

ADULT CARDIAC SURGERY

in New York State
2010-2012



**Department
of Health**

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INTRODUCTION

For over twenty years, the NYS Cardiac Data Reporting System has been a powerful resource for quality improvement in the areas of cardiac surgery and percutaneous coronary interventions (PCI). Building on this strong foundation, we are pleased to include for the first time in one report information on mortality after coronary artery bypass graft (CABG) surgery and valve repair or replacement surgery, readmissions after CABG, and preliminary information on transcatheter aortic valve replacement (TAVR) in NYS.

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.

The information contained in this report is intended for health care providers, patients and families of patients who are considering cardiac surgery. It includes:

- Mortality rates, adjusted for patient severity of illness, for CABG surgery and valve repair or replacement surgery at NYS hospitals.
- Readmission rates, adjusted for patient severity of illness, following CABG at NYS hospitals.
- Mortality rates, adjusted for patient severity of illness, following CABG for surgeons performing the procedure.
- Volume (number of cases) of all cardiac surgery for NYS hospitals and surgeons.
- Volume (number of cases) of TAVR at NYS hospitals.
- Description of the patient risk factors associated with mortality for CABG and valve surgery and those associated with readmissions after CABG surgery.

The data that serve as the basis for this report are collected by the NYS Department of Health cooperatively with hospitals throughout the state. Careful auditing and rigorous analysis assure that these reports represent meaningful outcome assessments. The report was developed with clinical guidance from the NYS Cardiac Advisory Committee, an advisory body to the Commissioner of Health consisting of nationally recognized cardiac surgeons, cardiologists and others from related disciplines working both in New York State and elsewhere. The Cardiac Advisory Committee is to be commended for sustained leadership in these efforts.

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 2012. Important changes may have taken place in hospitals during that time period.

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 sedentary lifestyle. Careful attention to these risk factors after surgery will continue to be important in promoting good health and preventing recurrence of disease.

Hospitals and physicians in NYS can take pride in the excellent patient care provided and in their role in contributing to this unique collaborative quality improvement system. The Department of Health will continue to work in partnership with hospitals and physicians to ensure that continued high-quality cardiac surgery is available to NYS residents.

CORONARY ARTERY BYPASS GRAFT SURGERY (CABG)

Heart disease is 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. 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.

HEART 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 surgeries when done alone or in combination with CABG: Aortic Valve Replacement, Mitral Valve Repair, Mitral Valve Replacement and Multiple Valve Surgery.

In recent years, a new technique for replacement of the aortic valve has been tested and approved for use in the United States under certain circumstances. This procedure, known as Transcatheter Aortic Valve Replacement (TAVR, also sometimes called Transcatheter Aortic Valve Implantation or TAVI), differs from traditional surgical valve replacement in that the replacement valve is delivered to the

heart through a catheter rather than through a standard surgical incision. The procedure is performed collaboratively by cardiologists and cardiac surgeons.

During the time-period included in this report (2010-2012), the procedure was performed relatively infrequently at a limited number of hospitals. The volume of cases in this time period is not large enough to adequately risk-adjust outcomes at the hospital or physician level. In the interest of providing some information about this emerging procedure while avoiding the risk of drawing invalid conclusions based on limited data, this report contains the volume of TAVR cases in 2012 for each hospital as well as the volume of cases for NYS and in-hospital mortality rate for all TAVR procedures performed in NYS in Table 5.

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 December 1, 2009, and November 30, 2012, provided by all non-federal hospitals in NYS where cardiac surgery is performed. The analysis period for this report includes patients discharged in December 2009 but not those discharged in December 2012. This strategy allows for more timely report publication by eliminating the need to track patients for 30-day mortality into the following calendar year. Inclusion of cases from

the previous December allows for meaningful comparison of 12-month volume as found in previous reports. The single year analysis for 2012 cases includes patients discharged from December 1, 2011 through November 30, 2012. In total there were 57,512 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.

When 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 9 cases reported by this hospital in the analysis period are not included in this report.

In addition, 111 records were excluded because they belong to patients residing outside the United States, and these patients could not be followed after hospital discharge. There were 9 cases excluded from analysis because each 30-day mortality can only be associated with a single cardiac surgery.

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 43.] 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, 524 cases with cardiogenic shock were removed from the data. This accounts for 0.91 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 56,859 cardiac surgeries analyzed in this report. Isolated CABG surgery represented 46.26 percent of all adult cardiac surgery included in this report. Valve or combined valve/CABG surgery represented 38.98 percent of all adult cardiac surgery for the same period. TAVR represented 1.26 percent of all cardiac surgeries reported. 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 2010 through 2012.

While there were 8,142 CABG cases included in the mortality analysis for 2012 discharges, some additional exclusions were required for the readmission analysis. Records belonging to patients residing outside NYS were excluded because there is no reliable way to track out-of-state readmissions. This accounted for 290 cases. Another 80 patients were excluded because they died in the same admission as their index CABG, so readmission was impossible.

One patient had a third admission within 30 days of the procedure after having had a CABG in the first and second admission, and this was counted as only a single re-admission. In total, the number of exclusions was 371, leaving 7771 cases to be examined for 30-day readmission rates.

Note on Hospitals Not Performing Cardiac Surgery During Entire 2010 – 2012 Period

Southside hospital began performing cardiac surgery in February 2011. Millard Fillmore hospital closed in 2012 and performed the last cardiac surgery in March of that year.

RISK ADJUSTMENT

FOR ASSESSING PROVIDER PERFORMANCE

Provider performance is directly related to patient outcomes. Whether patients recover quickly, experience complications, require another hospitalization, 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 death and readmission 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 and 30-Day Readmission

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 Department of Health, the New York City Department of Health and Mental Hygiene Bureau of Vital Statistics, the National Death Index, and the Social Security Administration Death Master File.

Data on readmissions are obtained from the Department of Health's acute care hospital dataset, the Statewide Planning and Research Cooperative System (SPARCS), which contains data pertaining to all acute care hospital discharges in the state.

Thirty-day readmission is defined as admission to a NYS non-Federal hospital within 30 days of discharge from the index hospitalization. For patients whose index hospitalization ends in transfer to another acute care facility, the 30 day period begins upon discharge from the second hospital.

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 or readmission 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 or being readmitted, 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 1.46 percent (in-hospital/30-day mortality in 2012) to obtain the provider's RAMR. For the three-year period 2010-2012, the ratio is multiplied by 1.46 percent (in-hospital/30-day mortality rate) for isolated CABG patients or 3.74 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.

Predicting Patient Readmission and Computing and Interpreting Risk-Adjusted Readmission Rates

Patient risk of 30-day readmission is assessed using the same methods used for assessing mortality risk as described above. All potential risk factors are considered and those that are independently related to readmission are identified and given weights so as to best predict the risk of 30-day readmission for each patient. Observed readmission rates (ORR), expected readmission rates (ERR) and risk-adjusted readmission rates (RARR) are calculated in the same way that OMR, EMR and RAMR are calculated. ERR and RARR are compared to the statewide observed readmission rate (14.39 percent in 2012).

This analysis is based on all-cause readmission, not just readmission directly related to the CABG procedure. Not all readmissions represent a poor patient outcome or reflect poor patient care. However, by risk-adjusting and comparing the results across the many hospitals that perform this procedure we are able to look for meaningful differences from the overall statewide experience. If the RARR is significantly lower than the statewide readmission rate, the hospital has a better performance than the state as a whole; if the RARR is significantly higher than the statewide readmission rate, the hospital has a worse performance than the state as a whole.

As described above for mortality, there are reasons that a provider's RARR may not be indicative of its true quality. Confidence intervals and careful attention to data quality are used in the same way for readmission as they are for mortality.

How This Initiative Contributes to Quality Improvement

One 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.

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, 1.46 percent for Isolated CABG patients in 2012 or 3.74 percent for Valve or Valve/CABG patients in 2010-2012).

The **observed readmission rate (ORR)** is the observed number of 30-day readmissions divided by the total number of analyzed cases.

The **expected readmission rate (ERR)** is the sum of the predicted probabilities of readmission for all patients divided by the total number of analyzed cases.

The **risk-adjusted readmission rate (RARR)** is the best estimate, based on the statistical model, of what the provider's readmission rate would have been if the provider had a mix of patients similar to the statewide mix. It is obtained by first dividing the ORR by the ERR, and then multiplying that quotient by the statewide readmission rate (14.39 percent 30-day readmission rate for all CABG patients discharged in 2012).

Confidence Intervals are used to identify which hospitals had significantly more or fewer deaths or readmissions than expected given the risk factors of their patients. The confidence interval identifies the range in which the risk-adjusted rate 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 risk-adjusted rate decreases.

2012 HOSPITAL OUTCOMES FOR CABG SURGERY

Table 1 and Figure 1 present the CABG surgery results for the 40 hospitals performing this operation in NYS in 2012. 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 2012, the number of in-hospital/30-day deaths, the OMR, the EMR based on the statistical model presented in Appendix 1, the RAMR and a 95 percent confidence interval for the RAMR.

As indicated in Table 1, the overall in-hospital/30-day mortality rate for the 8,142 CABG surgeries was 1.46 percent. In-hospital/30-day OMRs ranged from 0.00 percent to 4.79 percent. The range of EMRs, which measure patient severity of illness, was 0.79 percent to 2.74 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 8.04 percent. No hospitals had RAMRs that were significantly lower than the statewide rate. Three hospitals (Bellevue Hospital Center in Manhattan, Rochester General Hospital, and UHS-Wilson Medical Center in Johnson City) had mortality rates that were significantly higher than the statewide rate.

The 2012 in-hospital/30-day mortality rate of 1.46 percent for Isolated CABG is higher than the 1.24 percent observed in 2011.

The in-hospital OMR for 2012 Isolated CABG discharges (not shown in Table 1) was 1.01 percent for all 8,142 patients included in the analysis.

Figure 1 provides a visual representation of the data displayed in Table 1. 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.

Table 2 presents the 30-day readmission results for the 40 hospitals performing CABG in NYS in 2012 for which data could be analyzed. The table contains, for each hospital, the number of CABG operations resulting in 2012 discharges, the number of in-hospital/30-day readmissions, the ORR, the ERR based on the statistical model presented in Appendix 2, the RARR and a 95 percent confidence interval for the RARR.

The overall in-hospital/30-day ORR for the 7771 CABG operations included in this 2012 analysis was 14.39 percent. Observed readmission rates ranged from 7.32 percent to 20.51 percent. The range in ERRs, which measure patient severity of illness, was between 12.15 percent and 18.76 percent. The RARRs, which measure hospital performance, range from 7.60 percent to 20.87 percent. Based on confidence intervals for RARRs, one hospital (Winthrop University Hospital in Mineola) had a RARR that was significantly higher than the statewide average. Three hospitals (Albany Medical Center, Mercy Hospital in Buffalo, and Vassar Brothers Medical Center in Poughkeepsie) had RARRs that were significantly lower than the statewide average.

Figure 2 provides a visual representation of the data displayed in Table 2. It is interpreted in the same way as Figure 1 described above.

Table 1**In-hospital/30-Day Observed, Expected and Risk-Adjusted Mortality Rates for Isolated CABG Surgery in New York State, 2012 Discharges**

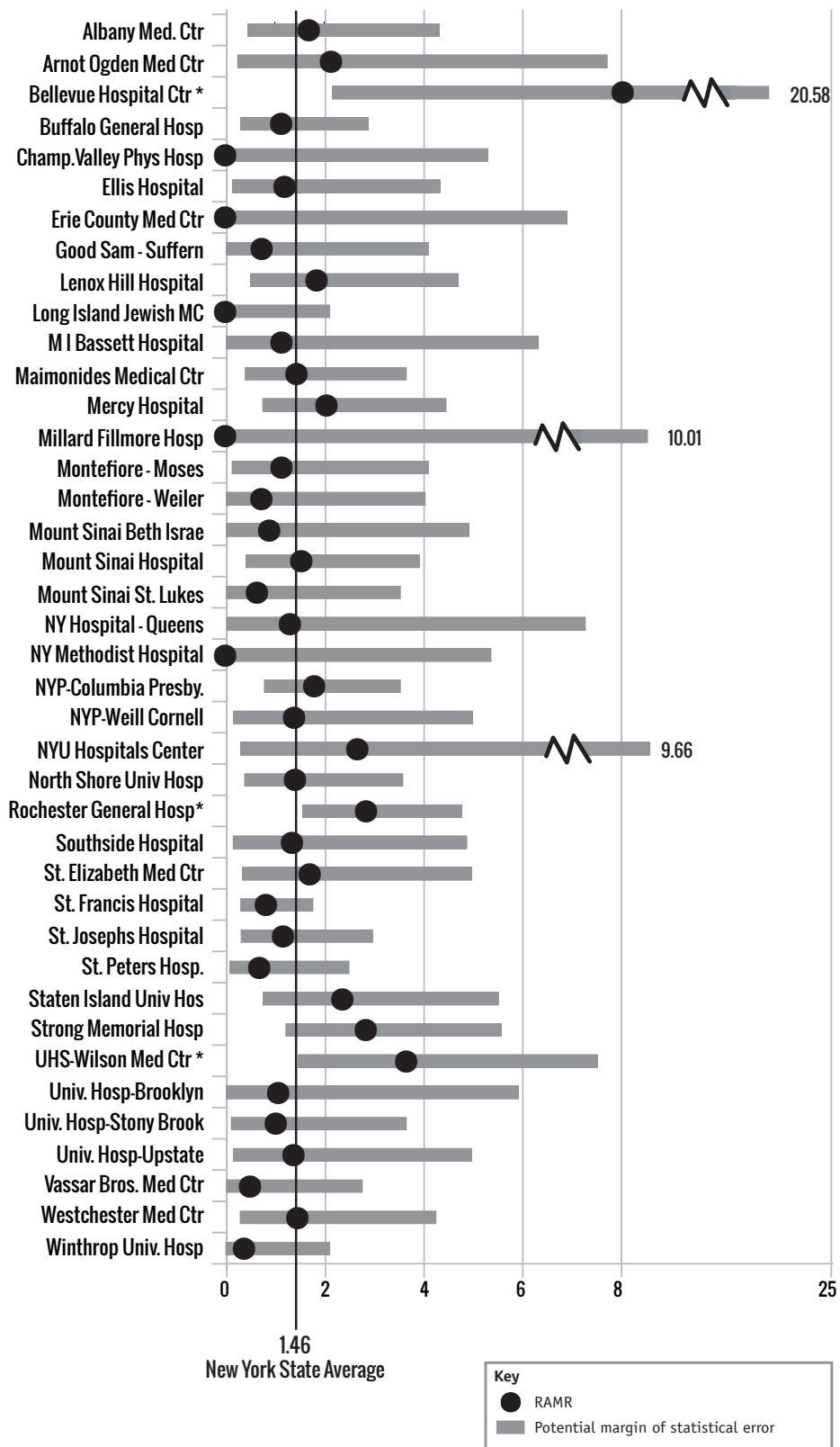
(Listed Alphabetically by Hospital)

