	1.52	1.78	(0.48, 4.57)
Statewide Total	**9421**	**149**	**1.58**			

* Risk-adjusted mortality rate significantly higher than statewide rate based on 95 percent confidence interval.

Figure 1: In-Hospital/30-Day Risk-Adjusted Mortality Rates for Isolated CABG in New York State, 2010 Discharges

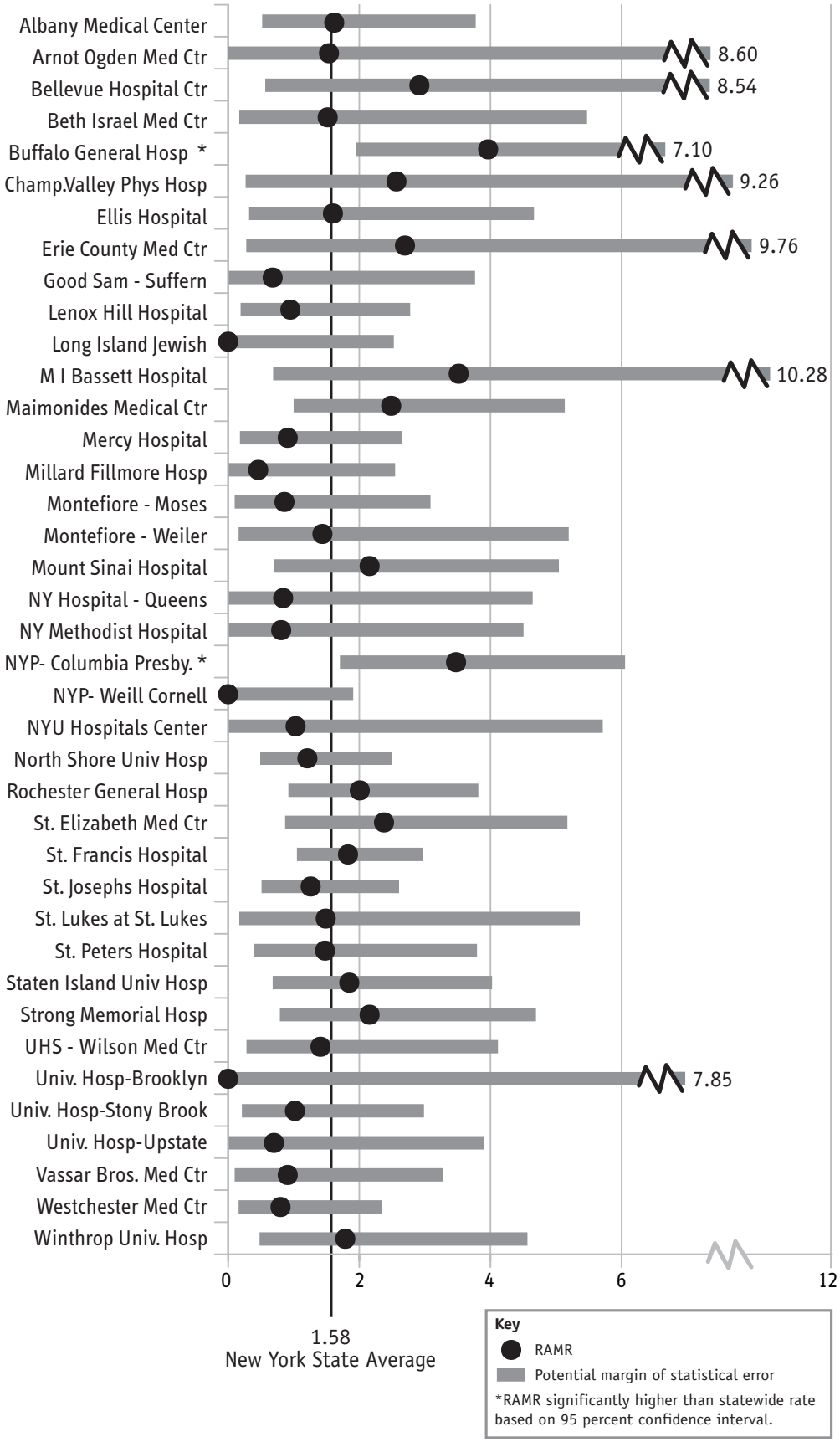

Table 3: In-hospital/30-Day Observed, Expected, and Risk-Adjusted Mortality Rates for Valve or Valve/CABG Surgery in New York State, 2008-2010 Discharges.

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Medical Center	443	18	4.06	4.10	4.55	(2.70, 7.20)
Arnot Ogden Med Ctr	110	5	4.55	2.99	6.97	(2.25,16.27)
Bellevue Hospital Ctr	275	8	2.91	3.62	3.69	(1.59, 7.27)
Beth Israel Med Ctr	330	25	7.58	4.78	7.27 *	(4.71,10.74)
Buffalo General Hosp	500	18	3.60	3.64	4.54	(2.69, 7.17)
Champ.Valley Phys Hosp	99	9	9.09	3.49	11.98 *	(5.47,22.74)
Ellis Hospital	325	8	2.46	3.70	3.06	(1.32, 6.02)
Erie County Med Ctr	49	2	4.08	4.10	4.57	(0.51,16.50)
Good Sam - Suffern	180	7	3.89	3.84	4.65	(1.86, 9.57)
Lenox Hill Hospital	653	48	7.35	5.24	6.44 *	(4.75, 8.54)
Long Island Jewish	643	16	2.49	5.19	2.20 **	(1.26, 3.58)
M I Bassett Hospital	120	1	0.83	2.97	1.29	(0.02, 7.17)
Maimonides Medical Ctr	428	19	4.44	5.02	4.06	(2.44, 6.34)
Mercy Hospital	345	18	5.22	3.83	6.25	(3.70, 9.88)
Millard Fillmore Hosp	279	13	4.66	3.02	7.10	(3.77,12.14)
Montefiore - Moses	457	21	4.60	5.04	4.19	(2.59, 6.41)
Montefiore - Weiler	364	24	6.59	5.18	5.85	(3.75, 8.71)
Mount Sinai Hospital	1538	73	4.75	4.27	5.10	(4.00, 6.42)
NY Hospital - Queens	73	2	2.74	3.45	3.65	(0.41,13.16)
NY Methodist Hospital	180	8	4.44	4.65	4.39	(1.89, 8.64)
NYP- Columbia Presby.	1776	80	4.50	4.57	4.52	(3.59, 5.63)
NYP- Weill Cornell	1212	26	2.15	3.96	2.49 **	(1.62, 3.64)
NYU Hospitals Center	1213	39	3.22	3.42	4.32	(3.07, 5.90)
North Shore Univ Hosp	1398	60	4.29	5.08	3.88	(2.96, 4.99)
Rochester General Hosp	979	56	5.72	4.94	5.32	(4.02, 6.91)
SVCMC- St. Vincents	51	4	7.84	2.74	13.15	(3.54,33.67)
St. Elizabeth Med Ctr	400	32	8.00	5.34	6.88 *	(4.71, 9.71)
St. Francis Hospital	1963	108	5.50	5.38	4.70	(3.85, 5.67)
St. Josephs Hospital	1061	60	5.66	5.87	4.43	(3.38, 5.70)
St. Lukes at St. Lukes	258	12	4.65	4.10	5.20	(2.69, 9.09)
St. Peters Hospital	861	33	3.83	4.50	3.92	(2.69, 5.50)
Staten Island Univ Hosp	303	17	5.61	3.64	7.08	(4.12,11.34)
Strong Memorial Hosp	628	31	4.94	3.79	5.98	(4.06, 8.48)
UHS -Wilson Med Ctr	224	12	5.36	3.66	6.73	(3.47,11.75)
Univ. Hosp-Brooklyn	142	7	4.93	5.17	4.37	(1.75, 9.01)
Univ. Hosp-SUNY Upstate	227	9	3.96	3.66	4.97	(2.27, 9.44)
Univ. Hosp-Stony Brook	557	38	6.82	6.06	5.17	(3.66, 7.09)
Vassar Bros. Med Ctr	513	8	1.56	4.36	1.64 **	(0.71, 3.24)
Westchester Med Ctr	503	15	2.98	5.19	2.64 **	(1.48, 4.35)
Winthrop Univ. Hosp	573	31	5.41	4.81	5.17	(3.51, 7.33)
Statewide Total	**22233**	**1021**	**4.59**			

*Risk-adjusted mortality rate significantly higher than the statewide rate based on 95 percent confidence interval.
** Risk-adjusted mortality rate significantly lower than the statewide rate based on 95 percent confidence interval.

Figure 2: In-Hospital/30-Day Risk-Adjusted Mortality Rates for Valve or Valve/CABG Surgery in New York State, 2008-2010 Discharges

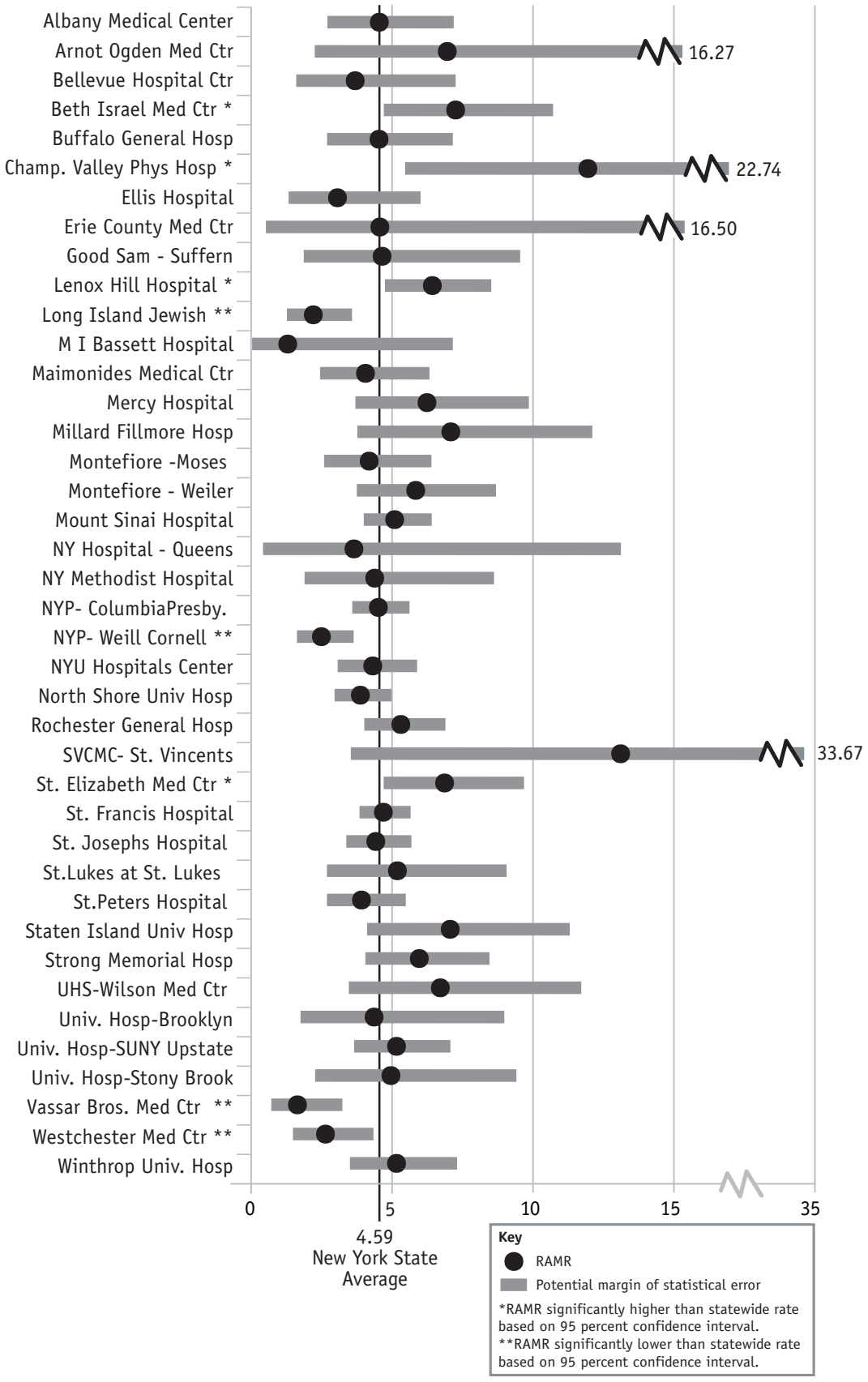

Table 4: Hospital Volume for Valve Procedures in New York State, 2008-2010 Discharges

Hospital	Aortic Valve Replace Surgery	Aortic Valve and CABG	Mitral Valve Replace Surgery	Mitral Replace and CABG	Mitral Valve Repair Surgery	Mitral Repair and CABG	Multiple Valve Surgery	Multiple Valve and CABG	Total Valve or Valve/ CABG
Albany Medical Center	133	164	27	16	33	22	40	8	443
Arnot Ogden Med Ctr	54	32	9	4	3	1	6	1	110
Bellevue Hospital Ctr	79	15	61	12	13	20	70	5	275
Beth Israel Med Ctr	73	78	34	15	27	38	44	21	330
Buffalo General Hosp	161	165	37	19	48	45	14	11	500
Champ.Valley Phys Hosp	36	31	0	2	5	15	7	3	99
Ellis Hospital	115	98	15	10	38	37	8	4	325
Erie County Med Ctr	14	13	12	5	1	0	3	1	49
Good Sam - Suffern	68	52	18	12	8	13	5	4	180
Lenox Hill Hospital	170	123	45	10	96	68	104	37	653
Long Island Jewish	169	137	94	49	50	40	69	35	643
M I Bassett Hospital	42	46	16	5	5	3	1	2	120
Maimonides Medical Ctr	130	71	87	20	21	32	58	9	428
Mercy Hospital	93	91	25	24	44	30	24	14	345
Millard Fillmore Hosp	97	92	18	9	29	14	11	9	279
Montefiore - Moses	111	92	57	33	32	61	59	12	457
Montefiore - Weiler	86	59	65	18	38	33	49	16	364
Mount Sinai Hospital	245	169	35	12	189	72	674	142	1538
NY Hospital - Queens	25	15	11	7	2	1	9	3	73
NY Methodist Hospital	54	36	18	8	17	13	30	4	180
NYP- Columbia Presby.	601	379	155	57	235	103	184	62	1776
NYP- Weill Cornell	465	225	110	32	146	44	151	39	1212
NYU Hospitals Center	461	117	92	18	290	49	168	18	1213
North Shore Univ Hosp	462	357	161	75	105	63	137	38	1398
Rochester General Hosp	385	248	87	26	90	70	50	23	979
SVCMC- St. Vincents	21	9	3	0	10	2	6	0	51
St. Elizabeth Med Ctr	122	102	28	22	23	53	24	26	400
St. Francis Hospital	642	508	106	42	207	143	211	104	1963
St. Josephs Hospital	277	281	93	56	94	82	114	64	1061
St. Lukes at St. Lukes	48	43	34	19	56	27	25	6	258
St. Peters Hospital	273	266	37	28	63	58	91	45	861
Staten Island Univ Hosp	86	66	46	16	35	32	15	7	303
Strong Memorial Hosp	235	165	52	12	88	31	36	9	628
Unitd Hlth Svcs-Wilson	77	77	21	16	14	4	10	5	224
Univ.Hosp-Brooklyn	29	18	31	5	16	18	19	6	142
Univ.Hosp-SUNY Upstate	72	52	12	8	44	10	26	3	227
Univ.Hosp-Stony Brook	144	113	55	23	45	43	77	57	557
Vassar Bros. Med Ctr	169	140	55	26	30	39	31	23	513
Westchester Med Ctr	188	152	31	6	55	30	28	13	503
Winthrop Univ. Hosp	168	142	48	33	39	75	42	26	573
Total	**6880**	**5039**	**1941**	**810**	**2384**	**1534**	**2730**	**915**	**22233**
Statewide Mortality Rate (%)	**2.94**	**4.82**	**4.95**	**8.40**	**1.22**	**4.43**	**6.41**	**15.30**	**4.59**

Table 5 provides the number of Isolated CABG operations, number of CABG patients who died in the hospital or after discharge but within 30 days of surgery, OMR, EMR, RAMR and the 95 percent confidence interval for the RAMR for Isolated CABG patients in 2008-2010. In addition, the final two columns provide the number of Isolated CABG, Valve and Valve/CABG procedures and the RAMR for these patients in 2008-2010 for each of the 40 hospitals performing these operations during the time period. Surgeons and hospitals with RAMRs that are significantly lower or higher than the statewide mortality rate (as judged by the 95 percent confidence interval) are also noted.

The hospital information is presented for each surgeon who met at least one of the following criteria: (a) performed 200 or more cardiac operations during 2008-2010, (b) performed at least one cardiac operation in each of the years, 2008-2010. A cardiac operation is defined as any reportable adult cardiac operation and may include cases not listed in Tables 5 or 6.

The results for surgeons not meeting either of the above criteria are grouped together and reported as "All Others" in the hospital in which the operations were performed. Surgeons who met the above criteria and who performed operations in more than one hospital during 2008-2010 are noted in Table 5 and listed under all hospitals in which they performed these operations.

Also, surgeons who met either criterion (a) or (b) above and have performed Isolated CABG, Valve or Valve/CABG operations in two or more NYS hospitals are listed separately in Table 6. This table contains the same information as Table 5 across all hospitals in which the surgeon performed operations.

Table 5: In-Hospital/30-Day Observed, Expected and Risk-Adjusted Mortality Rates by Surgeon for Isolated CABG and Valve Surgery (done in combination with or without CABG) in New York State, 2008-2010 Discharges

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	**30276**	**525**	**1.73**				**52509**	**2.94**
Albany Medical Center								
Britton L	304	3	0.99	1.36	1.26	(0.25, 3.68)	455	3.60
##Depan H	122	2	1.64	1.51	1.88	(0.21, 6.79)	210	1.90
Fuzesi L	173	2	1.16	1.72	1.17	(0.13, 4.22)	211	2.97
Miller S	297	6	2.02	1.64	2.14	(0.78, 4.66)	463	2.68
Total	**896**	**13**	**1.45**	**1.54**	**1.63**	**(0.87, 2.79)**	**1339**	**2.86**
Arnot Ogden Med Ctr								
Nast E	168	2	1.19	1.51	1.37	(0.15, 4.93)	214	3.75
Raudat C W	195	2	1.03	1.56	1.14	(0.13, 4.11)	259	2.38
Total	**363**	**4**	**1.10**	**1.54**	**1.24**	**(0.33, 3.18)**	**473**	**2.99**
Bellevue Hospital Ctr								
#Balsam L B	102	0	0.00	1.07	0.00	(0.00, 5.82)	190	1.39
##Crooke G	129	0	0.00	1.19	0.00	(0.00, 4.16)	181	1.48
##Deanda A	45	2	4.44	1.66	4.64	(0.52,16.74)	76	3.26
##Loulmet D F	5	1	20.00	1.41	24.55	(0.32,100.0)	14	16.09
##Ribakove G	66	2	3.03	1.35	3.90	(0.44,14.07)	139	4.43
#Schwartz C F	21	0	0.00	0.85	0.00	(0.00,35.61)	28	0.00
All Others	24	0	0.00	0.93	0.00	(0.00,28.64)	39	0.00
Total	**392**	**5**	**1.28**	**1.21**	**1.83**	**(0.59, 4.28)**	**667**	**2.61**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Beth Israel Med Ctr								
Geller C M	113	0	0.00	1.26	0.00	(0.00, 4.46)	162	2.71
Hoffman D	200	3	1.50	1.04	2.51	(0.50, 7.33)	264	4.62
##Ko W	8	0	0.00	0.66	0.00	(0.00,100.0)	12	0.00
Tranbaugh R	321	4	1.25	1.27	1.71	(0.46, 4.37)	533	4.19
All Others	3	0	0.00	0.36	0.00	(0.00,100.0)	4	0.00
Total	**645**	**7**	**1.09**	**1.18**	**1.59**	**(0.64, 3.28)**	**975**	**4.02**
Buffalo General Hosp								
#Ashraf M	2	0	0.00	2.49	0.00	(0.00,100.0)	2	0.00
Grosner G	694	14	2.02	1.48	2.36	(1.29, 3.96)	1092	3.45
#Lewin A	165	9	5.45	1.64	5.76 *	(2.63,10.94)	173	9.80 *
##Picone A	214	11	5.14	1.94	4.59 *	(2.29, 8.22)	308	4.87
Total	**1075**	**34**	**3.16**	**1.60**	**3.43 ***	**(2.37, 4.79)**	**1575**	**4.32 ***
Champ.Valley Phys Hosp								
Abbott A E	210	3	1.43	1.41	1.76	(0.35, 5.13)	294	5.42
#Canavan T	5	0	0.00	1.19	0.00	(0.00,100.0)	5	0.00
#Reich H	.	.	.	.	.	(. , .)	1	0.00
#Saifi J	1	0	0.00	1.45	0.00	(0.00,100.0)	2	0.00
#Singh C	47	1	2.13	1.48	2.50	(0.03,13.90)	53	3.40
All Others	41	1	2.44	1.06	3.99	(0.05,22.19)	48	11.02
Total	**304**	**5**	**1.64**	**1.37**	**2.08**	**(0.67, 4.86)**	**403**	**5.41 ***
Ellis Hospital								
##Depan H	185	4	2.16	2.06	1.82	(0.49, 4.67)	309	2.79
#Reich H	246	5	2.03	1.36	2.59	(0.84, 6.05)	383	2.98
#Singh C	165	0	0.00	1.41	0.00	(0.00, 2.74)	220	0.00 **
All Others	56	2	3.57	1.63	3.80	(0.43,13.72)	65	5.09
Total	**652**	**11**	**1.69**	**1.59**	**1.84**	**(0.92, 3.29)**	**977**	**2.50**
Erie County Med Ctr								
#Downing S W	258	3	1.16	1.56	1.29	(0.26, 3.77)	293	2.22
##Picone A	10	0	0.00	0.90	0.00	(0.00,70.93)	18	0.00
All Others	76	3	3.95	1.33	5.14	(1.03,15.03)	82	8.75
Total	**344**	**6**	**1.74**	**1.49**	**2.03**	**(0.74, 4.41)**	**393**	**3.30**
Good Sam - Suffern								
Lundy E F	239	2	0.84	1.79	0.81	(0.09, 2.93)	379	2.01
Salenger R	285	3	1.05	1.30	1.41	(0.28, 4.11)	325	3.18
Total	**524**	**5**	**0.95**	**1.52**	**1.09**	**(0.35, 2.54)**	**704**	**2.37**
LIJ Medical Center								
Graver L	179	2	1.12	1.56	1.24	(0.14, 4.48)	487	1.98
Manetta F	116	0	0.00	1.92	0.00	(0.00, 2.86)	169	1.59
Palazzo R	183	0	0.00	1.52	0.00	(0.00, 2.29)	290	0.36 **
Parnell V	.	.	.	.	.	(. , .)	1	0.00
Scheinerman S J	183	2	1.09	1.86	1.02	(0.11, 3.68)	356	0.51 **
#Vatsia S	.	.	.	.	.	(. , .)	1	100.00
Total	**661**	**4**	**0.61**	**1.69**	**0.62 ****	**(0.17, 1.59)**	**1304**	**1.32 ****