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med. Ctr	245	4	1.63	1.41	1.69	(0.45, 4.33)
Arnot Ogden Med Ctr	85	2	2.35	1.61	2.14	(0.24, 7.73)
Bellevue Hospital Ctr	92	4	4.35	0.79	8.04*	(2.16,20.58)
Buffalo General Hosp	387	4	1.03	1.34	1.13	(0.30, 2.90)
Champ.Valley Phys Hosp	82	0	0.00	1.23	0.00	(0.00, 5.32)
Ellis Hospital	170	2	1.18	1.43	1.20	(0.14, 4.35)
Erie County Med Ctr	70	0	0.00	1.11	0.00	(0.00, 6.92)
Good Sam - Suffern	126	1	0.79	1.57	0.74	(0.01, 4.11)
Lenox Hill Hospital	242	4	1.65	1.31	1.85	(0.50, 4.72)
Long Island Jewish MC	189	0	0.00	1.34	0.00	(0.00, 2.12)
M I Bassett Hospital	81	1	1.23	1.58	1.14	(0.01, 6.34)
Maimonides Medical Ctr	255	4	1.57	1.60	1.44	(0.39, 3.67)
Mercy Hospital	306	6	1.96	1.40	2.05	(0.75, 4.47)
Millard Fillmore Hosp	59	0	0.00	0.91	0.00	(0.00,10.01)
Montefiore - Moses	196	2	1.02	1.31	1.14	(0.13, 4.11)
Montefiore - Weiler	151	1	0.66	1.33	0.73	(0.01, 4.05)
Mount Sinai Beth Israel	143	1	0.70	1.15	0.89	(0.01, 4.94)
Mount Sinai Hospital	319	4	1.25	1.19	1.54	(0.41, 3.93)
Mount Sinai St. Lukes	120	1	0.83	1.91	0.64	(0.01, 3.55)
NY Hospital - Queens	98	1	1.02	1.14	1.31	(0.02, 7.29)
NY Methodist Hospital	87	0	0.00	1.15	0.00	(0.00, 5.38)
NYP-Columbia Presby.	416	8	1.92	1.56	1.80	(0.78, 3.55)
NYP-Weill Cornell	163	2	1.23	1.29	1.39	(0.16, 5.01)
NYU Hospitals Center	133	2	1.50	0.82	2.67	(0.30, 9.66)
North Shore Univ Hosp	278	4	1.44	1.49	1.41	(0.38, 3.60)
Rochester General Hosp	342	14	4.09	2.10	2.85*	(1.56, 4.79)
Southside Hospital	124	2	1.61	1.74	1.35	(0.15, 4.89)
St. Elizabeth Med Ctr	190	3	1.58	1.35	1.71	(0.34, 4.99)
St. Francis Hospital	667	6	0.90	1.61	0.82	(0.30, 1.78)
St. Josephs Hospital	383	4	1.04	1.31	1.17	(0.31, 2.99)
St. Peters Hosp.	319	2	0.63	1.32	0.69	(0.08, 2.51)
Staten Island Univ Hosp	186	5	2.69	1.66	2.37	(0.76, 5.53)
Strong Memorial Hosp	283	8	2.83	1.46	2.84	(1.22, 5.59)
UHS-Wilson Med Ctr	146	7	4.79	1.92	3.66*	(1.47, 7.54)
Univ. Hosp-Brooklyn	50	1	2.00	2.74	1.07	(0.01, 5.94)
Univ. Hosp-Stony Brook	203	2	0.99	1.42	1.02	(0.11, 3.67)
Univ. Hosp-Upstate	148	2	1.35	1.43	1.38	(0.16, 4.99)
Vassar Bros. Med Ctr	190	1	0.53	1.54	0.50	(0.01, 2.78)
Westchester Med Ctr	193	3	1.55	1.56	1.46	(0.29, 4.27)
Winthrop Univ. Hosp	225	1	0.44	1.71	0.38	(0.00, 2.12)
Statewide Total	8142	119	1.46			

* Risk-adjusted mortality rate significantly higher than the 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, 2012 Discharges



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

Table 2**In-hospital/30-Day Observed, Expected and Risk-Adjusted Readmission Rates for Isolated CABG Surgery in New York State, 2012 Discharges**

(Listed Alphabetically by Hospital)

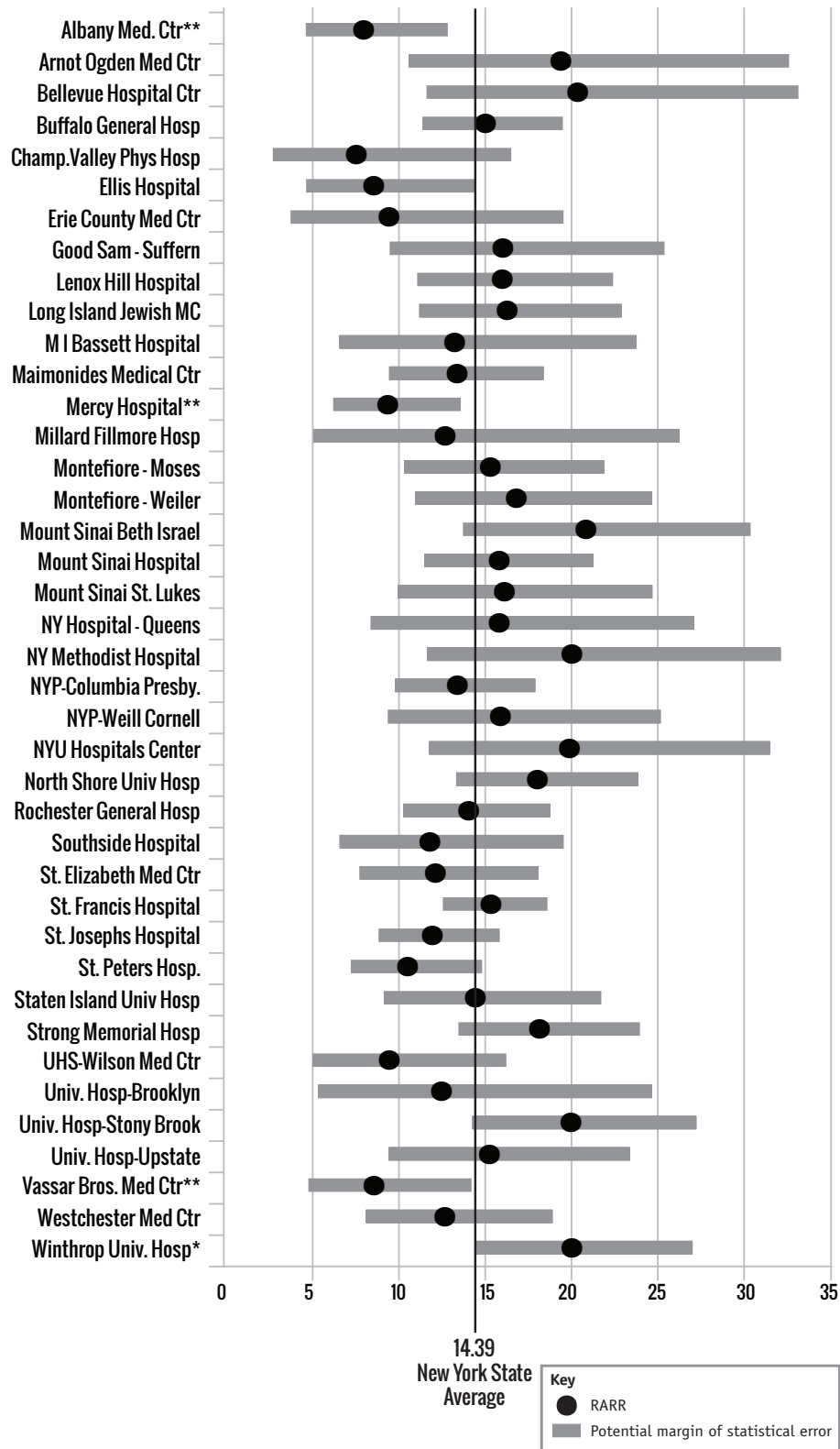
Hospital	Cases	Readmits	ORR	ERR	RARR	95% CI for RARR
Albany Med. Ctr	213	17	7.98	14.27	8.04**	(4.68,12.88)
Arnot Ogden Med Ctr	78	14	17.95	13.30	19.42	(10.61,32.58)
Bellevue Hospital Ctr	88	16	18.18	12.83	20.39	(11.65,33.12)
Buffalo General Hosp	382	57	14.92	14.25	15.07	(11.41,19.52)
Champ.Valley Phys Hosp	82	6	7.32	13.85	7.60	(2.78,16.54)
Ellis Hospital	167	14	8.38	14.02	8.61	(4.70,14.44)
Erie County Med Ctr	69	7	10.14	15.37	9.49	(3.80,19.56)
Good Sam - Suffern	112	18	16.07	14.39	16.06	(9.52,25.39)
Lenox Hill Hospital	224	34	15.18	13.61	16.04	(11.11,22.42)
Long Island Jewish MC	188	33	17.55	15.48	16.31	(11.23,22.91)
M I Bassett Hospital	81	11	13.58	14.71	13.28	(6.62,23.77)
Maimonides Medical Ctr	252	38	15.08	16.17	13.42	(9.49,18.41)
Mercy Hospital	301	28	9.30	14.19	9.43**	(6.26,13.63)
Millard Fillmore Hosp	59	7	11.86	13.39	12.74	(5.11,26.26)
Montefiore - Moses	191	30	15.71	14.73	15.34	(10.35,21.90)
Montefiore - Weiler	149	26	17.45	14.90	16.84	(11.00,24.68)
Mount Sinai Beth Israel	140	27	19.29	13.30	20.87	(13.75,30.36)
Mount Sinai Hospital	302	44	14.57	13.22	15.86	(11.52,21.29)
Mount Sinai St. Lukes	113	21	18.58	16.56	16.15	(9.99,24.69)
NY Hospital - Queens	96	13	13.54	12.30	15.85	(8.43,27.10)
NY Methodist Hospital	86	17	19.77	14.19	20.05	(11.67,32.10)
NYP-Columbia Presby.	350	46	13.14	14.06	13.44	(9.84,17.93)
NYP-Weill Cornell	132	18	13.64	12.32	15.93	(9.43,25.17)
NYU Hospitals Center	107	18	16.82	12.15	19.92	(11.80,31.48)
North Shore Univ Hosp	273	49	17.95	14.30	18.06	(13.36,23.88)
Rochester General Hosp	331	46	13.90	14.20	14.09	(10.31,18.79)
Southside Hospital	121	15	12.40	15.04	11.86	(6.63,19.56)
St. Elizabeth Med Ctr	187	24	12.83	15.18	12.17	(7.79,18.10)
St. Francis Hospital	649	105	16.18	15.12	15.39	(12.59,18.63)
St. Josephs Hospital	379	49	12.93	15.49	12.01	(8.88,15.88)
St. Peters Hosp.	309	33	10.68	14.52	10.58	(7.28,14.86)
Staten Island Univ Hosp	171	23	13.45	13.35	14.49	(9.18,21.74)
Strong Memorial Hosp	275	50	18.18	14.39	18.18	(13.49,23.97)
UHS-Wilson Med Ctr	131	13	9.92	15.02	9.51	(5.06,16.26)
Univ. Hosp-Brooklyn	49	8	16.33	18.76	12.52	(5.39,24.67)
Univ. Hosp-Stony Brook	195	40	20.51	14.76	20.00	(14.29,27.23)
Univ. Hosp-Upstate	145	21	14.48	13.62	15.30	(9.47,23.39)
Vassar Bros. Med Ctr	185	15	8.11	13.50	8.64**	(4.83,14.25)
Westchester Med Ctr	188	24	12.77	14.43	12.72	(8.15,18.93)
Winthrop Univ. Hosp	221	43	19.46	13.96	20.05*	(14.51,27.01)
Statewide Total	7771	1118	14.39			

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

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

Figure 2

In-Hospital / 30-day Risk-Adjusted Readmission Rates for Isolated CABG in New York State, 2012 Discharges



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

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

2010-2012 HOSPITAL OUTCOMES FOR VALVE SURGERY

Table 3 and Figure 3 present the combined Valve Only and Valve/CABG surgery results for the 40 hospitals performing these operations in NYS during the years 2010-2012. The table contains, for each hospital, the combined number of Valve Only and Valve/CABG operations resulting in 2010-2012 discharges, the number of in-hospital/30-day deaths, the OMR, the EMR based on the statistical models presented in Appendices 3-4, 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 22,161 combined Valve Only and Valve/CABG procedures performed at the 40 hospitals was 3.74 percent. The OMRs ranged from 0.00 percent to 8.41 percent. The range of EMRs, which measure patient severity of illness, was 1.62 percent to 4.55 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 14.59 percent. Two hospitals (Arnot Ogden Medical Center in Elmira, and Rochester General Hospital) had RAMRs that were significantly higher than the statewide rate. One hospital (Long Island Jewish Medical Center in New Hyde) had a RAMR that was significantly lower than the statewide rate.