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Lenox Hill Hospital								
#Ciuffo G B	65	0	0.00	1.99	0.00	(0.00, 4.91)	99	2.78
##Loulmet D F	11	0	0.00	1.66	0.00	(0.00,34.86)	111	6.06
Patel N C	562	7	1.25	1.75	1.23	(0.49, 2.54)	771	2.22
#Plestis K A	58	1	1.72	1.43	2.09	(0.03,11.63)	156	1.26
Subramanian V	419	9	2.15	1.88	1.98	(0.90, 3.75)	625	4.59 *
#Swistel D	2	0	0.00	0.74	0.00	(0.00,100.0)	5	0.00
All Others	17	0	0.00	1.80	0.00	(0.00,20.80)	20	6.25
Total	**1134**	**17**	**1.50**	**1.80**	**1.45**	**(0.84, 2.32)**	**1787**	**3.50**
M I Bassett Hospital								
#Kelley J	46	1	2.17	1.52	2.48	(0.03,13.80)	77	1.75
Lancey R A	121	4	3.31	1.74	3.30	(0.89, 8.44)	180	4.10
All Others	54	0	0.00	1.32	0.00	(0.00, 8.93)	84	0.00
Total	**221**	**5**	**2.26**	**1.59**	**2.47**	**(0.79, 5.76)**	**341**	**2.50**
Maimonides Medical Ctr								
Abrol S	204	4	1.96	1.79	1.90	(0.51, 4.87)	308	2.67
#Brevetti G R	4	0	0.00	1.81	0.00	(0.00,88.02)	6	0.00
##Crooke G	15	0	0.00	1.53	0.00	(0.00,27.71)	21	0.00
Genovesi M H	30	2	6.67	1.60	7.23	(0.81,26.09)	35	8.58
Jacobowitz I	338	5	1.48	1.97	1.30	(0.42, 3.05)	476	2.05
Lahey S J	24	2	8.33	2.38	6.06	(0.68,21.88)	29	10.58
##Ribakove G	17	0	0.00	1.85	0.00	(0.00,20.24)	49	2.39
Stephens G A	73	3	4.11	1.19	5.97	(1.20,17.44)	114	5.20
Vaynblat M	184	6	3.26	1.85	3.06	(1.12, 6.67)	274	4.58
All Others	9	0	0.00	2.90	0.00	(0.00,24.35)	14	0.00
Total	**898**	**22**	**2.45**	**1.84**	**2.31**	**(1.45, 3.50)**	**1326**	**3.18**
Mercy Hospital								
#Aldridge J	111	3	2.70	2.03	2.31	(0.47, 6.76)	136	3.96
Bell-Thomson J	493	10	2.03	1.63	2.16	(1.03, 3.96)	750	4.08
#Downing S W	184	1	0.54	1.83	0.51	(0.01, 2.86)	211	1.24
Lico S	211	2	0.95	1.59	1.03	(0.12, 3.73)	247	2.28
All Others	1	0	0.00	0.33	0.00	(0.00,100.0)	1	0.00
Total	**1000**	**16**	**1.60**	**1.70**	**1.63**	**(0.93, 2.65)**	**1345**	**3.31**
Millard Fillmore Hosp								
#Aldridge J	152	1	0.66	1.62	0.70	(0.01, 3.91)	198	2.95
#Ashraf M	604	9	1.49	1.46	1.77	(0.81, 3.37)	813	3.51
#Lewin A	1	0	0.00	0.60	0.00	(0.00,100.0)	1	0.00
##Picone A	10	0	0.00	2.28	0.00	(0.00,27.93)	34	3.63
All Others	4	0	0.00	1.19	0.00	(0.00,100.0)	4	0.00
Total	**771**	**10**	**1.30**	**1.50**	**1.50**	**(0.72, 2.76)**	**1050**	**3.39**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Montefiore - Moses								
#Bello R A	51	0	0.00	2.56	0.00	(0.00, 4.87)	68	2.23
#D Alessandro D A	268	5	1.87	1.63	1.98	(0.64, 4.63)	410	2.29
##Deanda A	35	1	2.86	1.70	2.91	(0.04,16.21)	56	3.18
#Derose J J	70	1	1.43	2.30	1.08	(0.01, 6.01)	80	1.42
#Goldstein D J	179	2	1.12	1.75	1.11	(0.12, 4.00)	312	2.43
#Michler R E	81	3	3.70	1.59	4.04	(0.81,11.81)	212	4.74
Weinstein S	.	.	.	.	.	(. , .)	1	0.00
All Others	15	0	0.00	1.44	0.00	(0.00,29.49)	17	0.00
Total	**699**	**12**	**1.72**	**1.79**	**1.66**	**(0.86, 2.91)**	**1156**	**2.73**
Montefiore - Weiler								
#Bello R A	195	7	3.59	1.71	3.65	(1.46, 7.51)	281	5.82 *
#D Alessandro D A	9	0	0.00	1.57	0.00	(0.00,45.06)	12	0.00
##Deanda A	3	0	0.00	0.91	0.00	(0.00,100.0)	4	0.00
#Derose J J	245	3	1.22	1.38	1.54	(0.31, 4.51)	466	3.31
#Goldstein D J	44	0	0.00	1.41	0.00	(0.00,10.26)	66	0.00
#Michler R E	11	1	9.09	5.59	2.82	(0.04,15.69)	42	3.00
Total	**507**	**11**	**2.17**	**1.60**	**2.35**	**(1.17, 4.21)**	**871**	**3.82**
Mount Sinai Hospital								
Adams D H	13	0	0.00	0.83	0.00	(0.00,58.96)	805	2.66
Anyanwu A C	50	2	4.00	1.77	3.92	(0.44,14.17)	103	5.87
#Ciuffo G B	94	6	6.38	1.81	6.11 *	(2.23,13.30)	173	7.48 *
DiLuozzo G	5	0	0.00	1.05	0.00	(0.00,100.0)	16	7.62
Filsoufi F	268	4	1.49	1.45	1.78	(0.48, 4.56)	391	2.70
Griepp R	.	.	.	.	.	(. , .)	18	0.00
Nguyen K	1	0	0.00	0.30	0.00	(0.00,100.0)	2	0.00
#Plestis K A	13	0	0.00	1.19	0.00	(0.00,41.21)	45	1.92
Reddy R C	182	5	2.75	1.23	3.87	(1.25, 9.03)	274	5.27 *
Stelzer P	40	2	5.00	1.37	6.32	(0.71,22.81)	220	3.37
#Zias E	149	3	2.01	1.43	2.44	(0.49, 7.13)	257	4.11
All Others	99	1	1.01	1.50	1.17	(0.02, 6.51)	148	1.80
Total	**914**	**23**	**2.52**	**1.44**	**3.02 ***	**(1.91, 4.53)**	**2452**	**3.58**
NY Hospital - Queens								
#Isom O	1	0	0.00	1.19	0.00	(0.00,100.0)	1	0.00
##Lang S	202	1	0.50	1.45	0.59	(0.01, 3.28)	258	0.61
#Mack C A	19	3	15.79	0.69	39.94 *	(8.03,100.0)	23	32.43 *
All Others	38	1	2.63	1.30	3.50	(0.05,19.48)	51	9.31
Total	**260**	**5**	**1.92**	**1.37**	**2.43**	**(0.78, 5.66)**	**333**	**3.38**
NY Methodist Hospital								
#Hedeshian M H	39	0	0.00	1.07	0.00	(0.00,15.21)	43	0.00
#Lee L Y	75	1	1.33	1.31	1.77	(0.02, 9.84)	147	3.41
#Tortolani A	148	4	2.70	1.54	3.04	(0.82, 7.79)	220	4.58
All Others	48	0	0.00	1.90	0.00	(0.00, 6.97)	80	0.00
Total	**310**	**5**	**1.61**	**1.48**	**1.89**	**(0.61, 4.41)**	**490**	**2.95**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
NYP- Columbia Presby.								
Argenziano M	132	5	3.79	1.87	3.52	(1.13, 8.21)	365	3.91
#Chen J M	.	.	.	.	.	(. , .)	1	0.00
#Naka Y	296	12	4.05	1.67	4.20 *	(2.17, 7.33)	584	3.91
Oz M	87	1	1.15	1.02	1.96	(0.03,10.90)	223	2.71
Quaegebeur J	.	.	.	.	.	(. , .)	5	0.00
Smith C	126	5	3.97	1.09	6.29 *	(2.03,14.68)	652	2.23
Stewart A S	175	9	5.14	1.51	5.89 *	(2.69,11.19)	525	4.17
Williams M R	136	3	2.21	1.54	2.49	(0.50, 7.27)	362	4.07
All Others	25	0	0.00	1.60	0.00	(0.00,15.90)	36	0.00
Total	**977**	**35**	**3.58**	**1.52**	**4.09 ***	**(2.85, 5.69)**	**2753**	**3.53**
NYP- Weill Cornell								
#Chen J M	.	.	.	.	.	(. , .)	3	0.00
Girardi L	284	1	0.35	1.66	0.37	(0.00, 2.04)	899	1.28 **
#Hedeshian M H	2	0	0.00	10.49	0.00	(0.00,30.33)	2	0.00
#Isom O	39	0	0.00	1.00	0.00	(0.00,16.30)	112	2.05
Krieger K	199	0	0.00	1.52	0.00	(0.00, 2.11)	587	1.39 **
##Lang S	5	0	0.00	3.83	0.00	(0.00,33.22)	12	0.00
#Lee L Y	19	1	5.26	2.11	4.32	(0.06,24.03)	26	5.60
#Mack C A	1	0	0.00	0.84	0.00	(0.00,100.0)	3	0.00
#Naka Y	2	0	0.00	0.79	0.00	(0.00,100.0)	2	0.00
Salemi A	133	2	1.50	2.09	1.25	(0.14, 4.50)	240	2.30
#Tortolani A	12	1	8.33	1.30	11.13	(0.15,61.94)	18	10.21
All Others	.	.	.	.	.	(. , .)	4	0.00
Total	**696**	**5**	**0.72**	**1.71**	**0.73 ****	**(0.23, 1.70)**	**1908**	**1.52 ****
NYU Hospitals Center								
#Balsam L B	3	0	0.00	0.61	0.00	(0.00,100.0)	5	0.00
##Crooke G	12	0	0.00	1.26	0.00	(0.00,42.06)	29	0.00
Culliford A	88	0	0.00	1.41	0.00	(0.00, 5.12)	200	3.97
##Deanda A	1	0	0.00	0.94	0.00	(0.00,100.0)	1	0.00
Galloway A	55	1	1.82	1.39	2.27	(0.03,12.65)	636	2.26
Grossi E	7	0	0.00	0.93	0.00	(0.00,97.20)	25	0.00
##Loulmet D F	25	0	0.00	1.15	0.00	(0.00,22.19)	147	2.43
Meyer D B	.	.	.	.	.	(. , .)	5	0.00
Mosca R S	1	0	0.00	0.41	0.00	(0.00,100.0)	5	0.00
##Ribakove G	43	0	0.00	1.77	0.00	(0.00, 8.37)	125	3.64
#Schwartz C F	105	1	0.95	1.83	0.90	(0.01, 5.03)	194	2.35
#Zias E	62	0	0.00	1.17	0.00	(0.00, 8.80)	197	2.03
All Others	6	0	0.00	1.11	0.00	(0.00,95.75)	52	2.31
Total	**408**	**2**	**0.49**	**1.47**	**0.58**	**(0.06, 2.08)**	**1621**	**2.54**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
North Shore Univ Hosp								
Esposito R	303	7	2.31	2.09	1.92	(0.77, 3.96)	552	3.40
Hall M	205	2	0.98	2.64	0.64	(0.07, 2.31)	362	2.59
Hartman A	105	2	1.90	1.80	1.84	(0.21, 6.64)	535	2.02
Kalimi R	339	6	1.77	2.58	1.19	(0.43, 2.59)	608	1.38 **
Pogo G	197	5	2.54	1.96	2.24	(0.72, 5.23)	339	3.56
#Vatsia S	191	3	1.57	1.60	1.70	(0.34, 4.98)	317	2.55
All Others	63	3	4.76	1.44	5.75	(1.16,16.80)	88	7.04
Total	**1403**	**28**	**2.00**	**2.15**	**1.61**	**(1.07, 2.32)**	**2801**	**2.56**
Rochester General Hosp								
Becker E J	176	7	3.98	2.31	2.99	(1.20, 6.15)	211	4.59
Cheeran D	586	9	1.54	2.03	1.31	(0.60, 2.49)	933	3.01
Kirshner R	546	12	2.20	2.09	1.83	(0.94, 3.19)	1143	3.26
Total	**1308**	**28**	**2.14**	**2.09**	**1.78**	**(1.18, 2.57)**	**2287**	**3.27**
SVCMC- St. Vincents[1]								
##Lang S	61	3	4.92	1.48	5.76	(1.16,16.82)	78	8.63
All Others	36	1	2.78	1.72	2.79	(0.04,15.55)	70	7.57
Total	**97**	**4**	**4.12**	**1.57**	**4.55**	**(1.22,11.65)**	**148**	**8.06 ***
St. Elizabeth Med Ctr								
El Amir N	230	3	1.30	1.84	1.23	(0.25, 3.60)	358	2.94
Joyce F	303	8	2.64	1.73	2.65	(1.14, 5.23)	484	4.53
#Kelley J	160	4	2.50	1.70	2.55	(0.69, 6.54)	241	4.30
All Others	16	0	0.00	2.13	0.00	(0.00,18.66)	26	9.12
Total	**709**	**15**	**2.12**	**1.76**	**2.08**	**(1.16, 3.43)**	**1109**	**4.09 ***
St. Francis Hospital								
Bercow N	346	4	1.16	2.19	0.92	(0.25, 2.35)	595	3.28
Colangelo R	660	10	1.52	1.97	1.33	(0.64, 2.45)	1049	2.02
Fernandez H A	391	3	0.77	2.21	0.60	(0.12, 1.76)	557	2.09
Lamendola C	385	9	2.34	2.19	1.85	(0.85, 3.52)	613	3.55
Robinson N	405	15	3.70	1.86	3.45 *	(1.93, 5.70)	807	5.22 *
Taylor J	350	5	1.43	2.07	1.20	(0.39, 2.79)	879	1.86 **
Total	**2537**	**46**	**1.81**	**2.07**	**1.52**	**(1.11, 2.03)**	**4500**	**2.87**
St. Josephs Hospital								
Green G R	274	5	1.82	1.80	1.76	(0.57, 4.10)	505	2.92
Marvasti M	235	3	1.28	1.75	1.26	(0.25, 3.69)	498	2.10
Nazem A	377	6	1.59	1.79	1.54	(0.56, 3.35)	552	2.30
Rosenberg J	266	8	3.01	2.29	2.28	(0.98, 4.49)	454	4.51 *
Zhou Z	382	7	1.83	2.06	1.54	(0.62, 3.18)	586	2.38
Total	**1534**	**29**	**1.89**	**1.94**	**1.69**	**(1.13, 2.43)**	**2595**	**2.85**
St. Lukes at St. Lukes								
Balaram S K	88	2	2.27	2.12	1.86	(0.21, 6.71)	155	2.54
#Swistel D	281	8	2.85	2.54	1.94	(0.84, 3.83)	472	3.54
Total	**369**	**10**	**2.71**	**2.44**	**1.93**	**(0.92, 3.54)**	**627**	**3.31**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
St. Peters Hospital								
Bennett E	208	0	0.00	1.36	0.00	(0.00, 2.24)	579	1.82
#Canavan T	444	7	1.58	1.70	1.61	(0.64, 3.31)	541	2.21
Dal Col R	184	3	1.63	1.56	1.81	(0.36, 5.30)	302	2.75
##Depan H	.	.	.	.	.	(. , .)	1	0.00
#Saifi J	339	5	1.47	1.85	1.38	(0.44, 3.22)	613	2.87
Total	**1175**	**15**	**1.28**	**1.66**	**1.33**	**(0.74, 2.20)**	**2036**	**2.43**
Staten Island Univ Hosp								
Asgarian K T	202	4	1.98	1.76	1.95	(0.53, 5.00)	346	4.43
McGinn J	472	7	1.48	1.37	1.88	(0.75, 3.87)	593	3.62
Nabagiez J P	8	0	0.00	2.03	0.00	(0.00,39.21)	8	0.00
Rosell F M	300	4	1.33	1.74	1.33	(0.36, 3.40)	337	2.52
All Others	3	0	0.00	0.87	0.00	(0.00,100.0)	4	0.00
Total	**985**	**15**	**1.52**	**1.57**	**1.69**	**(0.94, 2.78)**	**1288**	**3.56**
Strong Memorial Hosp								
Alfieris G	.	.	.	.	.	(. , .)	5	0.00
Hicks G	297	6	2.02	1.51	2.32	(0.85, 5.05)	415	4.81
Knight P	554	12	2.17	1.40	2.69	(1.39, 4.70)	1008	3.75
Massey H	175	4	2.29	1.45	2.73	(0.74, 7.00)	225	3.88
All Others	.	.	.	.	.	(. , .)	1	0.00
Total	**1026**	**22**	**2.14**	**1.44**	**2.59**	**(1.62, 3.92)**	**1654**	**4.05 ***
UHS - Wilson Med Ctr								
Wong K	295	2	0.68	1.99	0.59	(0.07, 2.13)	423	2.18
Yousuf M	287	6	2.09	1.77	2.04	(0.75, 4.45)	383	4.24
Total	**582**	**8**	**1.37**	**1.88**	**1.27**	**(0.54, 2.49)**	**806**	**3.07**
Univ.Hosp-Brooklyn								
#Brevetti G R	.	.	.	.	.	(. , .)	2	0.00
Burack J H	18	0	0.00	1.88	0.00	(0.00,18.76)	24	0.00
##Ko W	64	2	3.13	2.20	2.47	(0.28, 8.91)	118	2.24
Tak V M	78	1	1.28	1.64	1.36	(0.02, 7.56)	143	3.72
All Others	23	1	4.35	2.21	3.41	(0.04,19.00)	38	3.31
Total	**183**	**4**	**2.19**	**1.93**	**1.97**	**(0.53, 5.03)**	**325**	**2.98**
Univ.Hosp-SUNY Upstate								
Fink G W	160	0	0.00	1.75	0.00	(0.00, 2.27)	239	0.48 **
Lutz C J	278	5	1.80	1.94	1.61	(0.52, 3.75)	426	3.67
Total	**438**	**5**	**1.14**	**1.87**	**1.06**	**(0.34, 2.47)**	**665**	**2.50**
Univ.Hosp-Stony Brook								
Bilfinger T	112	1	0.89	2.06	0.75	(0.01, 4.19)	167	2.75
McLarty A	126	3	2.38	1.88	2.19	(0.44, 6.41)	180	4.82
Rosengart T	201	1	0.50	1.69	0.51	(0.01, 2.84)	462	2.15
Seifert F	278	5	1.80	1.54	2.03	(0.65, 4.73)	399	4.20
All Others	52	0	0.00	1.61	0.00	(0.00, 7.58)	118	1.31
Total	**769**	**10**	**1.30**	**1.71**	**1.32**	**(0.63, 2.42)**	**1326**	**3.01**

Table 5 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Vassar Bros. Med Ctr								
Bhutani A K	109	2	1.83	1.30	2.45	(0.28, 8.84)	119	5.37
Sarabu M	140	1	0.71	1.81	0.68	(0.01, 3.80)	433	0.75 **
Shahani R	177	0	0.00	1.31	0.00	(0.00, 2.75)	262	0.51 **
Zakow P	215	1	0.47	1.47	0.55	(0.01, 3.06)	340	1.36
All Others	1	0	0.00	0.63	0.00	(0.00,100.0)	1	0.00
Total	**642**	**4**	**0.62**	**1.47**	**0.74**	**(0.20, 1.88)**	**1155**	**1.11 ** **
Westchester Med Ctr								
Lafaro R	281	4	1.42	1.68	1.47	(0.39, 3.75)	371	2.30
Lansman S	286	3	1.05	2.05	0.89	(0.18, 2.59)	393	1.94
Malekan R	80	1	1.25	2.89	0.75	(0.01, 4.18)	123	1.24
Saunders P	1	0	0.00	0.58	0.00	(0.00,100.0)	2	0.00
Spielvogel D	364	4	1.10	2.07	0.92	(0.25, 2.36)	608	1.37 **
All Others	63	0	0.00	2.14	0.00	(0.00, 4.72)	81	1.40
Total	**1075**	**12**	**1.12**	**2.03**	**0.95 ** **	**(0.49, 1.67)**	**1578**	**1.66 ** **
Winthrop Univ. Hosp								
Goncalves J A	350	4	1.14	1.77	1.12	(0.30, 2.87)	561	2.78
Kokotos W J	236	3	1.27	2.12	1.04	(0.21, 3.04)	389	3.17
Schubach S	207	1	0.48	1.37	0.61	(0.01, 3.41)	416	2.23
Total	**793**	**8**	**1.01**	**1.77**	**0.99**	**(0.43, 1.95)**	**1366**	**2.76**
Statewide Total	**30276**	**525**	**1.73**				**52509**	**2.94**

1 St. Vincent's cases discharged in 2009 and 2010 not included in this table.
* RAMR significantly higher than statewide rate based on 95 percent confidence interval.
** RAMR significantly lower than statewide rate based on 95 percent confidence interval.
# Performed operations in another NYS hospital.
Performed operations in two or more other NYS hospitals.

Table 6: Summary Information for Surgeons Practicing at More Than One Hospital, 2008-2010.