Figure 3 provides a visual representation of the data displayed in Table 3. It is interpreted in the same way as Figure 1 described above.

Table 4 presents valve procedures performed at the 40 cardiac surgery hospitals in NYS during 2010-2012. 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 2010-2012 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 2010-2012 in-hospital/30-day OMR of 3.74 percent for Valve and Valve/CABG surgeries is lower than the 4.22 percent observed for 2009-2011. The in-hospital OMR for 2010-2012 valve surgeries (not shown in Table 3) is 3.22 percent for the 22,161 patients included in this analysis.

Table 5 presents the number of transcatheter aortic valve replacement (TAVR) procedures performed at the 15 hospitals performing TAVR during the 2012 discharge period. Table 5 also presents the statewide in-hospital / 30-day mortality rate of 6.71 percent for the 715 TAVR discharges during that time period. It is important to note that TAVR was a relatively new procedure during the time period in question and the number of cases performed in 2012 may be very different from current program volume. Some hospitals listed in Table 5 began performing the procedure during 2012 and the number of cases listed does not represent a full year's program activity. Other hospitals have begun performing the procedure more recently.

Table 3**In-hospital/30-Day Observed, Expected, and Risk-Adjusted Mortality Rates for Valve or Valve/CABG Surgery in New York State, 2010 - 2012 Discharges.**

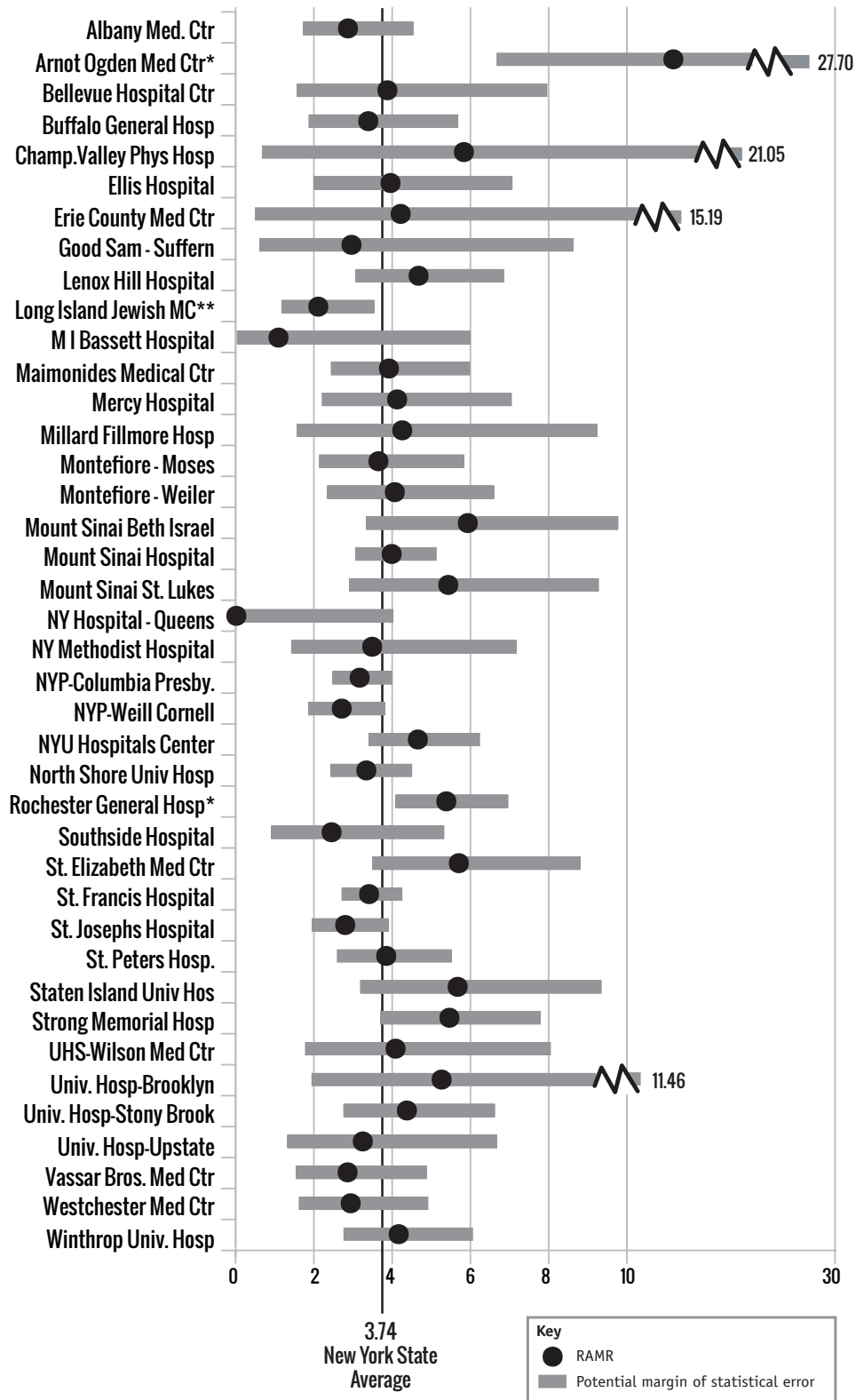
Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med. Ctr	599	18	3.01	3.93	2.86	(1.70, 4.53)
Arnot Ogden Med Ctr	107	9	8.41	2.16	14.59*	(6.66,27.70)
Bellevue Hospital Ctr	264	7	2.65	2.57	3.87	(1.55, 7.96)
Buffalo General Hosp	542	14	2.58	2.86	3.38	(1.85, 5.68)
Champ.Valley Phys Hosp	79	2	2.53	1.62	5.83	(0.65,21.05)
Ellis Hospital	306	11	3.59	3.40	3.95	(1.97, 7.07)
Erie County Med Ctr	47	2	4.26	3.78	4.21	(0.47,15.19)
Good Sam - Suffern	152	3	1.97	2.50	2.95	(0.59, 8.63)
Lenox Hill Hospital	501	26	5.19	4.15	4.67	(3.05, 6.85)
Long Island Jewish MC	582	14	2.41	4.28	2.10**	(1.15, 3.53)
M I Bassett Hospital	116	1	0.86	2.99	1.08	(0.01, 6.00)
Maimonides Medical Ctr	455	21	4.62	4.41	3.91	(2.42, 5.98)
Mercy Hospital	449	13	2.90	2.63	4.12	(2.19, 7.05)
Millard Fillmore Hosp	214	6	2.80	2.47	4.25	(1.55, 9.24)
Montefiore - Moses	412	17	4.13	4.24	3.64	(2.12, 5.83)
Montefiore - Weiler	324	16	4.94	4.55	4.06	(2.32, 6.60)
Mount Sinai Beth Israel	271	15	5.54	3.49	5.93	(3.32, 9.78)
Mount Sinai Hospital	1686	61	3.62	3.40	3.98	(3.05, 5.12)
Mount Sinai St. Lukes	277	13	4.69	3.23	5.43	(2.89, 9.28)
NY Hospital - Queens	112	0	0.00	3.05	0.00	(0.00, 4.02)
NY Methodist Hospital	201	7	3.48	3.74	3.48	(1.40, 7.18)
NYP-Columbia Presby.	2095	70	3.34	3.96	3.16	(2.46, 3.99)
NYP-Weill Cornell	1317	32	2.43	3.37	2.70	(1.84, 3.81)
NYU Hospitals Center	1261	44	3.49	2.81	4.65	(3.38, 6.24)
North Shore Univ Hosp	1092	42	3.85	4.32	3.33	(2.40, 4.50)
Rochester General Hosp	971	57	5.87	4.09	5.38*	(4.07, 6.96)
Southside Hospital	227	6	2.64	4.05	2.44	(0.89, 5.32)
St. Elizabeth Med Ctr	351	20	5.70	3.74	5.70	(3.48, 8.81)
St. Francis Hospital	1895	77	4.06	4.47	3.40	(2.69, 4.25)
St. Josephs Hospital	1008	34	3.37	4.52	2.79	(1.93, 3.90)
St. Peters Hosp.	736	29	3.94	3.83	3.84	(2.57, 5.52)
Staten Island Univ Hosp	318	15	4.72	3.11	5.67	(3.17, 9.35)
Strong Memorial Hosp	624	30	4.81	3.29	5.46	(3.68, 7.79)
UHS-Wilson Med Ctr	248	8	3.23	2.95	4.08	(1.76, 8.05)
Univ. Hosp-Brooklyn	96	6	6.25	4.44	5.26	(1.92,11.46)
Univ. Hosp-Stony Brook	440	22	5.00	4.28	4.37	(2.74, 6.62)
Univ. Hosp-Upstate	254	7	2.76	3.18	3.24	(1.30, 6.68)
Vassar Bros. Med Ctr	499	13	2.61	3.42	2.85	(1.52, 4.88)
Westchester Med Ctr	423	14	3.31	4.23	2.93	(1.60, 4.91)
Winthrop Univ. Hosp	610	27	4.43	3.98	4.16	(2.74, 6.06)
Statewide Total	22161	829	3.74			

* 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 3

In-Hospital/30-Day Risk-Adjusted Mortality Rates for Valve or Valve/CABG Surgery in New York State, 2010-2012 Discharges



* 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.

Table 4**Hospital Volume for Valve Surgeries in New York State, 2010-2012 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 CABG	Multiple Valve and CABG	Total Valve/Valve/
Albany Med. Ctr	206	197	28	18	66	26	42	16	599
Arnot Ogden Med Ctr	52	35	10	2	3	4	1	0	107
Bellevue Hospital Ctr	77	16	52	11	24	11	67	6	264
Buffalo General Hosp	201	183	42	16	46	30	19	5	542
Champ.Valley Phys Hosp	44	28	2	0	3	1	1	0	79
Ellis Hospital	113	90	27	11	22	21	14	8	306
Erie County Med Ctr	17	11	8	6	1	0	2	2	47
Good Sam - Suffern	58	34	9	12	19	8	8	4	152
Lenox Hill Hospital	162	82	46	10	71	32	75	23	501
Long Island Jewish MC	164	108	99	34	58	38	55	26	582
M I Bassett Hospital	45	44	14	2	2	4	3	2	116
Maimonides Medical Ctr	146	85	93	26	26	20	54	5	455
Mercy Hospital	154	123	26	19	68	24	22	13	449
Millard Fillmore Hosp	78	70	11	4	26	10	11	4	214
Montefiore - Moses	102	60	69	26	36	47	60	12	412
Montefiore - Weiler	89	52	49	16	27	32	43	16	324
Mount Sinai Beth Israel	72	62	35	15	28	22	24	13	271
Mount Sinai Hospital	265	166	28	8	204	62	798	155	1686
Mount Sinai St. Lukes	56	51	29	13	66	31	23	8	277
NY Hospital - Queens	47	18	12	7	6	4	15	3	112
NY Methodist Hospital	82	44	22	7	8	4	32	2	201
NYP-Columbia Presby.	855	399	179	57	251	88	212	54	2095
NYP-Weill Cornell	539	219	129	35	150	35	165	45	1317
NYU Hospitals Center	499	107	112	25	285	41	168	24	1261
North Shore Univ Hosp	396	277	118	59	68	36	99	39	1092
Rochester General Hosp	356	226	69	27	110	68	73	42	971
Southside Hospital	69	50	21	7	21	21	27	11	227
St. Elizabeth Med Ctr	116	85	20	15	27	37	32	19	351
St. Francis Hospital	673	450	103	32	194	119	217	107	1895
St. Josephs Hospital	283	230	81	60	103	73	113	65	1008
St. Peters Hosp.	254	217	26	27	49	52	61	50	736
Staten Island Univ Hosp	108	64	42	22	33	29	15	5	318
Strong Memorial Hosp	272	164	39	8	71	18	36	16	624
UHS-Wilson Med Ctr	101	99	12	14	3	4	11	4	248
Univ. Hosp-Brooklyn	15	15	14	3	10	13	18	8	96
Univ. Hosp-Stony Brook	126	104	38	19	41	28	44	40	440
Univ. Hosp-Upstate	83	49	21	5	56	8	28	4	254
Vassar Bros. Med Ctr	176	152	46	26	28	20	31	20	499
Westchester Med Ctr	151	123	27	4	51	27	28	12	423
Winthrop Univ. Hosp	212	162	54	35	49	53	34	11	610
Total	7514	4751	1862	743	2410	1201	2781	899	22161
State-wide Mortality Rate (%)	2.56	4.04	4.62	4.98	1.12	4.50	5.29	10.46	3.74

Table 5

Hospital Volume for Transcatheter Aortic Valve Replacement in New York State, 2012 Discharges (Listed Alphabetically by Hospital)

Hospital	Cases
Albany Med. Ctr	45
Buffalo General Hosp	23
Lenox Hill Hospital	16
Long Island Jewish MC	32
Maimonides Medical Ctr	12
Montefiore - Moses	6
Mount Sinai Hospital	84
NYP-Columbia Presby.	289
NYP-Weill Cornell	81
NYU Hospitals Center	10
North Shore Univ Hosp	14
St. Francis Hospital	42
St. Josephs Hospital	4
Strong Memorial Hosp	9
Winthrop Univ. Hosp	48
Statewide Total	715
Statewide Mortality Rate (%)	6.71

2010-2012 HOSPITAL AND SURGEON OUTCOMES

Table 6 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 2010-2012. In addition, the final two columns provide the number of Isolated CABG, Valve and Valve/CABG procedures and the RAMR for these patients in 2010-2012 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 2010-2012, (b) performed at least one cardiac operation in each of the years, 2010-2012. A cardiac operation is defined as any reportable adult cardiac operation and may include cases not listed in Tables 6 or 7.