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Aldridge J	**263**	**4**	**1.52**	**1.79**	**1.47**	**(0.40, 3.77)**	**334**	**3.44**
Mercy Hospital	111	3	2.70	2.03	2.31	(0.47, 6.76)	136	3.96
Millard Fillmore Hosp	152	1	0.66	1.62	0.70	(0.01, 3.91)	198	2.95
Ashraf M	**606**	**9**	**1.49**	**1.46**	**1.76**	**(0.81, 3.35)**	**815**	**3.50**
Buffalo General Hosp	2	0	0.00	2.49	0.00	(0.00,100.0)	2	0.00
Millard Fillmore Hosp	604	9	1.49	1.46	1.77	(0.81, 3.37)	813	3.51
Balsam L B	**105**	**0**	**0.00**	**1.06**	**0.00**	**(0.00, 5.72)**	**195**	**1.37**
Bellevue Hospital Ctr	102	0	0.00	1.07	0.00	(0.00, 5.82)	190	1.39
NYU Hospitals Center	3	0	0.00	0.61	0.00	(0.00,100.0)	5	0.00
Bello R A	**246**	**7**	**2.85**	**1.88**	**2.62**	**(1.05, 5.40)**	**349**	**4.98 ***
Montefiore - Moses	51	0	0.00	2.56	0.00	(0.00, 4.87)	68	2.23
Montefiore - Weiler	195	7	3.59	1.71	3.65	(1.46, 7.51)	281	5.82 *
Brevetti G R	**4**	**0**	**0.00**	**1.81**	**0.00**	**(0.00,88.02)**	**8**	**0.00**
Maimonides Medical Ctr	4	0	0.00	1.81	0.00	(0.00,88.02)	6	0.00
Univ.Hosp-Brooklyn	.	.	.	.	.	(. , .)	2	0.00
Canavan T	**449**	**7**	**1.56**	**1.69**	**1.60**	**(0.64, 3.29)**	**546**	**2.20**
Champ.Valley Phys Hosp	5	0	0.00	1.19	0.00	(0.00,100.0)	5	0.00
St. Peters Hospital	444	7	1.58	1.70	1.61	(0.64, 3.31)	541	2.21
Chen J M	**.**	**.**	**.**	**.**	**.**	**(. , .)**	**4**	**0.00**
NYP- Columbia Presby.	.	.	.	.	.	(. , .)	1	0.00
NYP- Weill Cornell	.	.	.	.	.	(. , .)	3	0.00
Ciuffo G B	**159**	**6**	**3.77**	**1.89**	**3.47**	**(1.27, 7.55)**	**272**	**5.59 ***
Lenox Hill Hospital	65	0	0.00	1.99	0.00	(0.00, 4.91)	99	2.78
Mount Sinai Hospital	94	6	6.38	1.81	6.11 *	(2.23,13.30)	173	7.48 *
Crooke G[1]	**156**	**0**	**0.00**	**1.22**	**0.00**	**(0.00, 3.33)**	**231**	**1.15**
Bellevue Hospital Ctr	129	0	0.00	1.19	0.00	(0.00, 4.16)	181	1.48
Maimonides Medical Ctr	15	0	0.00	1.53	0.00	(0.00,27.71)	21	0.00
NYU Hospitals Center	12	0	0.00	1.26	0.00	(0.00,42.06)	29	0.00
D Alessandro D A	**277**	**5**	**1.81**	**1.63**	**1.92**	**(0.62, 4.48)**	**422**	**2.21**
Montefiore - Moses	268	5	1.87	1.63	1.98	(0.64, 4.63)	410	2.29
Montefiore - Weiler	9	0	0.00	1.57	0.00	(0.00,45.06)	12	0.00
Deanda A	**84**	**3**	**3.57**	**1.64**	**3.77**	**(0.76,11.01)**	**137**	**3.17**
Bellevue Hospital Ctr	45	2	4.44	1.66	4.64	(0.52,16.74)	76	3.26
Montefiore - Moses	35	1	2.86	1.70	2.91	(0.04,16.21)	56	3.18
Montefiore - Weiler	3	0	0.00	0.91	0.00	(0.00,100.0)	4	0.00
NYU Hospitals Center	1	0	0.00	0.94	0.00	(0.00,100.0)	1	0.00

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Depan H	**307**	**6**	**1.95**	**1.84**	**1.84**	**(0.67, 4.01)**	**520**	**2.41**
Albany Medical Center	122	2	1.64	1.51	1.88	(0.21, 6.79)	210	1.90
Ellis Hospital	185	4	2.16	2.06	1.82	(0.49, 4.67)	309	2.79
St. Peters Hospital	.	.	.	.	.	(. , .)	1	0.00
Derose J J	**315**	**4**	**1.27**	**1.58**	**1.39**	**(0.37, 3.57)**	**546**	**3.06**
Montefiore - Moses	70	1	1.43	2.30	1.08	(0.01, 6.01)	80	1.42
Montefiore - Weiler	245	3	1.22	1.38	1.54	(0.31, 4.51)	466	3.31
Downing S W	**442**	**4**	**0.90**	**1.68**	**0.94**	**(0.25, 2.40)**	**504**	**1.75**
Erie County Med Ctr	258	3	1.16	1.56	1.29	(0.26, 3.77)	293	2.22
Mercy Hospital	184	1	0.54	1.83	0.51	(0.01, 2.86)	211	1.24
Goldstein D J	**223**	**2**	**0.90**	**1.68**	**0.92**	**(0.10, 3.34)**	**378**	**2.11**
Montefiore - Moses	179	2	1.12	1.75	1.11	(0.12, 4.00)	312	2.43
Montefiore - Weiler	44	0	0.00	1.41	0.00	(0.00,10.26)	66	0.00
Hedeshian M H	**41**	**0**	**0.00**	**1.53**	**0.00**	**(0.00,10.13)**	**45**	**0.00**
NY Methodist Hospital	39	0	0.00	1.07	0.00	(0.00,15.21)	43	0.00
NYP- Weill Cornell	2	0	0.00	10.49	0.00	(0.00,30.33)	2	0.00
Isom O	**40**	**0**	**0.00**	**1.01**	**0.00**	**(0.00,15.82)**	**113**	**2.04**
NY Hospital - Queens	1	0	0.00	1.19	0.00	(0.00,100.0)	1	0.00
NYP- Weill Cornell	39	0	0.00	1.00	0.00	(0.00,16.30)	112	2.05
Kelley J	**206**	**5**	**2.43**	**1.66**	**2.54**	**(0.82, 5.93)**	**318**	**3.87**
M I Bassett Hospital	46	1	2.17	1.52	2.48	(0.03,13.80)	77	1.75
St. Elizabeth Med Ctr	160	4	2.50	1.70	2.55	(0.69, 6.54)	241	4.30
Ko W[1]	**72**	**2**	**2.78**	**2.03**	**2.38**	**(0.27, 8.59)**	**130**	**2.10**
Beth Israel Med Ctr	8	0	0.00	0.66	0.00	(0.00,100.0)	12	0.00
Univ.Hosp-Brooklyn	64	2	3.13	2.20	2.47	(0.28, 8.91)	118	2.24
Lang S[1]	**268**	**4**	**1.49**	**1.50**	**1.72**	**(0.46, 4.40)**	**348**	**2.25**
NY Hospital - Queens	202	1	0.50	1.45	0.59	(0.01, 3.28)	258	0.61
NYP- Weill Cornell	5	0	0.00	3.83	0.00	(0.00,33.22)	12	0.00
SVCMC- St. Vincents	61	3	4.92	1.48	5.76	(1.16,16.82)	78	8.63
Lee L Y	**94**	**2**	**2.13**	**1.47**	**2.51**	**(0.28, 9.06)**	**173**	**3.65**
NY Methodist Hospital	75	1	1.33	1.31	1.77	(0.02, 9.84)	147	3.41
NYP- Weill Cornell	19	1	5.26	2.11	4.32	(0.06,24.03)	26	5.60
Lewin A	**166**	**9**	**5.42**	**1.63**	**5.75 ***	**(2.62,10.92)**	**174**	**9.78 ***
Buffalo General Hosp	165	9	5.45	1.64	5.76 *	(2.63,10.94)	173	9.80 *
Millard Fillmore Hosp	1	0	0.00	0.60	0.00	(0.00,100.0)	1	0.00
Loulmet D F	**41**	**1**	**2.44**	**1.32**	**3.21**	**(0.04,17.87)**	**272**	**4.93**
Bellevue Hospital Ctr	5	1	20.00	1.41	24.55	(0.32,100.0)	14	16.09
Lenox Hill Hospital	11	0	0.00	1.66	0.00	(0.00,34.86)	111	6.06
NYU Hospitals Center	25	0	0.00	1.15	0.00	(0.00,22.19)	147	2.43

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Mack C A	**20**	**3**	**15.00**	**0.69**	**37.53 ***	**(7.54,100.0)**	**26**	**22.20 ***
NY Hospital - Queens	19	3	15.79	0.69	39.94 *	(8.03,100.0)	23	32.43 *
NYP- Weill Cornell	1	0	0.00	0.84	0.00	(0.00,100.0)	3	0.00
Michler R E	**92**	**4**	**4.35**	**2.07**	**3.65**	**(0.98, 9.34)**	**254**	**4.33**
Montefiore - Moses	81	3	3.70	1.59	4.04	(0.81,11.81)	212	4.74
Montefiore - Weiler	11	1	9.09	5.59	2.82	(0.04,15.69)	42	3.00
Naka Y	**298**	**12**	**4.03**	**1.67**	**4.18 ***	**(2.16, 7.31)**	**586**	**3.91**
NYP- Columbia Presby.	296	12	4.05	1.67	4.20 *	(2.17, 7.33)	584	3.91
NYP- Weill Cornell	2	0	0.00	0.79	0.00	(0.00,100.0)	2	0.00
Picone A	**234**	**11**	**4.70**	**1.91**	**4.27 ***	**(2.13, 7.64)**	**360**	**4.52**
Buffalo General Hosp	214	11	5.14	1.94	4.59 *	(2.29, 8.22)	308	4.87
Erie County Med Ctr	10	0	0.00	0.90	0.00	(0.00,70.93)	18	0.00
Millard Fillmore Hosp	10	0	0.00	2.28	0.00	(0.00,27.93)	34	3.63
Plestis K A	**71**	**1**	**1.41**	**1.39**	**1.76**	**(0.02, 9.81)**	**201**	**1.43**
Lenox Hill Hospital	58	1	1.72	1.43	2.09	(0.03,11.63)	156	1.26
Mount Sinai Hospital	13	0	0.00	1.19	0.00	(0.00,41.21)	45	1.92
Reich H	**246**	**5**	**2.03**	**1.36**	**2.59**	**(0.84, 6.05)**	**384**	**2.97**
Champ.Valley Phys Hosp	.	.	.	.	.	(. , .)	1	0.00
Ellis Hospital	246	5	2.03	1.36	2.59	(0.84, 6.05)	383	2.98
Ribakove G	**126**	**2**	**1.59**	**1.56**	**1.77**	**(0.20, 6.37)**	**313**	**3.76**
Bellevue Hospital Ctr	66	2	3.03	1.35	3.90	(0.44,14.07)	139	4.43
Maimonides Medical Ctr	17	0	0.00	1.85	0.00	(0.00,20.24)	49	2.39
NYU Hospitals Center	43	0	0.00	1.77	0.00	(0.00, 8.37)	125	3.64
Saifi J	**340**	**5**	**1.47**	**1.85**	**1.38**	**(0.44, 3.21)**	**615**	**2.85**
Champ.Valley Phys Hosp	1	0	0.00	1.45	0.00	(0.00,100.0)	2	0.00
St. Peters Hospital	339	5	1.47	1.85	1.38	(0.44, 3.22)	613	2.87
Schwartz C F	**126**	**1**	**0.79**	**1.67**	**0.83**	**(0.01, 4.60)**	**222**	**2.22**
Bellevue Hospital Ctr	21	0	0.00	0.85	0.00	(0.00,35.61)	28	0.00
NYU Hospitals Center	105	1	0.95	1.83	0.90	(0.01, 5.03)	194	2.35
Singh C	**212**	**1**	**0.47**	**1.42**	**0.58**	**(0.01, 3.20)**	**273**	**0.62**
Champ.Valley Phys Hosp	47	1	2.13	1.48	2.50	(0.03,13.90)	53	3.40
Ellis Hospital	165	0	0.00	1.41	0.00	(0.00, 2.74)	220	0.00 **
Swistel D	**283**	**8**	**2.83**	**2.53**	**1.94**	**(0.84, 3.82)**	**477**	**3.48**
Lenox Hill Hospital	2	0	0.00	0.74	0.00	(0.00,100.0)	5	0.00
St. Lukes at St. Lukes	281	8	2.85	2.54	1.94	(0.84, 3.83)	472	3.54
Tortolani A	**160**	**5**	**3.13**	**1.52**	**3.56**	**(1.15, 8.31)**	**238**	**4.88**
NY Methodist Hospital	148	4	2.70	1.54	3.04	(0.82, 7.79)	220	4.58
NYP- Weill Cornell	12	1	8.33	1.30	11.13	(0.15,61.94)	18	10.21

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	No of Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Vatsia S	**191**	**3**	**1.57**	**1.60**	**1.70**	**(0.34, 4.98)**	**318**	**2.87**
LIJ Medical Center	.	.	.	.	.	(. , .)	1	100.00
North Shore Univ Hosp	191	3	1.57	1.60	1.70	(0.34, 4.98)	317	2.55
Zias E	**211**	**3**	**1.42**	**1.35**	**1.82**	**(0.37, 5.33)**	**454**	**3.21**
Mount Sinai Hospital	149	3	2.01	1.43	2.44	(0.49, 7.13)	257	4.11
NYU Hospitals Center	62	0	0.00	1.17	0.00	(0.00, 8.80)	197	2.03

1 St. Vincent's cases discharged in 2009 not included in this table.

* RAMR significantly higher than statewide rate based on 95 percent confidence interval.