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 2010-2012 are noted in Table 6 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 7. This table contains the same information as Table 6 across all hospitals in which the surgeon performed operations.

Table 6

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, 2010-2012 Discharges

	No of Cases	Deaths	Isolated CABG			95% CI for RAMR	Isolated CABG, or Valve or Valve/CABG	
			OMR	EMR	RAMR		Cases	RAMR
STATEWIDE TOTAL	26295	385	1.46				48456	2.51
Albany Med. Ctr								
#Bennett E	52	0	0.00	1.18	0.00	(0.00, 8.74)	170	2.24
Britton L	214	1	0.47	1.64	0.42	(0.01, 2.32)	376	1.94
Depan H	290	3	1.03	1.80	0.84	(0.17, 2.46)	464	1.33
Miller S	217	5	2.30	1.64	2.06	(0.66, 4.80)	362	2.32
Total	773	9	1.16	1.67	1.02	(0.47, 1.94)	1372	1.86
Arnot Ogden Med Ctr								
Nast E	134	1	0.75	1.29	0.84	(0.01, 4.70)	195	4.15
Raudat C W	115	2	1.74	1.32	1.94	(0.22, 6.99)	161	6.92*
All Others	1	0	0.00	1.00	0.00	(0.00,100.0)	1	0.00
Total	250	3	1.20	1.30	1.35	(0.27, 3.94)	357	5.40*

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Bellevue Hospital Ctr								
#Balsam L B	130	1	0.77	0.99	1.14	(0.01, 6.32)	262	1.11
##Crooke G	13	0	0.00	0.92	0.00	(0.00,44.78)	19	0.00
#Culliford A	1	0	0.00	3.15	0.00	(0.00,100.0)	1	0.00
#Deanda A	121	5	4.13	1.09	5.55*	(1.79,12.96)	197	5.72
##Loulmet D F	28	1	3.57	0.98	5.31	(0.07,29.55)	66	6.42
##Ribakove G	4	0	0.00	0.65	0.00	(0.00,100.0)	9	23.49
#Schwartz C F	19	0	0.00	0.68	0.00	(0.00,41.62)	26	0.00
##Zias E	1	0	0.00	1.69	0.00	(0.00,100.0)	1	0.00
Total	317	7	2.21	1.01	3.20	(1.28, 6.59)	581	3.51
Buffalo General Hosp								
##Aldridge J	49	2	4.08	1.31	4.57	(0.51,16.51)	53	10.08
#Ashraf M	138	0	0.00	1.47	0.00	(0.00, 2.66)	181	1.64
##Downing S W	1	0	0.00	0.64	0.00	(0.00,100.0)	2	0.00
Grosner G	717	10	1.39	1.31	1.55	(0.74, 2.86)	1179	2.29
##Picone A	111	6	5.41	1.44	5.49*	(2.00,11.94)	143	6.38
All Others	35	2	5.71	1.02	8.20	(0.92,29.62)	35	14.04
Total	1051	20	1.90	1.34	2.08	(1.27, 3.22)	1593	2.88
Champ.Valley Phys Hosp								
Cahill A T	163	3	1.84	1.07	2.51	(0.50, 7.33)	218	4.77
#Canavan T	1	0	0.00	2.03	0.00	(0.00,100.0)	1	0.00
#El Amir N	14	0	0.00	0.76	0.00	(0.00,50.80)	17	0.00
All Others	86	1	1.16	1.09	1.57	(0.02, 8.72)	107	1.96
Total	264	4	1.52	1.06	2.08	(0.56, 5.34)	343	3.67
Ellis Hospital								
Choumarov K	197	3	1.52	1.47	1.52	(0.31, 4.45)	248	4.49
#Reich H	143	3	2.10	1.37	2.24	(0.45, 6.56)	311	1.94
Singh C	202	1	0.50	1.50	0.48	(0.01, 2.69)	289	1.36
Total	542	7	1.29	1.45	1.30	(0.52, 2.68)	848	2.47
Erie County Med Ctr								
#Bell-Thomson J	1	0	0.00	0.78	0.00	(0.00,100.0)	1	0.00
##Downing S W	215	2	0.93	1.13	1.20	(0.14, 4.34)	254	2.47
##Picone A	23	0	0.00	0.71	0.00	(0.00,33.01)	31	0.00
Total	239	2	0.84	1.09	1.12	(0.13, 4.06)	286	2.29
Good Sam – Suffern								
Lundy E F	183	1	0.55	1.70	0.47	(0.01, 2.61)	290	0.80
Salenger R	203	1	0.49	1.28	0.56	(0.01, 3.14)	248	2.29
Total	386	2	0.52	1.48	0.51	(0.06, 1.85)	538	1.32

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Lenox Hill Hospital								
#Galloway A	2	0	0.00	1.98	0.00	(0.00,100.0)	6	0.00
##Loulmet D F	1	0	0.00	0.53	0.00	(0.00,100.0)	2	0.00
Patel N C	536	4	0.75	1.34	0.82	(0.22, 2.09)	757	1.82
Plestis K A	72	1	1.39	1.48	1.38	(0.02, 7.66)	201	1.55
Subramanian V	199	3	1.51	1.71	1.29	(0.26, 3.78)	310	4.06
##Zias E	1	0	0.00	0.62	0.00	(0.00,100.0)	3	0.00
All Others	38	0	0.00	1.54	0.00	(0.00, 9.15)	71	5.11
Total	849	8	0.94	1.45	0.95	(0.41, 1.88)	1350	2.57
Long Island Jewish MC								
Graver L	158	0	0.00	1.39	0.00	(0.00, 2.44)	433	1.74
#Manetta F	30	1	3.33	1.07	4.58	(0.06,25.46)	52	3.43
Meyer D B	1	0	0.00	0.63	0.00	(0.00,100.0)	1	0.00
Palazzo R	159	0	0.00	1.25	0.00	(0.00, 2.71)	254	1.19
Parnell V	.	.	.	.	.	( . , . )	2	0.00
Scheinerman S J	150	1	0.67	1.61	0.61	(0.01, 3.38)	338	0.26**
Total	498	2	0.40	1.39	0.42	(0.05, 1.53)	1080	1.26**
M I Bassett Hospital								
Kelley J	124	2	1.61	1.37	1.73	(0.19, 6.24)	194	1.39
Lancey R A	95	2	2.11	1.40	2.21	(0.25, 7.96)	141	2.61
Total	219	4	1.83	1.38	1.94	(0.52, 4.96)	335	1.93
Maimonides Medical Ctr								
Abrol S	160	0	0.00	1.78	0.00	(0.00, 1.89)	242	2.16
##Crooke G	61	2	3.28	1.97	2.43	(0.27, 8.78)	98	2.74
Jacobowitz I	267	3	1.12	1.95	0.85	(0.17, 2.47)	394	1.33
##Ribakove G	63	1	1.59	2.06	1.13	(0.01, 6.28)	159	2.68
#Saunders P	23	0	0.00	1.34	0.00	(0.00,17.36)	23	0.00
Stephens G A	54	1	1.85	0.98	2.78	(0.04,15.47)	83	5.58
Vaynblat M	141	5	3.55	1.73	3.00	(0.97, 7.00)	223	3.51
All Others	9	1	11.11	2.66	6.11	(0.08,33.99)	11	12.50
Total	778	13	1.67	1.81	1.35	(0.72, 2.32)	1233	2.50
Mercy Hospital								
##Aldridge J	18	0	0.00	1.30	0.00	(0.00,23.02)	26	0.00
#Bell-Thomson J	412	5	1.21	1.41	1.26	(0.41, 2.94)	717	2.59
##Downing S W	150	1	0.67	1.43	0.68	(0.01, 3.80)	187	0.71
Lico S	433	6	1.39	1.35	1.51	(0.55, 3.28)	532	3.01
Total	1013	12	1.18	1.38	1.25	(0.65, 2.19)	1462	2.43
Millard Fillmore Hosp								
##Aldridge J	77	0	0.00	1.45	0.00	(0.00, 4.82)	112	1.16
#Ashraf M	430	3	0.70	1.27	0.80	(0.16, 2.34)	582	1.93
##Picone A	9	0	0.00	1.88	0.00	(0.00,31.69)	36	3.08
Total	516	3	0.58	1.31	0.65	(0.13, 1.90)	730	1.87

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Montefiore – Moses								
#Bello R A	7	0	0.00	2.25	0.00	(0.00,34.17)	10	0.00
#D Alessandro D A	237	3	1.27	1.48	1.25	(0.25, 3.66)	360	2.53
#Derose J J	38	0	0.00	1.91	0.00	(0.00, 7.41)	42	0.00
#Goldstein D J	143	2	1.40	1.45	1.41	(0.16, 5.08)	259	2.12
#Jakobleff W A	84	1	1.19	1.24	1.41	(0.02, 7.83)	95	1.64
#Michler R E	78	0	0.00	1.23	0.00	(0.00, 5.58)	233	2.51
Total	587	6	1.02	1.44	1.04	(0.38, 2.26)	999	2.22
Montefiore - Weiler								
#Bello R A	190	2	1.05	1.42	1.09	(0.12, 3.93)	280	3.45
#D Alessandro D A	2	0	0.00	5.04	0.00	(0.00,53.23)	2	0.00
#Derose J J	283	1	0.35	1.16	0.45	(0.01, 2.48)	448	2.15
#Goldstein D J	51	0	0.00	1.17	0.00	(0.00, 8.99)	92	0.00
#Jakobleff W A	2	0	0.00	4.71	0.00	(0.00,57.01)	2	0.00
#Michler R E	5	0	0.00	0.88	0.00	(0.00,100.0)	33	0.00
Total	533	3	0.56	1.28	0.64	(0.13, 1.88)	857	2.21
Mount Sinai Beth Israel								
Dimitrova K R	3	0	0.00	1.35	0.00	(0.00,100.0)	5	0.00
Geller C M	69	0	0.00	1.25	0.00	(0.00, 6.23)	106	1.02
Hoffman D	162	2	1.23	1.05	1.72	(0.19, 6.23)	205	5.67
Ko W	28	1	3.57	1.92	2.72	(0.04,15.13)	71	3.31
Tranbaugh R	249	2	0.80	1.04	1.13	(0.13, 4.07)	395	3.10
##Zias E	1	0	0.00	0.85	0.00	(0.00,100.0)	1	0.00
Total	512	5	0.98	1.12	1.27	(0.41, 2.97)	783	3.29
Mount Sinai Hospital								
Adams D H	24	0	0.00	0.84	0.00	(0.00,26.79)	936	2.05
Anyanwu A C	41	1	2.44	1.53	2.33	(0.03,12.96)	119	4.14
Chikwe J Y	124	0	0.00	1.19	0.00	(0.00, 3.63)	207	1.72
DiLuozzo G	4	0	0.00	1.03	0.00	(0.00,100.0)	18	11.01
Filsoufi F	265	2	0.75	1.05	1.05	(0.12, 3.79)	402	2.33
Nguyen K	1	0	0.00	0.25	0.00	(0.00,100.0)	2	0.00
Reddy R C	290	8	2.76	1.27	3.17	(1.37, 6.26)	387	4.58*
Stelzer P	38	2	5.26	1.02	7.59	(0.85,27.39)	279	2.54
Tannous H J	59	0	0.00	1.10	0.00	(0.00, 8.31)	91	0.00
All Others	104	4	3.85	1.00	5.63*	(1.52,14.43)	195	6.37*
Total	950	17	1.79	1.15	2.28	(1.33, 3.66)	2636	2.87
Mount Sinai St. Lukes								
Balaram S K	90	2	2.22	2.03	1.61	(0.18, 5.80)	151	3.74
Swistel D	243	5	2.06	1.99	1.51	(0.49, 3.53)	459	3.03
Total	333	7	2.10	2.00	1.54	(0.62, 3.17)	610	3.21
NY Hospital – Queens								
#Lang S	322	3	0.93	1.27	1.07	(0.22, 3.13)	432	1.00
All Others	2	0	0.00	0.47	0.00	(0.00,100.0)	4	0.00
Total	324	3	0.93	1.27	1.07	(0.22, 3.13)	436	1.00