** RAMR significantly lower than statewide rate based on 95 percent confidence interval.

SURGEON AND HOSPITAL VOLUMES FOR TOTAL ADULT CARDIAC SURGERY, 2008-2010

Table 7 presents, for each hospital and for each surgeon performing at least 200 cardiac operations in any hospital in 2008-2010 and/or performing one or more cardiac operations in each of the years 2008-2010, the total number of Isolated CABG operations, the total number of Valve or Valve/CABG operations, the total number of Other Cardiac operations and Total Cardiac operations. As in Table 5, results for surgeons not meeting the above criteria are grouped together in an "All Others" category.

The Isolated CABG column includes patients who undergo bypass of one or more of the coronary arteries with no other major heart surgery earlier in the same admission. Valve or Valve/CABG volumes include the total number of cases for the eight Valve or Valve/CABG groups that were identified in Table 4. Other Cardiac Surgery refers to cardiac procedures not represented by Isolated CABG, and Valve or Valve/CABG operations and includes, but is not limited to: repairs of congenital conditions, heart transplants, aneurysm repairs, ventricular reconstruction and ventricular assist device insertions. Total Cardiac Surgery is the sum of the previous three columns and includes any surgery on the heart or great vessels.

Table 7: Surgeon and Hospital Volume for Isolated CABG, Valve or Valve/CABG, Other Cardiac Surgery, and Total Adult Cardiac Surgery, 2008-2010.

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Albany Medical Center				
Britton L	304	151	54	509
Depan H	122	88	23	233
Fuzesi L	173	38	10	221
Miller S	297	166	14	477
All Others	0	0	16	16
Total	**896**	**443**	**117**	**1456**
Arnot Ogden Med Ctr				
Nast E	168	46	13	227
Raudat C W	195	64	11	270
Total	**363**	**110**	**24**	**497**
Bellevue Hospital Ctr				
Balsam L B	102	88	39	229
Crooke G	129	52	48	229
Deanda A	45	31	32	108
Loulmet D F	5	9	2	16
Ribakove G	66	73	18	157
Schwartz C F	21	7	9	37
All Others	24	15	7	46
Total	**392**	**275**	**155**	**822**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Beth Israel Med Ctr				
Geller C M	113	49	11	173
Hoffman D	200	64	11	275
Ko W	8	4	1	13
Tranbaugh R	321	212	45	578
All Others	3	1	0	4
Total	**645**	**330**	**68**	**1043**
Buffalo General Hosp				
Ashraf M	2	0	0	2
Grosner G	694	398	40	1132
Lewin A	165	8	9	182
Picone A	214	94	18	326
All Others	0	0	3	3
Total	**1075**	**500**	**70**	**1645**
Champ.Valley Phys Hosp				
Abbott A E	210	84	25	319
Canavan T	5	0	0	5
Reich H	0	1	0	1
Saifi J	1	1	0	2
Singh C	47	6	2	55
All Others	41	7	0	48
Total	**304**	**99**	**27**	**430**
Ellis Hospital				
Depan H	185	124	21	330
Reich H	246	137	17	400
Singh C	165	55	8	228
All Others	56	9	0	65
Total	**652**	**325**	**46**	**1023**
Erie County Med Ctr				
Downing S W	258	35	22	315
Picone A	10	8	1	19
All Others	76	6	20	102
Total	**344**	**49**	**43**	**436**
Good Sam - Suffern				
Lundy E F	239	140	13	392
Salenger R	285	40	5	330
Total	**524**	**180**	**18**	**722**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Lenox Hill Hospital				
Ciuffo G B	65	34	12	111
Loulmet D F	11	100	17	128
Patel N C	562	209	31	802
Plestis K A	58	98	194	350
Subramanian V	419	206	38	663
Swistel D	2	3	0	5
All Others	17	3	1	21
Total	**1134**	**653**	**293**	**2080**
Long Island Jewish				
Graver L	179	308	50	537
Manetta F	116	53	24	193
Palazzo R	183	107	24	314
Parnell V	0	1	16	17
Scheinerman S J	183	173	20	376
Vatsia S	0	1	1	2
All Others	0	0	4	4
Total	**661**	**643**	**139**	**1443**
M I Bassett Hospital				
Kelley J	46	31	5	82
Lancey R A	121	59	6	186
All Others	54	30	4	88
Total	**221**	**120**	**15**	**356**
Maimonides Medical Ctr				
Abrol S	204	104	84	392
Brevetti G R	4	2	2	8
Crooke G	15	6	7	28
Genovesi M H	30	5	3	38
Jacobowitz I	338	138	32	508
Lahey S J	24	5	3	32
Ribakove G	17	32	2	51
Stephens G A	73	41	13	127
Vaynblat M	184	90	24	298
All Others	9	5	5	19
Total	**898**	**428**	**175**	**1501**
Mercy Hospital				
Aldridge J	111	25	2	138
Bell-Thomson J	493	257	67	817
Downing S W	184	27	14	225
Lico S	211	36	19	266
All Others	1	0	0	1
Total	**1000**	**345**	**102**	**1447**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Millard Fillmore Hosp				
Aldridge J	152	46	43	241
Ashraf M	604	209	30	843
Lewin A	1	0	0	1
Picone A	10	24	4	38
All Others	4	0	1	5
Total	**771**	**279**	**78**	**1128**
Montefiore - Moses				
Bello R A	51	17	10	78
D Alessandro D A	268	142	78	488
Deanda A	35	21	45	101
Derose J J	70	10	7	87
Goldstein D J	179	133	63	375
Michler R E	81	131	26	238
Weinstein S	0	1	18	19
All Others	15	2	5	22
Total	**699**	**457**	**252**	**1408**
Montefiore - Weiler				
Bello R A	195	86	22	303
D Alessandro D A	9	3	2	14
Deanda A	3	1	5	9
Derose J J	245	221	66	532
Goldstein D J	44	22	4	70
Michler R E	11	31	3	45
Total	**507**	**364**	**102**	**973**
Mount Sinai Hospital				
Adams D H	13	792	80	885
Anyanwu A C	50	53	124	227
Ciuffo G B	94	79	6	179
DiLuozzo G	5	11	87	103
Filsoufi F	268	123	23	414
Griepp R	0	18	53	71
Nguyen K	1	1	44	46
Plestis K A	13	32	37	82
Reddy R C	182	92	43	317
Stelzer P	40	180	153	373
Zias E	149	108	16	273
All Others	99	49	19	167
Total	**914**	**1538**	**685**	**3137**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
NY Hospital - Queens				
Isom O	1	0	0	1
Lang S	202	56	22	280
Mack C A	19	4	4	27
All Others	38	13	4	55
Total	**260**	**73**	**30**	**363**
NY Methodist Hospital				
Hedeshian M H	39	4	0	43
Lee L Y	75	72	28	175
Tortolani A	148	72	6	226
All Others	48	32	6	86
Total	**310**	**180**	**40**	**530**
NYP- Columbia Presby.				
Argenziano M	132	233	59	424
Chen J M	0	1	18	19
Naka Y	296	288	227	811
Oz M	87	136	27	250
Quaegebeur J	0	5	74	79
Smith C	126	526	52	704
Stewart A S	175	350	375	900
Williams M R	136	226	135	497
All Others	25	11	259	295
Total	**977**	**1776**	**1226**	**3979**
NYP- Weill Cornell				
Chen J M	0	3	42	45
Girardi L	284	615	577	1476
Hedeshian M H	2	0	1	3
Isom O	39	73	16	128
Krieger K	199	388	13	600
Lang S	5	7	2	14
Lee L Y	19	7	1	27
Mack C A	1	2	0	3
Naka Y	2	0	0	2
Salemi A	133	107	24	264
Tortolani A	12	6	0	18
All Others	0	4	3	7
Total	**696**	**1212**	**679**	**2587**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
NYU Hospitals Center				
Balsam L B	3	2	1	6
Crooke G	12	17	8	37
Culliford A	88	112	35	235
Deanda A	1	0	5	6
Galloway A	55	581	72	708
Grossi E	7	18	7	32
Loulmet D F	25	122	25	172
Meyer D B	0	5	5	10
Mosca R S	1	4	21	26
Ribakove G	43	82	18	143
Schwartz C F	105	89	20	214
Zias E	62	135	30	227
All Others	6	46	4	56
Total	**408**	**1213**	**251**	**1872**
North Shore Univ Hosp				
Esposito R	303	249	44	596
Hall M	205	157	15	377
Hartman A	105	430	95	630
Kalimi R	339	269	44	652
Pogo G	197	142	47	386
Vatsia S	191	126	49	366
All Others	63	25	31	119
Total	**1403**	**1398**	**325**	**3126**
Rochester General Hosp				
Becker E J	176	35	14	225
Cheeran D	586	347	71	1004
Kirshner R	546	597	71	1214
Total	**1308**	**979**	**156**	**2443**
SVCMC- St. Vincents				
Crooke G	0	1	1	2
Ko W	25	24	15	64
Lang S	73	24	8	105
All Others	56	40	12	108
Total	**154**	**89**	**36**	**279**
St. Elizabeth Med Ctr				
El Amir N	230	128	40	398
Joyce F	303	181	22	506
Kelley J	160	81	24	265
All Others	16	10	1	27
Total	**709**	**400**	**87**	**1196**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
St. Francis Hospital				
Bercow N	346	249	16	611
Colangelo R	660	389	46	1095
Fernandez H A	391	166	21	578
Lamendola C	385	228	26	639
Robinson N	405	402	36	843
Taylor J	350	529	56	935
Total	**2537**	**1963**	**201**	**4701**
St. Josephs Hospital				
Green G R	274	231	41	546
Marvasti M	235	263	46	544
Nazem A	377	175	38	590
Rosenberg J	266	188	125	579
Zhou Z	382	204	41	627
Total	**1534**	**1061**	**291**	**2886**
St. Lukes at St. Lukes				
Balaram S K	88	67	28	183
Swistel D	281	191	41	513
Total	**369**	**258**	**69**	**696**
St. Peters Hospital				
Bennett E	208	371	42	621
Canavan T	444	97	6	547
Dal Col R	184	118	9	311
Depan H	0	1	0	1
Saifi J	339	274	43	656
Total	**1175**	**861**	**100**	**2136**
Staten Island Univ Hosp				
Asgarian K T	202	144	31	377
McGinn J	472	121	15	608
Nabagiez J P	8	0	2	10
Rosell F M	300	37	28	365
All Others	3	1	0	4
Total	**985**	**303**	**76**	**1364**
Strong Memorial Hosp				
Alfieris G	0	5	46	51
Hicks G	297	118	63	478
Knight P	554	454	159	1167
Massey H	175	50	147	372
All Others	0	1	19	20
Total	**1026**	**628**	**434**	**2088**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
United Hlth Svcs-Wilson				
Wong K	295	128	15	438
Yousuf M	287	96	20	403
Total	**582**	**224**	**35**	**841**
Univ. Hosp-Brooklyn				
Brevetti G R	0	2	0	2
Burack J H	18	6	3	27
Ko W	64	54	21	139
Tak V M	78	65	21	164
All Others	23	15	5	43
Total	**183**	**142**	**50**	**375**
Univ. Hosp-SUNY Upstate				
Fink G W	160	79	36	275
Lutz C J	278	148	29	455
All Others	0	0	1	1
Total	**438**	**227**	**66**	**731**
Univ. Hosp-Stony Brook				
Bilfinger T	112	55	21	188
McLarty A	126	54	41	221
Rosengart T	201	261	24	486
Seifert F	278	121	15	414
All Others	52	66	17	135
Total	**769**	**557**	**118**	**1444**
Vassar Bros. Med Ctr				
Bhutani A K	109	10	1	120
Sarabu M	140	293	58	491
Shahani R	177	85	16	278
Zakow P	215	125	19	359
All Others	1	0	0	1
Total	**642**	**513**	**94**	**1249**
Westchester Med Ctr				
Lafaro R	281	90	21	392
Lansman S	286	107	17	410
Malekan R	80	43	33	156
Saunders P	1	1	11	13
Spielvogel D	364	244	176	784
All Others	63	18	9	90
Total	**1075**	**503**	**267**	**1845**