Table 6 continued

	Isolated CABG					Isolated CABG, or Valve or Valve/CABG		
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
NY Methodist Hospital								
#Ciaburri D	72	0	0.00	1.98	0.00	(0.00, 3.77)	130	0.00**
Gulkarov I M	58	0	0.00	1.36	0.00	(0.00, 6.83)	88	0.00
#Tortolani A	130	2	1.54	1.05	2.15	(0.24, 7.76)	241	4.48
All Others	7	0	0.00	1.18	0.00	(0.00,64.88)	9	0.00
Total	267	2	0.75	1.37	0.80	(0.09, 2.89)	468	2.02
NYP – Columbia Presby.								
Argenziano M	159	3	1.89	1.14	2.42	(0.49, 7.07)	428	2.76
Bacha E	.	.	.	.	.	(. , .)	12	0.00
#Chen J M	.	.	.	.	.	(. , .)	2	0.00
Naka Y	282	7	2.48	1.61	2.26	(0.90, 4.65)	568	3.36
Smith C	117	3	2.56	1.00	3.77	(0.76,11.01)	678	1.55
Stewart A S	200	7	3.50	1.88	2.72	(1.09, 5.60)	622	2.59
Takayama H	201	4	1.99	1.82	1.60	(0.43, 4.10)	337	2.94
Williams M R	127	2	1.57	1.54	1.50	(0.17, 5.41)	519	1.89
All Others	13	0	0.00	2.76	0.00	(0.00,14.96)	28	0.00
Total	1099	26	2.37	1.57	2.20	(1.44, 3.23)	3194	2.40
NYP – Weill Cornell								
#Chen J M	.	.	.	.	.	(. , .)	5	0.00
#Ciaburri D	1	0	0.00	0.94	0.00	(0.00,100.0)	6	0.00
Girardi L	224	0	0.00	1.42	0.00	(0.00, 1.68)	946	1.27**
Isom O	24	0	0.00	0.94	0.00	(0.00,23.76)	74	0.00
Krieger K	158	1	0.63	1.53	0.61	(0.01, 3.38)	558	2.36
#Lang S	6	0	0.00	2.45	0.00	(0.00,36.58)	12	0.00
Salemi A	112	2	1.79	1.43	1.83	(0.21, 6.59)	241	2.18
#Tortolani A	1	1	100.00	1.05	100.00*	(1.82,100.0)	1	100.00*
All Others	1	0	0.00	0.46	0.00	(0.00,100.0)	1	0.00
Total	527	4	0.76	1.44	0.77	(0.21, 1.97)	1844	1.73**
NYU Hospitals Center								
#Balsam L B	3	0	0.00	0.47	0.00	(0.00,100.0)	7	0.00
##Crooke G	.	.	.	.	.	(. , .)	1	0.00
#Culliford A	71	1	1.41	0.84	2.46	(0.03,13.68)	170	2.30
#Deanda A	3	0	0.00	0.78	0.00	(0.00,100.0)	7	0.00
#Galloway A	42	1	2.38	1.19	2.93	(0.04,16.28)	533	3.14
Grossi E	7	0	0.00	0.93	0.00	(0.00,82.14)	18	3.67
##Loulmet D F	57	0	0.00	0.81	0.00	(0.00,11.67)	315	3.59
Mosca R S	.	.	.	.	.	(. , .)	4	0.00
##Ribakove G	1	0	0.00	1.20	0.00	(0.00,100.0)	8	5.93
#Schwartz C F	92	1	1.09	1.29	1.23	(0.02, 6.86)	211	3.41
##Zias E	132	3	2.27	0.90	3.69	(0.74,10.79)	395	3.17
Total	408	6	1.47	0.99	2.17	(0.79, 4.72)	1669	3.18

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
North Shore Univ Hosp								
Esposito R	299	2	0.67	1.38	0.71	(0.08, 2.56)	536	2.86
Hall M	196	1	0.51	1.66	0.45	(0.01, 2.51)	379	1.86
#Hartman A	51	0	0.00	1.27	0.00	(0.00, 8.27)	301	1.88
#Kalimi R	157	3	1.91	2.23	1.25	(0.25, 3.66)	289	1.75
Pogo G	180	4	2.22	1.56	2.09	(0.56, 5.36)	309	2.77
Vatsia S	216	4	1.85	1.40	1.94	(0.52, 4.95)	376	1.62
All Others	1	0	0.00	1.35	0.00	(0.00,100.0)	2	0.00
Total	1100	14	1.27	1.58	1.18	(0.64, 1.98)	2192	2.17
Rochester General Hosp								
Becker E J	100	5	5.00	1.93	3.79	(1.22, 8.85)	130	6.22*
Cheeran D	488	11	2.25	1.82	1.81	(0.90, 3.24)	830	3.06
Kirshner R	433	14	3.23	1.53	3.10*	(1.69, 5.20)	1032	4.15*
Total	1021	30	2.94	1.71	2.52*	(1.70, 3.59)	1992	3.82*
Southside Hospital								
#Hartman A	37	0	0.00	1.36	0.00	(0.00,10.68)	158	1.80
#Kalimi R	122	2	1.64	1.71	1.40	(0.16, 5.06)	205	1.35
#Manetta F	75	2	2.67	1.58	2.47	(0.28, 8.90)	98	4.12
All Others	2	0	0.00	2.11	0.00	(0.00,100.0)	2	0.00
Total	236	4	1.69	1.62	1.53	(0.41, 3.92)	463	1.93
St. Elizabeth Med Ctr								
Akujuo A C	139	2	1.44	1.29	1.63	(0.18, 5.89)	215	4.61
#El Amir N	214	2	0.93	1.39	0.98	(0.11, 3.55)	330	2.75
Joyce F	275	7	2.55	1.71	2.17	(0.87, 4.48)	434	3.43
Total	628	11	1.75	1.51	1.70	(0.85, 3.04)	979	3.44
St. Francis Hospital								
Bercow N	302	4	1.32	1.67	1.16	(0.31, 2.98)	494	3.04
Colangelo R	665	8	1.20	1.33	1.33	(0.57, 2.62)	1100	1.65
#Fernandez H A	349	2	0.57	1.80	0.47	(0.05, 1.68)	490	1.77
Lamendola C	316	7	2.22	1.50	2.16	(0.87, 4.45)	546	3.32
Robinson N	352	6	1.70	1.37	1.83	(0.67, 3.97)	759	2.91
#Taylor J	295	3	1.02	1.34	1.11	(0.22, 3.24)	785	1.74
Total	2279	30	1.32	1.48	1.31	(0.88, 1.86)	4174	2.27
St. Josephs Hospital								
Green G R	263	4	1.52	1.46	1.53	(0.41, 3.92)	502	1.86
#Lutz C J	25	0	0.00	1.00	0.00	(0.00,21.57)	43	2.31
Marvasti M	195	4	2.05	1.39	2.16	(0.58, 5.53)	436	1.31
Nazem A	352	5	1.42	1.73	1.20	(0.39, 2.81)	535	1.35
Rosenberg J	106	2	1.89	1.93	1.43	(0.16, 5.18)	183	6.70*
Zhou Z	366	6	1.64	1.52	1.58	(0.58, 3.45)	616	1.99
Total	1307	21	1.61	1.56	1.50	(0.93, 2.30)	2315	2.09

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
St. Peters Hosp.								
#Bennett E	71	0	0.00	1.02	0.00	(0.00, 7.40)	249	1.92
#Canavan T	339	4	1.18	1.45	1.19	(0.32, 3.05)	411	2.03
Edwards N	81	0	0.00	0.99	0.00	(0.00, 6.70)	185	2.17
#Reich H	5	0	0.00	1.21	0.00	(0.00,88.84)	5	0.00
Saifi J	245	3	1.22	1.44	1.24	(0.25, 3.63)	594	2.68
Terrien C M	192	2	1.04	1.07	1.42	(0.16, 5.14)	225	2.49
Total	933	9	0.96	1.30	1.09	(0.50, 2.07)	1669	2.36
Staten Island Univ Hosp								
Asgarian K T	258	4	1.55	1.38	1.64	(0.44, 4.21)	423	3.45
McGinn J	284	6	2.11	1.39	2.23	(0.81, 4.85)	404	4.27
Rosell F M	253	5	1.98	1.65	1.75	(0.57, 4.09)	286	2.39
All Others	14	1	7.14	1.25	8.40	(0.11,46.72)	14	14.37
Total	809	16	1.98	1.47	1.98	(1.13, 3.21)	1127	3.57
Strong Memorial Hosp								
Alfieris G	.	.	.	.	.	( . , . )	1	0.00
Gensini P F	.	.	.	.	.	( . , . )	1	0.00
Hicks G	245	3	1.22	1.33	1.35	(0.27, 3.93)	361	3.55
Knight P	511	16	3.13	1.34	3.42*	(1.95, 5.56)	970	4.35*
Massey H	101	1	0.99	1.82	0.80	(0.01, 4.44)	148	1.88
Total	857	20	2.33	1.39	2.45*	(1.50, 3.79)	1481	3.85*
UHS-Wilson Med Ctr								
Wong K	256	6	2.34	1.77	1.93	(0.71, 4.21)	393	2.40
Yousuf M	261	7	2.68	1.34	2.92	(1.17, 6.02)	372	4.63
Total	517	13	2.51	1.56	2.36	(1.26, 4.04)	765	3.42
Univ. Hosp – Brooklyn								
Burack J H	11	0	0.00	1.73	0.00	(0.00,28.16)	15	0.00
Lee D C	41	0	0.00	2.74	0.00	(0.00, 4.78)	57	0.00
Tak V M	112	3	2.68	2.11	1.86	(0.37, 5.44)	188	3.73
Total	164	3	1.83	2.24	1.20	(0.24, 3.49)	260	2.84
Univ. Hosp – Stony Brook								
Bilfinger T	63	2	3.17	2.10	2.21	(0.25, 7.99)	90	4.00
#Fernandez H A	15	0	0.00	1.72	0.00	(0.00,20.79)	22	0.00
Gupta S	152	2	1.32	1.50	1.28	(0.14, 4.63)	292	1.01
McLarty A	54	2	3.70	1.21	4.47	(0.50,16.15)	74	9.18*
Rosengart T	131	2	1.53	1.74	1.29	(0.14, 4.65)	259	3.59
Seifert F	259	3	1.16	1.37	1.24	(0.25, 3.61)	361	2.20
#Taylor J	21	0	0.00	1.02	0.00	(0.00,25.04)	37	0.00
Total	695	11	1.58	1.52	1.53	(0.76, 2.73)	1135	2.81
Univ. Hosp – Upstate								
Fink G W	200	3	1.50	1.34	1.64	(0.33, 4.80)	303	2.00
#Lutz C J	236	3	1.27	1.58	1.18	(0.24, 3.44)	386	2.45
All Others	5	0	0.00	0.49	0.00	(0.00,100.0)	6	0.00
Total	441	6	1.36	1.46	1.37	(0.50, 2.97)	695	2.24

Table 6 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Vassar Bros. Med Ctr								
Bhutani A K	76	2	2.63	1.26	3.06	(0.34,11.06)	87	6.19
Sarabu M	155	1	0.65	1.71	0.55	(0.01, 3.08)	411	1.25
Shahani R	156	2	1.28	1.60	1.17	(0.13, 4.24)	250	1.98
Zakow P	209	2	0.96	1.35	1.04	(0.12, 3.75)	347	2.30
Total	596	7	1.17	1.50	1.15	(0.46, 2.37)	1095	1.93
Westchester Med Ctr								
Lafaro R	152	2	1.32	1.54	1.25	(0.14, 4.53)	221	2.72
Lansman S	124	0	0.00	1.56	0.00	(0.00, 2.77)	189	1.49
Malekan R	174	3	1.72	2.31	1.09	(0.22, 3.19)	241	2.07
#Saunders P	1	0	0.00	2.70	0.00	(0.00,100.0)	1	0.00
Sett S S	.	.	.	.	.	( . , . )	1	0.00
Spielvogel D	273	2	0.73	1.85	0.58	(0.06, 2.09)	486	1.24
All Others	17	0	0.00	1.91	0.00	(0.00,16.51)	25	0.00
Total	741	7	0.94	1.85	0.75	(0.30, 1.54)	1164	1.66
Winthrop Univ. Hosp								
Goncalves J A	254	4	1.57	1.34	1.72	(0.46, 4.41)	482	2.47
Kokotos W J	207	4	1.93	1.73	1.63	(0.44, 4.18)	378	3.16
Schubach S	159	0	0.00	1.08	0.00	(0.00, 3.12)	339	2.27
All Others	116	0	0.00	1.81	0.00	(0.00, 2.56)	147	0.81
Total	736	8	1.09	1.47	1.08	(0.47, 2.14)	1346	2.50
STATEWIDE TOTAL	26295	385	1.46				48456	2.51

* 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 7**Summary Information for Surgeons Practicing at More Than One Hospital, 2010-2012.**