Table 7 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Winthrop Univ. Hosp				
Goncalves J A	350	211	73	634
Kokotos W J	236	153	23	412
Schubach S	207	209	10	426
Total	**793**	**573**	**106**	**1472**
Statewide Total	**30333**	**22271**	**7146**	**59750**

Criteria Used in Reporting Significant Risk Factors (2010)

Based on Documentation in Medical Records

Patient Risk Factor	Definitions
Demographic	
• Body Surface Area	Body surface area (BSA) is a function of height and weight and increases for larger heights and weights. The statistical formula used to calculate BSA in this report is: BSA (m^2) =0.0003207 x Height(cm)$^{0.3}$ x Weight(grams)$^{(0.7285 - (0.0188 \times LOG(grams))}$
Hemodynamic State	**Determined in the immediate pre-operative period, defined as the period prior to anesthesia taking responsibility for the patient.**
• Unstable	Patient requires pharmacologic or mechanical support to maintain blood pressure or cardiac index.
• Shock	Acute hypotension (systolic blood pressure < 80 mmHg) or low cardiac index (< 2.0 liters/min/m^2), despite pharmacologic or mechanical support. Records with this risk factor were excluded from all analyses in this report.
Comorbidities	
• Cerebrovascular Disease	A history of stroke, with or without residual deficit, angiographic or ultrasound demonstration of at least 50% narrowing in a major cerebral or carotid artery (common or internal), or previous surgery for such disease. A history of bruits or transient ischemic attacks (TIA) is not sufficient evidence of cerebrovascular disease.
• COPD	Patients who require chronic (longer than three months) bronchodilator therapy to avoid disability from obstructive airway disease, or have forced expiratory volume in one second of less than 75 percent of the predicted value or less than 1.25 liters or have a room air PO_2 <60 or a PCO_2 >50.
• Diabetes, Requiring Medication	The patient is receiving either oral hypoglycemics or insulin prior to hospital admission.
• Endocarditis	Two or more positive blood cultures without other obvious source with demonstrated valvular vegetations or acute valvular dysfunction caused by infection.
• Peripheral Vascular Disease	Angiographic demonstration of at least 50% narrowing in a major aortoiliac or femoral/popliteal vessel, previous surgery for such disease, absent femoral or pedal pulses, or the inability to insert a catheter or intra-aortic balloon due to iliac aneurysm or obstruction of the aortoiliac or femoral arteries.
• Renal Failure, Creatinine	Highest pre-operative creatinine during the hospital admission was in the indicated range.
• Renal Failure Requiring Dialysis	The patient is on chronic peritoneal or hemodialysis.

Patient Risk Factor	Definitions
Ventricular Function	
• Ejection Fraction	Value of the ejection fraction taken closest to but before the start of the procedure. When a calculated measure is unavailable the ejection fraction should be estimated visually from the ventriculogram or by echocardiography. Intraoperative direct observation of the heart is not an adequate basis for a visual estimate of the ejection fraction. If no ejection fraction is reported, the ejection fraction is considered "normal" for purposes of analysis and is classified with the reference category.
• Previous MI	One or more myocardial infarctions (MI) in the specified time period prior to surgery.
Previous Cardiac Procedures	
• Previous Open Heart Operations	Open heart surgery performed prior to the current operating room visit. Minimally invasive procedures are included.
Vessels Diseased:	
• Three Vessels Diseased	The patient has at least a 70 percent blockage in each of the three native coronary arteries - the Left Anterior Descending (LAD), the Right Coronary Artery (RCA), and the Left Circumflex (LCX) or their major branches.

angina pectoris - The pain or discomfort felt when blood and oxygen flow to the heart are impeded by blockages in the coronary arteries. Can also be caused by an arterial spasm.

angioplasty - Also known as *percutaneous transluminal coronary angioplasty* (PTCA) or *percutaneous coronary intervention* (PCI). In this procedure, a balloon catheter is threaded up to the site of blockage in an artery in the heart, and is then inflated to push arterial plaque against the wall of the artery to create a wider channel in the artery. Other procedures or devices are frequently used in conjunction with, or in place of, the balloon catheter. In particular, stents are used for most patients and devices such as rotoblaters and ultrasound are sometimes used.

arteriosclerosis - Also called *atherosclerotic coronary artery disease* or *coronary artery disease,* the group of diseases characterized by thickening and loss of elasticity of the arterial walls, popularly called "hardening of the arteries."

atherosclerosis - One form of arteriosclerosis in which plaques or fatty deposits form in the inner layer of the arteries.

coronary artery bypass graft surgery (CABG) - A procedure in which a vein or artery from another part of the body is used to create an alternate path for blood to flow to the heart muscle, bypassing the arterial blockage. Typically, a section of one of the large saphenous veins in the leg, the radial artery in the arm or the mammary artery in the chest is used to construct the bypass. One or more bypasses may be performed during a single operation. When no other major heart surgery (such as valve replacement) is included, the operation is referred to as an isolated CABG.

The average number of bypass grafts created during CABG is three or four. Generally, all significantly blocked arteries are bypassed unless they enter areas of the heart that are permanently damaged by previous heart attacks. Five or more bypasses are occasionally created. Multiple bypasses are often performed to provide several alternate routes for the blood flow and to improve the long-term success of the procedure, not necessarily because the patient's condition is more severe.

cardiac catheterization - Also known as *coronary angiography*, a procedure for diagnosing the condition of the heart and the arteries connecting to it. A thin tube threaded through an artery to the heart releases a dye, which allows doctors to observe blockages with an X-ray camera. This procedure is generally required before coronary bypass surgery.

cardiovascular disease - Disease of the heart and blood vessels, the most common form is coronary artery disease.

coronary arteries - The arteries that supply the heart muscle with blood. When they are narrowed or blocked, oxygen-rich blood cannot flow freely to the heart muscle or myocardium.

heart valve- Gates that connect the different chambers of the heart so that there is a one-way flow of blood between the chambers. The heart has four valves: the tricuspid, mitral, pulmonic and aortic valves.

incompetent valves - A valve that does not close tightly.

ischemic heart disease (ischemia) - Heart disease that occurs as a result of inadequate blood supply to the heart muscle or myocardium.

myocardial infarction (MI) - Also called a *heart attack,* partial destruction of the heart muscle due to interrupted blood supply.

plaque - Also called *atheroma,* this is the fatty deposit in the coronary artery that can block blood flow.

risk factors for heart disease - Certain risk factors have been found to increase the likelihood of developing heart disease. Some are controllable or avoidable and some cannot be controlled. The biggest heart disease risk factors are heredity, gender and age, none of which can be controlled. Men are much more likely to develop heart disease than women before the age of 55, although it is the number one killer of both men and women.

Some controllable risk factors that contribute to a higher likelihood of developing coronary artery disease are high cholesterol levels, cigarette smoking, high blood pressure (hypertension), obesity, a sedentary lifestyle or lack of exercise, diabetes and poor stress management.

stenosis - The narrowing of an artery due to blockage. Restenosis is when the narrowing recurs after surgery.

stenotic valve- A valve that does not open fully.

valve disease- Occurs when a valve cannot open all of the way (reducing flow to the next heart chamber) or cannot close all of the way (causing blood to leak backwards into the previous heart chamber).

valve repair- Widening valve openings for stenotic valves or narrowing or tightening valve openings for incompetent valves without having to replace the valves.

valve replacement- Replacement of a diseased valve. New valves are either mechanical (durable materials such as Dacron or titanium) or biological (tissues taken from pigs, cows or human donors).

Appendix 1. 2008-2010 Risk Factors For Isolated CABG In-Hospital/30-Day Mortality

The significant pre-procedural risk factors for in-hospital/30-day mortality following isolated CABG in the 2008-2010 time period are presented in the table that follows.

Roughly speaking, the odds ratio for a risk factor represents the number of times a patient with that risk factor is more likely to die in the hospital during or after CABG or after discharge but within 30 days of the operation than a patient without the risk factor, all other risk factors being the same. For example, the odds ratio for the risk factor COPD is 1.403. This means that a patient with COPD is approximately 1.403 times as likely to die in the hospital during or after undergoing CABG or after discharge but within 30 days as a patient without COPD who has the same other significant risk factors.

For some risk factors in the table, there are only two possibilities – having the risk factor and not having it. For example, a patient either has COPD or does not have it. Female Gender, Unstable, Peripheral Vascular Disease and Previous Open Heart Operations are also interpreted in this way.

With regard to age, the odds ratio roughly represents the number of times a patient who is over age 50 is more likely to die in the hospital than another patient who is one year younger, all other significant risk factors being the same. Thus, the chance of in-hospital/30-day mortality for a patient undergoing CABG surgery who is 51 years old is approximately 1.050 times that of a 50 year-old patient undergoing CABG, all other risk factors being the same. All patients age 50 or under have roughly the same odds of dying in the hospital or after discharge but within 30 days if their risk factors are identical.

Body surface area (BSA) is a function of height and weight and is a proxy for vessel size. Since larger vessels are easier to work with, larger BSA is associated with decreased likelihood of mortality. This model includes terms for both BSA and BSA - squared, reflecting the fact that for these patients, the lowest and highest body surface areas were related to higher mortality, all other risk factors remaining the same. This functional form is used to improve the model's ability to predict mortality, but it means that the odds ratios for these terms do not have a straightforward interpretation.

Ejection Fraction, which is the percentage of blood in the heart's left ventricle that is expelled when it contracts (with more denoting a healthier heart), is subdivided into four ranges: less than 20 percent; 20-29 percent; 30-39 percent; and 40 percent or more. The last range is referred to as the reference category. This means that the odds ratios that appear for the other Ejection Fraction categories in the table are relative to patients with an ejection fraction of 40 percent or more. Thus, a patient with an ejection fraction less than 20 percent is about 2.242 times as likely to die in the hospital or after discharge but within 30 days as a patient with an ejection fraction of 40 percent or higher, all other significant risk factors being the same.

Previous MI is subdivided into five groups: occurring less than 1 day prior to surgery; occurring 1 to 7 days prior to surgery; occurring 8 to 20 days prior to surgery; occurring 21 or more days prior to surgery; and no MI prior to the procedure. The last range is referred to as the reference category. The odds ratios for the Previous MI ranges listed above are relative to patients who have not had a previous MI prior to the procedure.

Since Renal Failure is expressed in terms of Renal Failure with dialysis and without dialysis, the odds ratios are relative to patients with no dialysis prior to surgery and no pre-operative creatinine greater than 1.5 mg/dL.