	Isolated CABG					95% CI for RAMR	Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR		Cases	RAMR
Aldridge J	144	2	1.39	1.38	1.47	(0.17, 5.32)	191	2.85
Buffalo General Hosp	49	2	4.08	1.31	4.57	(0.51,16.51)	53	10.08
Mercy Hospital	18	0	0.00	1.30	0.00	(0.00,23.02)	26	0.00
Millard Fillmore Hosp	77	0	0.00	1.45	0.00	(0.00, 4.82)	112	1.16
Ashraf M	568	3	0.53	1.32	0.59	(0.12, 1.71)	763	1.86
Buffalo General Hosp	138	0	0.00	1.47	0.00	(0.00, 2.66)	181	1.64
Millard Fillmore Hosp	430	3	0.70	1.27	0.80	(0.16, 2.34)	582	1.93
Balsam L B	133	1	0.75	0.98	1.12	(0.01, 6.25)	269	1.10
Bellevue Hospital Ctr	130	1	0.77	0.99	1.14	(0.01, 6.32)	262	1.11
NYU Hospitals Center	3	0	0.00	0.47	0.00	(0.00,100.0)	7	0.00
Bell-Thomson J	413	5	1.21	1.41	1.26	(0.41, 2.93)	718	2.59
Erie County Med Ctr	1	0	0.00	0.78	0.00	(0.00,100.0)	1	0.00
Mercy Hospital	412	5	1.21	1.41	1.26	(0.41, 2.94)	717	2.59
Bello R A	197	2	1.02	1.45	1.03	(0.12, 3.71)	290	3.32
Montefiore - Moses	7	0	0.00	2.25	0.00	(0.00,34.17)	10	0.00
Montefiore - Weiler	190	2	1.05	1.42	1.09	(0.12, 3.93)	280	3.45
Bennett E	123	0	0.00	1.09	0.00	(0.00, 4.01)	419	2.05
Albany Med. Ctr	52	0	0.00	1.18	0.00	(0.00, 8.74)	170	2.24
St. Peters Hosp.	71	0	0.00	1.02	0.00	(0.00, 7.40)	249	1.92
Canavan T	340	4	1.18	1.45	1.19	(0.32, 3.04)	412	2.03
Champ.Valley Phys Hosp	1	0	0.00	2.03	0.00	(0.00,100.0)	1	0.00
St. Peters Hosp.	339	4	1.18	1.45	1.19	(0.32, 3.05)	411	2.03
Chen J M	.	.	.	.	.	( . , . )	7	0.00
NYP-Columbia Presby.	.	.	.	.	.	( . , . )	2	0.00
NYP-Weill Cornell	.	.	.	.	.	( . , . )	5	0.00
Ciaburri D	73	0	0.00	1.96	0.00	(0.00, 3.75)	136	0.00 **
NY Methodist Hospital	72	0	0.00	1.98	0.00	(0.00, 3.77)	130	0.00 **
NYP-Weill Cornell	1	0	0.00	0.94	0.00	(0.00,100.0)	6	0.00
Crooke G	74	2	2.70	1.79	2.21	(0.25, 7.99)	118	2.38
Bellevue Hospital Ctr	13	0	0.00	0.92	0.00	(0.00,44.78)	19	0.00
Maimonides Medical Ctr	61	2	3.28	1.97	2.43	(0.27, 8.78)	98	2.74
NYU Hospitals Center	.	.	.	.	.	( . , . )	1	0.00
Culliford A	72	1	1.39	0.87	2.34	(0.03,13.00)	171	2.29
Bellevue Hospital Ctr	1	0	0.00	3.15	0.00	(0.00,100.0)	1	0.00
NYU Hospitals Center	71	1	1.41	0.84	2.46	(0.03,13.68)	170	2.30

Table 7 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
D Alessandro D A	239	3	1.26	1.51	1.22	(0.24, 3.56)	362	2.50
Montefiore - Moses	237	3	1.27	1.48	1.25	(0.25, 3.66)	360	2.53
Montefiore - Weiler	2	0	0.00	5.04	0.00	(0.00,53.23)	2	0.00
Deanda A	124	5	4.03	1.08	5.46 *	(1.76,12.73)	204	5.60
Bellevue Hospital Ctr	121	5	4.13	1.09	5.55 *	(1.79,12.96)	197	5.72
NYU Hospitals Center	3	0	0.00	0.78	0.00	(0.00,100.0)	7	0.00
Derose J J	321	1	0.31	1.25	0.36	(0.00, 2.03)	490	1.97
Montefiore - Moses	38	0	0.00	1.91	0.00	(0.00, 7.41)	42	0.00
Montefiore - Weiler	283	1	0.35	1.16	0.45	(0.01, 2.48)	448	2.15
Downing S W	366	3	0.82	1.25	0.96	(0.19, 2.80)	443	1.65
Buffalo General Hosp	1	0	0.00	0.64	0.00	(0.00,100.0)	2	0.00
Erie County Med Ctr	215	2	0.93	1.13	1.20	(0.14, 4.34)	254	2.47
Mercy Hospital	150	1	0.67	1.43	0.68	(0.01, 3.80)	187	0.71
El Amir N	228	2	0.88	1.35	0.95	(0.11, 3.43)	347	2.68
Champ.Valley Phys Hosp	14	0	0.00	0.76	0.00	(0.00,50.80)	17	0.00
St. Elizabeth Med Ctr	214	2	0.93	1.39	0.98	(0.11, 3.55)	330	2.75
Fernandez H A	364	2	0.55	1.80	0.45	(0.05, 1.62)	512	1.71
St. Francis Hospital	349	2	0.57	1.80	0.47	(0.05, 1.68)	490	1.77
Univ. Hosp-Stony Brook	15	0	0.00	1.72	0.00	(0.00,20.79)	22	0.00
Galloway A	44	1	2.27	1.23	2.71	(0.04,15.08)	539	3.12
Lenox Hill Hospital	2	0	0.00	1.98	0.00	(0.00,100.0)	6	0.00
NYU Hospitals Center	42	1	2.38	1.19	2.93	(0.04,16.28)	533	3.14
Goldstein D J	194	2	1.03	1.38	1.09	(0.12, 3.95)	351	1.62
Montefiore - Moses	143	2	1.40	1.45	1.41	(0.16, 5.08)	259	2.12
Montefiore - Weiler	51	0	0.00	1.17	0.00	(0.00, 8.99)	92	0.00
Hartman A	88	0	0.00	1.31	0.00	(0.00, 4.66)	459	1.85
North Shore Univ Hosp	51	0	0.00	1.27	0.00	(0.00, 8.27)	301	1.88
Southside Hospital	37	0	0.00	1.36	0.00	(0.00,10.68)	158	1.80
Jakobleff W A	86	1	1.16	1.32	1.29	(0.02, 7.18)	97	1.55
Montefiore - Moses	84	1	1.19	1.24	1.41	(0.02, 7.83)	95	1.64
Montefiore - Weiler	2	0	0.00	4.71	0.00	(0.00,57.01)	2	0.00
Kalimi R	279	5	1.79	2.01	1.31	(0.42, 3.05)	494	1.59
North Shore Univ Hosp	157	3	1.91	2.23	1.25	(0.25, 3.66)	289	1.75
Southside Hospital	122	2	1.64	1.71	1.40	(0.16, 5.06)	205	1.35
Lang S	328	3	0.91	1.29	1.04	(0.21, 3.02)	444	0.97
NY Hospital - Queens	322	3	0.93	1.27	1.07	(0.22, 3.13)	432	1.00
NYP-Weill Cornell	6	0	0.00	2.45	0.00	(0.00,36.58)	12	0.00
Loulmet D F	86	1	1.16	0.86	1.98	(0.03,10.99)	383	4.07
Bellevue Hospital Ctr	28	1	3.57	0.98	5.31	(0.07,29.55)	66	6.42
Lenox Hill Hospital	1	0	0.00	0.53	0.00	(0.00,100.0)	2	0.00
NYU Hospitals Center	57	0	0.00	0.81	0.00	(0.00,11.67)	315	3.59

Table 7 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Lutz C J	261	3	1.15	1.53	1.10	(0.22, 3.22)	429	2.44
St. Josephs Hospital	25	0	0.00	1.00	0.00	(0.00,21.57)	43	2.31
Univ. Hosp-Upstate	236	3	1.27	1.58	1.18	(0.24, 3.44)	386	2.45
Manetta F	105	3	2.86	1.44	2.91	(0.59, 8.51)	150	3.81
Long Island Jewish MC	30	1	3.33	1.07	4.58	(0.06,25.46)	52	3.43
Southside Hospital	75	2	2.67	1.58	2.47	(0.28, 8.90)	98	4.12
Michler R E	83	0	0.00	1.21	0.00	(0.00, 5.33)	266	2.19
Montefiore - Moses	78	0	0.00	1.23	0.00	(0.00, 5.58)	233	2.51
Montefiore - Weiler	5	0	0.00	0.88	0.00	(0.00,100.0)	33	0.00
Picone A	143	6	4.20	1.35	4.54 *	(1.66, 9.89)	210	5.03
Buffalo General Hosp	111	6	5.41	1.44	5.49 *	(2.00,11.94)	143	6.38
Erie County Med Ctr	23	0	0.00	0.71	0.00	(0.00,33.01)	31	0.00
Millard Fillmore Hosp	9	0	0.00	1.88	0.00	(0.00,31.69)	36	3.08
Reich H	148	3	2.03	1.36	2.18	(0.44, 6.36)	316	1.93
Ellis Hospital	143	3	2.10	1.37	2.24	(0.45, 6.56)	311	1.94
St. Peters Hosp.	5	0	0.00	1.21	0.00	(0.00,88.84)	5	0.00
Ribakove G	68	1	1.47	1.96	1.10	(0.01, 6.10)	176	3.37
Bellevue Hospital Ctr	4	0	0.00	0.65	0.00	(0.00,100.0)	9	23.49
Maimonides Medical Ctr	63	1	1.59	2.06	1.13	(0.01, 6.28)	159	2.68
NYU Hospitals Center	1	0	0.00	1.20	0.00	(0.00,100.0)	8	5.93
Saunders P	24	0	0.00	1.40	0.00	(0.00,15.97)	24	0.00
Maimonides Medical Ctr	23	0	0.00	1.34	0.00	(0.00,17.36)	23	0.00
Westchester Med Ctr	1	0	0.00	2.70	0.00	(0.00,100.0)	1	0.00
Schwartz C F	111	1	0.90	1.19	1.11	(0.01, 6.18)	237	3.24
Bellevue Hospital Ctr	19	0	0.00	0.68	0.00	(0.00,41.62)	26	0.00
NYU Hospitals Center	92	1	1.09	1.29	1.23	(0.02, 6.86)	211	3.41
Taylor J	316	3	0.95	1.32	1.05	(0.21, 3.07)	822	1.69
St. Francis Hospital	295	3	1.02	1.34	1.11	(0.22, 3.24)	785	1.74
Univ. Hosp-Stony Brook	21	0	0.00	1.02	0.00	(0.00,25.04)	37	0.00
Tortolani A	131	3	2.29	1.05	3.20	(0.64, 9.35)	242	4.97
NY Methodist Hospital	130	2	1.54	1.05	2.15	(0.24, 7.76)	241	4.48
NYP-Weill Cornell	1	1	100.00	1.05	100.00*	(1.82,100.0)	1	100.00 *
Zias E	135	3	2.22	0.90	3.60	(0.72,10.51)	400	3.14
Bellevue Hospital Ctr	1	0	0.00	1.69	0.00	(0.00,100.0)	1	0.00
Lenox Hill Hospital	1	0	0.00	0.62	0.00	(0.00,100.0)	3	0.00
Mount Sinai Beth Israel	1	0	0.00	0.85	0.00	(0.00,100.0)	1	0.00
NYU Hospitals Center	132	3	2.27	0.90	3.69	(0.74,10.79)	395	3.17

* 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, 2010-2012

Table 8 presents, for each hospital and for each surgeon performing at least 200 cardiac operations in any hospital in 2010-2012 and/or performing one or more cardiac operations in each of the years 2010-2012, 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 6, 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 8

Surgeon and Hospital Volume for Isolated CABG, Valve or Valve/CABG, Other Cardiac Surgery, and Total Adult Cardiac Surgery, 2010-2012.

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Albany Med. Ctr				
Bennett E	52	118	48	218
Britton L	214	162	56	432
Depan H	290	174	54	518
Miller S	217	145	20	382
All Others	0	0	15	15
Total	773	599	193	1565
Arnot Ogden Med Ctr				
Nast E	134	61	15	210
Raudat C W	115	46	14	175
All Others	1	0	0	1
Total	250	107	29	386
Bellevue Hospital Ctr				
Balsam L B	130	132	69	331
Crooke G	13	6	9	28
Culliford A	1	0	1	2
Deanda A	121	76	95	292
Loulmet D F	28	38	3	69
Ribakove G	4	5	3	12
Schwartz C F	19	7	4	30
Zias E	1	0	0	1
All Others	0	0	1	1
Total	317	264	185	766

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Buffalo General Hosp				
Aldridge J	49	4	11	64
Ashraf M	138	43	16	197
Downing S W	1	1	0	2
Grosner G	717	462	71	1250
Picone A	111	32	5	148
All Others	35	0	1	36
Total	1051	542	104	1697
Champ.Valley Phys Hosp				
Cahill A T	163	55	10	228
Canavan T	1	0	0	1
El Amir N	14	3	1	18
All Others	86	21	11	118
Total	264	79	22	365
Ellis Hospital				
Choumarov K	197	51	3	251
Reich H	143	168	18	329
Singh C	202	87	15	304
Total	542	306	36	884
Erie County Med Ctr				
Bell-Thomson J	1	0	1	2
Downing S W	215	39	31	285
Picone A	23	8	2	33
All Others	0	0	3	3
Total	239	47	37	323
Good Sam – Suffern				
Lundy E F	183	107	9	299
Salenger R	203	45	8	256
Total	386	152	17	555
Lenox Hill Hospital				
Galloway A	2	4	0	6
Loulmet D F	1	1	1	3
Patel N C	536	221	23	780
Plestis K A	72	129	217	418
Subramanian V	199	111	31	341
Zias E	1	2	0	3
All Others	38	33	38	109
Total	849	501	310	1660
Long Island Jewish MC				
Graver L	158	275	49	482
Manetta F	30	22	8	60
Meyer D B	1	0	8	9
Palazzo R	159	95	34	288
Parnell V	0	2	23	25
Scheinerman S J	150	188	40	378
All Others	0	0	2	2
Total	498	582	164	1244

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
M I Bassett Hospital				
Kelley J	124	70	14	208
Lancey R A	95	46	9	150
Total	219	116	23	358
Maimonides Medical Ctr				
Abrol S	160	82	64	306
Crooke G	61	37	29	127
Jacobowitz I	267	127	18	412
Ribakove G	63	96	19	178
Saunders P	23	0	8	31
Stephens G A	54	29	8	91
Vaynblat M	141	82	21	244
All Others	9	2	2	13
Total	778	455	169	1402
Mercy Hospital				
Aldridge J	18	8	1	27
Bell-Thomson J	412	305	84	801
Downing S W	150	37	9	196
Lico S	433	99	43	575
Total	1013	449	137	1599
Millard Fillmore Hosp				
Aldridge J	77	35	20	132
Ashraf M	430	152	22	604
Picone A	9	27	3	39
Total	516	214	45	775
Montefiore – Moses				
Bello R A	7	3	15	25
D Alessandro D A	237	123	92	452
Derose J J	38	4	17	59
Goldstein D J	143	116	74	333
Jakobleff W A	84	11	14	109
Michler R E	78	155	50	283
All Others	0	0	34	34
Total	587	412	296	1295
Montefiore – Weiler				
Bello R A	190	90	32	312
D Alessandro D A	2	0	1	3
Derose J J	283	165	78	526
Goldstein D J	51	41	4	96
Jakobleff W A	2	0	2	4
Michler R E	5	28	2	35
Total	533	324	119	976

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Mount Sinai Beth Israel				
Dimitrova K R	3	2	5	10
Geller C M	69	37	9	115
Hoffman D	162	43	11	216
Ko W	28	43	17	88
Tranbaugh R	249	146	50	445
Zias E	1	0	0	1
Total	512	271	92	875
Mount Sinai Hospital				
Adams D H	24	912	148	1084
Anyanwu A C	41	78	166	285
Chikwe J Y	124	83	25	232
DiLuozzo G	4	14	133	151
Filsoufi F	265	137	17	419
Nguyen K	1	1	38	40
Reddy R C	290	97	56	443
Stelzer P	38	241	169	448
Tannous H J	59	32	7	98
All Others	104	91	57	252
Total	950	1686	816	3452
Mount Sinai St. Lukes				
Balaram S K	90	61	33	184
Swistel D	243	216	40	499
Total	333	277	73	683
NY Hospital - Queens				
Lang S	322	110	29	461
All Others	2	2	1	5
Total	324	112	30	466
NY Methodist Hospital				
Ciaburri D	72	58	9	139
Gulkarov I M	58	30	20	108
Tortolani A	130	111	6	247
All Others	7	2	2	11
Total	267	201	37	505
NYP – Columbia Presby.				
Argenziano M	159	269	54	482
Bacha E	0	12	137	149
Chen J M	0	2	14	16
Naka Y	282	286	219	787
Smith C	117	561	62	740
Stewart A S	200	422	410	1032
Takayama H	201	136	111	448
Williams M R	127	392	455	974
All Others	13	15	347	375
Total	1099	2095	1809	5003

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
NYP – Weill Cornell				
Chen J M	0	5	42	47
Ciaburri D	1	5	0	6
Girardi L	224	722	605	1551
Isom O	24	50	11	85
Krieger K	158	400	21	579
Lang S	6	6	2	14
Salemi A	112	129	172	413
Tortolani A	1	0	0	1
All Others	1	0	0	1
Total	527	1317	853	2697
NYU Hospitals Center				
Balsam L B	3	4	13	20
Crooke G	0	1	0	1
Culliford A	71	99	25	195
Deanda A	3	4	29	36
Galloway A	42	491	40	573
Grossi E	7	11	9	27
Loulmet D F	57	258	51	366
Mosca R S	0	4	35	39
Ribakove G	1	7	3	11
Schwartz C F	92	119	21	232
Zias E	132	263	50	445
All Others	0	0	7	7
Total	408	1261	283	1952
North Shore Univ Hosp				
Esposito R	299	237	44	580
Hall M	196	183	17	396
Hartman A	51	250	62	363
Kalimi R	157	132	18	307
Pogo G	180	129	35	344
Vatsia S	216	160	44	420
All Others	1	1	5	7
Total	1100	1092	225	2417
Rochester General Hosp				
Becker E J	100	30	6	136
Cheeran D	488	342	101	931
Kirshner R	433	599	87	1119
Total	1021	971	194	2186
Southside Hospital				
Hartman A	37	121	38	196
Kalimi R	122	83	19	224
Manetta F	75	23	15	113
All Others	2	0	2	4
Total	236	227	74	537

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
St. Elizabeth Med Ctr				
Akujuo A C	139	76	7	222
El Amir N	214	116	45	375
Joyce F	275	159	22	456
Total	628	351	74	1053
St. Francis Hospital				
Bercow N	302	192	18	512
Colangelo R	665	435	46	1146
Fernandez H A	349	141	21	511
Lamendola C	316	230	30	576
Robinson N	352	407	101	860
Taylor J	295	490	58	843
All Others	0	0	1	1
Total	2279	1895	275	4449
St. Josephs Hospital				
Green G R	263	239	56	558
Lutz C J	25	18	5	48
Marvasti M	195	241	48	484
Nazem A	352	183	47	582
Rosenberg J	106	77	49	232
Zhou Z	366	250	46	662
Total	1307	1008	251	2566
St. Peters Hosp.				
Bennett E	71	178	14	263
Canavan T	339	72	2	413
Edwards N	81	104	32	217
Reich H	5	0	0	5
Saifi J	245	349	64	658
Terrien C M	192	33	6	231
Total	933	736	118	1787
Staten Island Univ Hosp				
Asgarian K T	258	165	37	460
McGinn J	284	120	7	411
Rosell F M	253	33	18	304
All Others	14	0	3	17
Total	809	318	65	1192
Strong Memorial Hosp				
Alfieris G	0	1	26	27
Gensini P F	0	1	40	41
Hicks G	245	116	55	416
Knight P	511	459	172	1142
Massey H	101	47	159	307
Total	857	624	452	1933
UHS-Wilson Med Ctr				
Wong K	256	137	15	408
Yousuf M	261	111	17	389
Total	517	248	32	797

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Univ. Hosp-Brooklyn				
Burack J H	11	4	0	15
Lee D C	41	16	5	62
Tak V M	112	76	21	209
Total	164	96	26	286
Univ. Hosp-Stony Brook				
Bilfinger T	63	27	15	105
Fernandez H A	15	7	2	24
Gupta S	152	140	40	332
McLarty A	54	20	40	114
Rosengart T	131	128	11	270
Seifert F	259	102	19	380
Taylor J	21	16	4	41
Total	695	440	131	1266
Univ. Hosp-Upstate				
Fink G W	200	103	51	354
Lutz C J	236	150	34	420
All Others	5	1	2	8
Total	441	254	87	782
Vassar Bros. Med Ctr				
Bhutani A K	76	11	1	88
Sarabu M	155	256	39	450
Shahani R	156	94	16	266
Zakow P	209	138	26	373
Total	596	499	82	1177
Westchester Med Ctr				
Lafaro R	152	69	17	238
Lansman S	124	65	9	198
Malekan R	174	67	61	302
Saunders P	1	0	11	12
Sett S S	0	1	7	8
Spielvogel D	273	213	142	628
All Others	17	8	14	39
Total	741	423	261	1425
Winthrop Univ. Hosp				
Goncalves J A	254	228	135	617
Kokotos W J	207	171	21	399
Schubach S	159	180	18	357
All Others	116	31	3	150
Total	736	610	177	1523
STATEWIDE TOTAL	26295	22161	8403	56859

CRITERIA USED IN REPORTING SIGNIFICANT RISK FACTORS (2012)

Based on Documentation in Medical Records

Patient Risk Factor	Definitions
Demographic	
Body Surface Area	<p>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:</p> $BSA (m^2) = 0.0003207 \times H^{0.3} \times W^{(0.7285 - (0.0188 \times \text{LOG}))}$ <p>Where H is Height in centimeters and W is Weight in grams.</p>
Body Mass Index	<p>Body Mass Index (BMI) is a measure of body fat that is the ratio of the weight of the body in kilograms to the square of its height in meters and is considered an indication of nutritional status of the body.</p> <p>The formula for BMI is: $BMI = \text{weight}(kg) / (\text{height}(m)^2)$.</p>
Hemodynamic State	
Unstable	<p>Determined in the immediate pre-operative period, defined as the period prior to anesthesia taking responsibility for the patient.</p> <p>Patient requires pharmacologic or mechanical support to maintain blood pressure or cardiac index.</p>
Shock	<p>Acute hypotension (systolic blood pressure < 80 mmHg) or low cardiac index (< 2.0 liters/min/m²), despite pharmacologic or mechanical support.</p> <p>Records with this risk factor were excluded from all analyses in this report.</p>
Comorbidities	
Cerebrovascular Disease	<p>Cerebrovascular disease prior to surgery documented by any one of the following:</p> <ul style="list-style-type: none"> • CVA (symptoms > 24 hrs after onset, presumed to be from vascular etiology); • TIA (recovery within 24 hrs); • Non-invasive carotid test with > 79% diameter occlusion.; or • Prior carotid surgery or stenting or prior cerebral aneurysm clipping or coil. <p>Does not include neurological disease processes such as metabolic and/or anoxic ischemic encephalopathy.</p>

Patient Risk Factor	Definitions
Comorbidities, <i>continued</i>	
Chronic Lung Disease	The patient has chronic lung disease with pre-operative findings of one of the following: <ul style="list-style-type: none"> • FEV₁ < 75% of predicted • Chronic inhaled or oral bronchodilators or steroid therapy; • Room Air pO₂ < 60 or Room Air pCO₂ > 50.
Diabetes	The patient has a history of diabetes diagnosed and/or treated by a physician.
Endocarditis	Patients with two or more positive blood cultures without other obvious source with demonstrated valvular vegetations or acute valvular dysfunction caused by infection. Includes patients who are on antibiotics at the time of surgery. Excludes patients who have completed antibiotic therapy and have no evidence of residual infection.
Extensive Aortic Atherosclerosis	Ascending, transverse, and/or descending aortic atherosclerosis marked by either extensive calcification or luminal atheroma such that the intended surgical procedure is altered.
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 Ankle-Brachial Index < 0.9 is also acceptable documentation.
Renal Failure, Creatinine	Last pre-operative creatinine was in the indicated range.
Renal Failure Requiring Dialysis	The patient is undergoing peritoneal or hemodialysis at the time of admission.
Ventricular Function	
Ejection Fraction	Value of the ejection fraction taken closest to but before the start of the procedure. Intraoperative direct observation of the heart is not an adequate basis for a visual estimate of the ejection fraction. Intra-operative TEE is acceptable, if no pre-operative Ejection Fraction is available. 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 CABG Surgery	Prior to this cardiac surgery, the patient has previously undergone CABG surgery. This include any surgeries that occurred prior to this one including those earlier in the current admission.
Any Previous Cardiac Surgery	Prior to this cardiac surgery, the patient has previously undergone one or more of the following: <ul style="list-style-type: none"> • CABG surgery • surgery or catheter based intervention for valve repair or replacement, • any other cardiac surgery excluding catheter based interventions.

MEDICAL TERMINOLOGY

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 rotoblators 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.

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

Risk Factors for CABG In-Hospital / 30-Day Deaths in New York State in 2012

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 2012 are presented in Appendix 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 Cerebrovascular Disease is 1.795. This means that a patient who has Cerebrovascular Disease prior to surgery is approximately 1.795 times as likely to die in the hospital or after discharge within 30 days of surgery as a patient who does not have Cerebrovascular 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 Cerebrovascular Disease or does not have Cerebrovascular Disease. Female Gender, Previous MI within 7 days and Renal Failure requiring Dialysis are interpreted in this way as well.

For Age in years, the odds ratio represents the increased likelihood for in-hospital/30-day mortality for each one year increase in age. If two patients have all of the same significant risk factors but one patient is one year older, the older patient will be 1.064 times as likely die in the hospital or within 30 days of discharge.