Appendix 1: Multivariable Risk Factor Equation for CABG In-Hospital/30-Day Deaths in New York State in 2008-2010

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 50	—	0.0492	<.0001	1.050
Female Gender	26.57	0.3737	0.0004	1.453
Body Surface Area (0.1 m^2)	—	-0.5298	0.0007	—
Body Surface Area – squared (0.01 m^4)	—	0.0125	0.0009	—
Hemodynamic State				
Unstable	0.75	1.5670	<.0001	4.792
Ventricular Function				
Ejection Fraction				
Ejection Fraction ≥ 40%	81.05	— Reference —		1.000
Ejection Fraction < 20%	1.65	0.8075	0.0009	2.242
Ejection Fraction 20-29%	6.26	0.7366	<.0001	2.089
Ejection Fraction 30-39%	11.05	0.5433	<.0001	1.722
Previous MI				
No Previous MI	52.55	— Reference —		1.000
Previous MI less than 1 day	2.39	1.0058	<.0001	2.734
Previous MI 1 - 7 days	17.40	0.5151	<.0001	1.674
Previous MI 8 - 20 days	5.58	0.4336	0.0087	1.543
Previous MI 21 days or more	22.08	0.3156	0.0094	1.371
Comorbidities				
COPD	23.53	0.3383	0.0005	1.403
Peripheral Vascular Disease	12.19	0.5530	<.0001	1.738
Renal Failure				
No Renal Failure	87.84	— Reference —		1.000
Renal Failure, Creatinine > 1.5 mg/dl	9.56	0.7058	<.0001	2.025
Renal Failure, Requiring Dialysis	2.60	1.3674	<.0001	3.925
Previous Open Heart Operations	3.01	0.4398	0.0297	1.552

Intercept = -0.4531

C Statistic = 0.764

Appendix 2. 2008-2010 Risk Factors For Valve Surgery In-Hospital/30-Day Mortality

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve surgery in the 2008-2010 time period are presented in the table that follows.

Most of the risk factors in this model, including Age, Female Gender, BSA, Previous MI, Peripheral Vascular Disease, Renal Failure, and Previous Open Heart Operations are interpreted in the same way as described in Appendix 1. The interpretation of Diabetes, Endocarditis, and Cerebrovascular Disease is like that provided for COPD in Appendix 1 - the patient either has the risk factor or does not have the risk factor.

The odds ratio for type of valve surgery represents the number of times a patient with a specific valve surgery is more likely to die in the hospital during or after that particular surgery or after discharge but within 30 days than a patient who has had aortic valve replacement surgery, all other risk factors being the same. For example, a patient who has a mitral valve replacement surgery is 1.529 times as likely to die in the hospital during or after surgery or after discharge but within 30 days as a patient with aortic valve replacement surgery, all other significant risk factors being the same.

Appendix 2: Multivariable Risk Factor Equation for Valve Surgery In-Hospital/30-Day Deaths In NYS, 2008-2010.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: number of years greater than 50	—	0.0474	<.0001	1.049
Female Gender	48.38	0.4194	0.0002	1.521
Body Surface Area (0.1 m^2)	—	-0.5049	0.0013	—
Body Surface Area – squared (0.01 m^4)	—	0.0124	0.0016	—
Type of Valve Surgery				
Aortic Valve Replacement	49.37	— Reference —		1.000
Mitral Valve Replacement	13.93	0.4245	0.0023	1.529
Mitral Valve Repair	17.11	-0.3795	0.0660	0.684
Multiple Valve Repair/Replacement	19.59	0.7905	<.0001	2.204
Hemodynamic State				
Unstable	0.56	1.1143	0.0005	3.048
Ventricular Function				
Previous MI				
No Previous MI	98.16	— Reference —		1.000
Previous MI within 20 days	1.84	0.5829	0.0134	1.791
Comorbidities				
Cerebrovascular Disease	13.38	0.3549	0.0019	1.426
Diabetes, Requiring Medication	18.76	0.2876	0.0085	1.333
Endocarditis	5.14	0.7035	<.0001	2.021
Peripheral Vascular Disease	7.92	0.4396	0.0009	1.552
Renal Failure				
No Renal Failure	75.01	— Reference —		1.000
Renal Failure, Creatinine 1.3 -1.5 mg/dl	12.08	0.6392	<.0001	1.895
Renal Failure, Creatinine 1.6 -2.5 mg/dl	8.40	0.9162	<.0001	2.500
Renal Failure, Creatinine > 2.5 mg/dl	1.62	1.3960	<.0001	4.039
Renal Failure, Requiring Dialysis	2.89	2.1276	<.0001	8.395
Previous Open Heart Operations	17.98	0.5871	<.0001	1.799

Intercept = -0.5435

C Statistic = 0.792

Appendix 3. 2008-2010 Risk Factors For Valve and CABG Surgery In-Hospital/30-Day Mortality

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve and CABG surgery in the 2008-2010 time period are presented in the table that follows. Most of the risk factors in this model are interpreted in the same way as described in Appendix 1.

The interpretation for Age is similar to that described in Appendix 1. In this case, the odds ratio for age roughly represents the number of times a patient who is over age 70 is more likely to die in the hospital or after discharge but within 30 days than another patient who is one year younger with all the other significant risk factors the same.

The odds ratio for Type of Valve with CABG surgery represents the number of times a patient with a specific Valve with CABG surgery is more likely to die in the hospital during or after that particular surgery or after discharge but within 30 days than a patient who has had aortic valve repair or replacement and CABG surgery, all other risk factors being the same. For example, a patient who has a mitral valve replacement and CABG surgery is 1.671 times as likely to die in the hospital during or after surgery as a patient with aortic valve repair or replacement and CABG surgery, all other significant risk factors being the same.

Three Vessels Diseased refers to patients with at least a 70 percent blockage in each of the three native coronary arteries - the Left Anterior Descending (LAD), the Right Coronary Artery (RCA), and the Left Circumflex (LCX) or their major branches. The reference category for this group includes patients who have fewer than three vessels diseased.

Appendix 3: Multivariable Risk Factor Equation for Valve and CABG Surgery In-Hospital/ 30-Day Deaths in NYS, 2008-2010.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 70	—	0.0640	<.0001	1.066
Female Gender	36.42	0.3644	0.0010	1.440
Body Surface Area (0.1 m^2)	—	-0.8920	<.0001	—
Body Surface Area – squared (0.01 m^4)	—	0.0221	<.0001	—
Type of Valve (with CABG)				
Aortic Valve Replacement	60.73	— Reference —		1.000
Mitral Valve Replacement	9.76	0.5131	0.0007	1.671
Mitral Valve Repair	18.49	-0.0887	0.5622	0.915
Multiple Valve Repair/Replacement	11.03	1.1861	<.0001	3.274
Hemodynamic State				
Unstable	1.07	1.0810	0.0005	2.948
Ventricular Function				
Ejection Fraction				
Ejection Fraction ≥ 30%	88.42	— Reference —		1.000
Ejection Fraction < 30 %	11.58	0.4426	0.0009	1.557
Comorbidities				
Cerebrovascular Disease	22.63	0.3134	0.0027	1.368
Peripheral Vascular Disease	13.45	0.3280	0.0066	1.388
Renal Failure				
No Renal Failure	65.56	— Reference —		1.000
Renal Failure, Creatinine 1.3 – 1.5 mg/dl	16.73	0.5421	<.0001	1.720
Renal Failure, Creatinine 1.6 – 2.0 mg/dl	9.76	0.7820	<.0001	2.186
Renal Failure, Creatinine > 2.0 mg/dl	4.82	1.2898	<.0001	3.632
Renal Failure Requiring Dialysis	3.13	1.6940	<.0001	5.441
Previous Open Heart Operations	7.81	0.4301	0.0040	1.537
Three Vessels Diseased	25.30	0.2590	0.0150	1.296

Intercept = 4.5366

C Statistic = 0.753

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Albany, New York 12208

Arnot Ogden Medical Center
600 Roe Avenue
Elmira, New York 14905

Bellevue Hospital Center
First Avenue and 27th Street
New York, New York 10016

Beth Israel Medical Center
10 Nathan D. Perlman Place
New York, New York 10003

Buffalo General Hospital
100 High Street
Buffalo, New York 14203

Champlain Valley Physicians Hospital
Medical Center
75 Beekman Street
Plattsburgh, New York 12901

Columbia Presbyterian Medical Center
– NY Presbyterian
161 Fort Washington Avenue
New York, New York 10032

Ellis Hospital
1101 Nott Street
Schenectady, New York 12308

Erie County Medical Center
462 Grider Street
Buffalo, New York 14215

Good Samaritan Hospital of Suffern
255 Lafayette Avenue
Suffern, New York 10901

Lenox Hill Hospital
100 East 77th Street
New York, New York 10021

Long Island Jewish
Medical Center
270-05 76th Avenue
New Hyde Park, New York 11040

Maimonides Medical Center
4802 Tenth Avenue
Brooklyn, New York 11219

Mary Imogene Bassett Healthcare
Atwell Road
Cooperstown, New York 13326

Mercy Hospital
565 Abbott Road
Buffalo, New York 14220

Millard Fillmore Hospital ***
3 Gates Circle
Buffalo, New York 14209

Montefiore Medical Center
Henry & Lucy Moses Division
111 East 210th Street
Bronx, New York 11219

Montefiore Medical Center-
Weiler Hospital of
A. Einstein College of Medicine
1825 Eastchester Road
Bronx, New York 10461

Mount Sinai Medical Center
One Gustave L. Levy Place
New York, New York 10019

NYU Hospitals Center
550 First Avenue
New York, New York 10016

New York Hospital Medical
Center-Queens
56-45 Main Street
Flushing, New York 11355

New York Methodist Hospital
506 Sixth Street
Brooklyn, New York 11215

North Shore University Hospital
300 Community Drive
Manhasset, New York 11030

Rochester General Hospital
1425 Portland Avenue
Rochester, New York 14621

St. Elizabeth Medical Center
2209 Genesee Street
Utica, New York 13413

St. Francis Hospital
Port Washington Boulevard
Roslyn, New York 11576

St. Joseph's Hospital
Health Center
301 Prospect Avenue
Syracuse, New York 13203

St. Luke's Roosevelt
Hospital Center
11-11 Amsterdam Avenue
at 114th Street
New York, New York 10025

St. Peter's Hospital
315 South Manning Boulevard
Albany, New York 12208

SVCMC - St. Vincent's Manhattan *
Center of NY
153 West 11th Street
New York, New York 10011

Southside Hospital**
301 East Main Street
Bayshore, New York 11706

Staten Island
University Hospital – North
475 Seaview Avenue
Staten Island, New York 10305

Strong Memorial Hospital
601 Elmwood Avenue
Rochester, New York 14642

United Health Services
Wilson Hospital Division
33-57 Harrison Street
Johnson City, New York 13790

University Hospital at Stony Brook
Stony Brook, New York 11794-8410

University Hospital of Brooklyn
450 Lenox Road
Brooklyn, New York 11203

University Hospital SUNY Health
Sciences Center
750 East Adams Street
Syracuse, New York 13210

Vassar Brother's Medical Center
45 Reade Place
Poughkeepsie, New York 12601

Weill-Cornell Medical Center –
NY Presbyterian
525 East 68th Street
New York, New York 10021

Westchester Medical Center
Grasslands Road
Valhalla, New York 10595

Winthrop University Hospital
259 First Street
Mineola, New York 11501

* Hospital closed in 2010
** Began performing cardiac surgery after 2010
*** Hospital closed in 2012

Additional copies of this report may be obtained through the Department of Health web site at http://www.nyhealth.gov or by writing to:

Cardiac
Box 2006
New York State Department of Health
Albany, New York 12220


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