While this is a small difference for a single year, an otherwise identical patient that is 10 years older is 1.856 times more likely to experience in-hospital/30-day mortality.

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 or 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.

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 three ranges (less than 30 percent, 30 percent to 49 percent, and 50 percent or more). The last range is referred to as the reference category. This means that the odds ratio that appears for the other Ejection Fraction categories in the table is relative to patients with an ejection fraction of 50 percent or more. Thus, a CABG patient with an ejection fraction of less than 30 percent is about 4.012 times as likely to die in the hospital or within 30 days as a patient with an ejection fraction of 50 percent or higher, all other significant risk factors being the same.

Appendix Table 1

Multivariable Risk Factor Equation for CABG In-Hospital / 30-Day Deaths in New York State in 2012.

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-Value	Odds Ratio
Demographic				
Age in years	—	0.0618	<0.0001	1.064
Female Gender	25.17	0.6125	0.0045	1.845
Body Surface Area (10 m ²)	—	-0.5978	0.0410	—
Body Surface Area – squared (100 m ⁴)	—	0.0156	0.0247	—
Ventricular Function				
Ejection Fraction				
Ejection Fraction ≥ 50%	64.32	— Reference —		1.000
Ejection Fraction < 30%	7.63	1.3894	<0.0001	4.012
Ejection Fraction 30% – 49%	28.05	0.8143	0.0002	2.258
Previous MI within 7 days	24.42	0.8306	<0.0001	2.295
Comorbidities				
Cerebrovascular Disease	15.22	0.5852	0.0057	1.795
Renal Failure, Requiring Dialysis	3.16	1.4042	<0.0001	4.072
Intercept = -4.0838				
C Statistic = 0.796				

Appendix 2

Risk Factors for CABG 30-Day Readmissions in New York State in 2012

The significant pre-procedural risk factors for 30-day readmissions following CABG in 2012 are presented in the table that follows. Female Gender, Chronic Lung Disease, Diabetes, Peripheral Vascular Disease, and Previous CABG surgery are interpreted in the same way as Cerebrovascular Disease in Appendix 1. The patient either has the risk factor or does not. For example, the odds ratio for the risk factor Peripheral Vascular Disease is 1.589. This means that a patient with peripheral vascular disease is approximately 1.589 times more likely to be readmitted to a hospital within 30 days following discharge after CABG than a patient without peripheral vascular disease who has the same other significant risk factors.

For age, the odds ratio roughly represents the number of times more likely to be readmitted a patient who is older than 65 is compared to a patient who is one year younger but otherwise has the same significant risk factors. Thus, the chance of 30-day readmission for a patient undergoing CABG who is 66 years old is approximately 1.021 times that of a patient 65 years old undergoing CABG, if all other risk factors are the same. All patients age 65 and younger have roughly the same odds of being readmitted within 30-days if their other risk factors are identical.

Body Mass Index (BMI) is a relationship of weight to height. It is a measure of body fat that is the

ratio of the weight of the body in kilograms to the square of its height in meters and is considered an indication of nutritional status of the body. This model includes terms for both BMI and BMI-squared, reflecting the complex relationship between BMI and 30-day readmission rate. This functional form is used to improve the model's ability to predict readmissions, but it means that the odds ratios for these terms do not have a straightforward interpretation.

Previous MI refers to myocardial infarction (commonly called heart attack) prior to surgery and is subdivided into three groups: occurring within 24 hours prior to surgery, one to twenty days prior to surgery and no MI within 20 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 20 days prior to the procedure. For example, a patient with an MI less than 24 hours prior to surgery is 1.855 times as likely to be readmitted as patient who has not had an MI within 20 days but has all of the same other risk factors.

Renal Failure is expressed in terms of renal failure with dialysis and elevated creatinine without dialysis. The odds ratios for both Renal Failure categories are relative to patients with no dialysis and whose last creatinine measured prior to surgery was not greater than 1.5 mg/dL.

Appendix Table 2

Multivariable Risk Factor Equation for CABG In-Hospital / 30-Day Readmission in New York State in 2012.

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-Value	Odds Ratio
Demographic				
Age: Number of years greater than 65	—	0.0205	0.0001	1.021
Female Gender	25.14	0.2765	0.0002	1.319
Body Mass Index	—	-0.0999	0.0026	---
Body Mass Index Squared	—	0.0017	0.0004	---
Ventricular Function				
Previous MI				
No Previous MI within 20 days	70.73	— Reference —		1.000
Previous MI within 24 hours	2.97	0.6180	0.0003	1.855
Previous MI within 1 – 20 days	26.30	0.2678	0.0002	1.307
Comorbidities				
Chronic Lung Disease	22.89	0.2731	0.0002	1.314
Diabetes	44.42	0.2376	0.0005	1.268
Peripheral Vascular Disease	11.18	0.4629	<0.0001	1.589
Renal Failure				
No Renal Failure	89.15	— Reference —		1.000
Renal Failure, Creatinine > 1.5 mg/dl	7.81	0.3253	0.0034	1.385
Renal Failure, Requiring Dialysis	3.04	0.9446	<0.0001	2.572
Previous CABG surgery	2.16	0.3961	0.0453	1.486

Intercept = -1.0187

C Statistic = 0.632

Appendix 3

2010-2012 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 2010-2012 time period are presented in the table that follows.

Body Surface Area is interpreted as described in Appendix 1 and Renal Failure is interpreted as described in Appendix 2.

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 1.713 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.

Three vessels diseased refers to patients with at least a 70 percent blockage in three of the native coronary arteries including the Left Anterior Descending (LAD), the Right Coronary Artery (RCA) and the Left Circumflex (LCX) or their major branches. The odds ratio is relative to patients with disease in fewer than 3 of these vessels and major branches.

All other variables can be interpreted in the same way as described in Appendix 1 for risk factors with only two possibilities.

Appendix Table 3

Multivariable Risk Factor Equation for Valve Surgery In-Hospital / 30-Day Deaths In NYS, 2010-2012.

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-Value	Odds Ratio
Demographic				
Age: Number of years greater than 50	—	0.0440	<0.0001	1.045
Body Surface Area (10 m ²)	—	-0.4291	0.0107	—
Body Surface Area – squared (100 m ⁴)	—	0.0096	0.0224	—
Type of Valve Surgery				
Aortic Valve Replacement	51.59	— Reference —		1.000
Mitral Valve Replacement	12.78	0.5384	0.0002	1.713
Mitral Valve Repair	16.54	-0.3051	0.1540	0.737
Multiple Valve Repair/Replacement	19.09	0.7360	<0.0001	2.088
Hemodynamic State				
Unstable	0.51	1.3832	0.0001	3.988
Comorbidities				
Chronic Lung Disease	23.86	0.3319	0.0016	1.394
Endocarditis	4.92	0.5867	0.0016	1.798
Peripheral Vascular Disease	7.64	0.6046	<0.0001	1.831
Diabetes	20.60	0.3447	0.0018	1.412
Renal Failure				
No Renal Failure	88.20	— Reference —		1.000
Renal Failure, Creatinine > 1.5 mg/dl	8.92	0.7003	<0.0001	2.014
Renal Failure, Requiring Dialysis	2.88	1.7590	<0.0001	5.807
Any Previous Cardiac Surgery	18.49	0.6199	<0.0001	1.859
Three Vessels Diseased	1.40	0.5282	0.0365	1.696

Intercept = -2.8900

C Statistic = 0.778

Appendix 4

Risk Factors for Valve and CABG Surgery In-Hospital/30-Day Mortality in New York State in 2010-2012

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve and CABG surgery in the 2010-2012 time period are presented in the table that follows.

Age and Body Surface Area are interpreted as described earlier. The categories for Renal Failure are all relative to patients with no renal failure. Except for type of valve, all other risk factors are interpreted as described in Appendix 1 for risk factors with only two possibilities.

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 1.084 times as likely to die in the hospital or within 30 days after discharge as a patient with aortic valve repair or replacement and CABG surgery, all other significant risk factors being the same.

Appendix Table 4

Multivariable Risk Factor Equation for Valve and CABG Surgery In-Hospital/ 30-Day Deaths in NYS, 2010-2012.

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-Value	Odds Ratio
Demographic				
Age: Number of years greater than 50	—	0.0468	<0.0001	1.048
Female Gender	35.38	0.4033	0.0016	1.497
Body Surface Area (10 m ²)	—	-0.6577	0.0017	—
Body Surface Area – squared (100 m ⁴)	—	0.0156	0.0031	—
Type of Valve (with CABG)				
Aortic Valve Replacement	62.56	— Reference —		1.000
Mitral Valve Replacement	9.78	0.0804	0.6801	1.084
Mitral Valve Repair	15.82	0.1521	0.3756	1.164
Multiple Valve Repair/Replacement	11.84	0.8980	<0.0001	2.455
Hemodynamic State				
Unstable	0.99	1.1771	0.0007	3.245
Ventricular Function				
Ejection Fraction < 30%	9.59	0.6278	0.0001	1.874
Comorbidities				
Extensive Aortic Atherosclerosis	8.63	0.3693	0.0261	1.447
Peripheral Vascular Disease	14.12	0.4136	0.0020	1.512
Renal Failure				
No Renal Failure	67.31	— Reference —		1.000
Renal Failure, Creatinine 1.3 – 1.5 mg/dl	15.60	0.4341	0.0050	1.544
Renal Failure, Creatinine 1.6 – 3.0 mg/dl	11.98	0.8487	<0.0001	2.337
Renal Failure, Creatinine > 3.0 mg/dl	1.07	1.5587	<0.0001	4.753
Renal Failure Requiring Dialysis	4.04	1.6906	<0.0001	5.423
Any Previous Cardiac Surgery	7.84	0.7358	<0.0001	2.087

Intercept = 1.6724

C Statistic = 0.750

Appendix 5

Risk Factors for Isolated CABG In-Hospital/30-Day Mortality in New York State 2010-2012

The significant pre-procedural risk factors for in-hospital/30-day mortality following isolated CABG in the 2010-2012 time period are presented in the table that follows. The risk factors in this model are interpreted as described in Appendices 1 – 4.

Appendix Table 5

Multivariable Risk Factor Equation for CABG In-Hospital / 30-Day Deaths in New York State in 2010-2012.

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-Value	Odds Ratio
Demographic				
Age: Number of years greater than 50	—	0.0534	<0.0001	1.055
Body Surface Area (10 m ²)	—	-0.7283	<0.0001	—
Body Surface Area – squared (100 m ⁴)	—	0.0179	<0.0001	—
Hemodynamic State				
Unstable	17.82	0.9811	0.0001	2.667
Ventricular Function				
Ejection Fraction				
Ejection Fraction \geq 50%	73.42	— Reference —		1.000
Ejection Fraction < 30%	2.66	1.0335	<0.0001	2.811
Ejection Fraction 30-49%	23.92	0.4655	0.0001	1.593
Previous MI				
No Previous MI within 14 days	87.57	— Reference —		1.000
Previous MI less than 1 day	11.70	0.9983	<0.0001	2.714
Previous MI 1 - 14 days	0.73	0.5712	<0.0001	1.770
Comorbidities				
Cerebrovascular Disease	7.48	0.5143	<0.0001	1.673
Peripheral Vascular Disease	28.34	0.6246	<0.0001	1.867
Renal Failure				
No Renal Failure	88.27	— Reference —		1.000
Renal Failure, Creatinine > 1.5 mg/dl	8.97	0.4216	0.0028	1.524
Renal Failure, Requiring Dialysis	2.76	1.3923	<0.0001	4.024

Intercept = 1.1605

C Statistic = 0.769

NEW YORK STATE CARDIAC SURGERY CENTERS

Albany Medical Center
New Scotland Avenue
Albany, New York 12208

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

Bassett Medical Center
Atwell Road
Cooperstown, New York 13326

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

Buffalo General Medical Center
100 High Street
Buffalo, New York 14203

Champlain Valley Physicians Hospital^{l***}
75 Beekman Street
Plattsburgh, New York 12901

Ellis Hospital
1101 Nott Street
Schenectady, New York 12308

Erie County Medical Center ^{***}
462 Grider Street
Buffalo, New York 14215

Good Samaritan Hospital Medical Center^{**}
1000 Montauk Highway
West Islip, New York 11795

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

Mercy Hospital of Buffalo
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 @ Jack D. Weiler
Hospital of A. Einstein College
1825 Eastchester Road
Bronx, New York 10461

Mount Sinai Beth Israel
10 Nathan D. Perlman Place
New York, New York 10003

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

Mount Sinai St. Luke's
11-11 Amsterdam Avenue at 114th Street
New York, New York 10025

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

NY Presbyterian Hospital @ Columbia
Presbyterian Center
161 Fort Washington Avenue
New York, New York 10032

NY Presbyterian Hospital @ New York Weill –
Cornell College
525 East 68th Street
New York, New York 10021

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

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

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

UHS Wilson Medical Center
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

Upstate University Hospital – State University of
New York
750 East Adams Street
Syracuse, New York 13210

Vassar Brothers Medical Center
45 Reade Place
Poughkeepsie, New York 12601

Westchester Medical Center
Grasslands Road
Valhalla, New York 10595

Winthrop University Hospital
259 First Street
Mineola, New York 11501

** Began performing cardiac surgery after 2012

*** No longer performing cardiac surgery as of September 2014

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Cardiac
Box 2006
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