ADULT CARDIAC SURGERY

in New York State

2013-2015

Department of Health

February 2018

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TABLE OF CONTENTS

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 in one report information on mortality after coronary artery bypass graft (CABG) surgery, valve repair or replacement surgery, transcatheter aortic valve replacement (TAVR), and readmissions after CABG.

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, valve repair or replacement surgery, and TAVR 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 and/or valve surgery for surgeons performing the procedure.
- Volume (number of cases) of all cardiac surgery for NYS hospitals and surgeons.
- Description of the patient risk factors associated with mortality for CABG and valve surgery and TAVR, 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 2015. 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.

CARDIAC VALVE PROCEDURES

Heart valves control the flow of blood as it enters the heart and is pumped from the chambers of the heart to the lungs for oxygenation and back to the body. There are four valves: the tricuspid, mitral, pulmonary 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.

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, 2012, and November 30, 2015, provided by all non-federal hospitals in NYS where cardiac surgery is performed. The analysis period for this report includes patients discharged in December 2012 but not those discharged in December 2015. 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 2015 cases includes patients discharged from December 1, 2014 through November 30, 2015. In total there were 60,820 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.

Records for 149 patients residing outside the United States were excluded because 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 45.] 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, 610 cases with cardiogenic shock were removed from the data. This accounts for 1.00 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 60,052 cardiac surgeries analyzed in this report. Isolated CABG surgery represented 40.74 percent of all adult cardiac surgery included in this report. Valve or combined valve/CABG surgery represented 36.85 percent of all adult cardiac surgery for the same period. TAVR represented 9.25 percent of all cardiac surgeries reported. Total cardiac surgery, isolated CABG, valve surgery and other cardiac surgery volumes are tabulated in Table 8 by hospital and surgeon for the period 2013 through 2015.

While there were 8,356 CABG cases included in the mortality analysis for 2015 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 326 cases. Another 105 patients were excluded because they died in the same admission as their index CABG, so readmission was impossible. Nineteen cases were transfered to another acute care facility after CABG and so were excluded from readmission analysis. Finally, 7 cases with a discharge status of 'left against medical advice' were excluded from the readmission analysis.

In total, the number of excluded cases was 451 (some patients had more than 1 reason for exclusion), leaving 7,905 cases to be examined for 30-day readmission rates.

Note on Hospitals Not Performing Cardiac Surgery During Entire 2013 – 2015 Period

Good Samaritan in West Islip began performing cardiac surgery in January 2014. The cardiac surgery programs at Erie County Medical Center and Champlain Valley Physician's Hospital closed in March and December of 2013, respectively.

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 or TAVR 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 or TAVR 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, and the National Death Index.

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.

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 1.56 percent (in-hospital/30-day mortality in 2015) to obtain the provider's RAMR. For the three-year period 2013-2015, the ratio is multiplied by 1.54 percent (in-hospital/30-day mortality rate) for isolated CABG patients or 3.03 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 (13.18 percent in 2015).

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 processes 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, 1.56 percent for Isolated CABG patients in 2015 or 3.03 percent for Valve or Valve/CABG patients in 2013-2015).

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 (13.18 percent 30-day readmission rate for all CABG patients discharged in 2015).

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.

2015 HOSPITAL OUTCOMES FOR CABG SURGERY

Table 1 and Figure 1 present the CABG surgery results for the 38 hospitals performing this operation in NYS in 2015. 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 2015, 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 8,356 CABG surgeries was 1.56 percent. In-hospital/30-day OMRs ranged from 0.00 percent to 16.67 percent. The range of EMRs, which measure patient severity of illness, was 0.82 percent to 2.28 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 12.60 percent. No hospitals had RAMRs that were significantly lower than the statewide rate. One hospital (University Hospital - Brooklyn) had mortality rate that was significantly higher than the statewide rate.

The 2015 in-hospital/30-day mortality rate of 1.56 percent for Isolated CABG is higher than the 1.22 percent observed in 2014.

The in-hospital OMR for 2015 Isolated CABG discharges (not shown in Table 1) was 1.26 percent for all 8,356 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. A gray bar that extends far above and/or below the statewide average indicates that a hospital has a wide confidence interval. This is common when the hospital has a very small number of cases. It does not necessarily mean that the risk-adjusted mortality rate is very high or very low. 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 38 hospitals performing CABG in NYS in 2015 for which data could be analyzed. The table contains, for each hospital, the number of CABGs resulting in 2015 discharges in the readmission analysis, the number of 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 ORR for the 7,905 CABGs included in this 2015 analysis was 13.18 percent. Observed readmission rates ranged from 4.65 percent to 25.00 percent. The range in ERRs, which measure patient severity of illness, was between 10.23 percent and 15.08 percent. The RARRs, which measure hospital performance, range from 5.41 percent to 21.91 percent.

Based on confidence intervals for RARRs, three hospitals (Bellevue Hospital in Manhattan, Good Samaritan Hospital in West Islip, and Rochester General Hospital) had RARRs that were significantly higher than the statewide average. Four hospitals (NYU Hospitals Center in Manhattan, Southside Hospital in Bayshore, St. Peter's Hospital in Albany, 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, 2015 Discharges

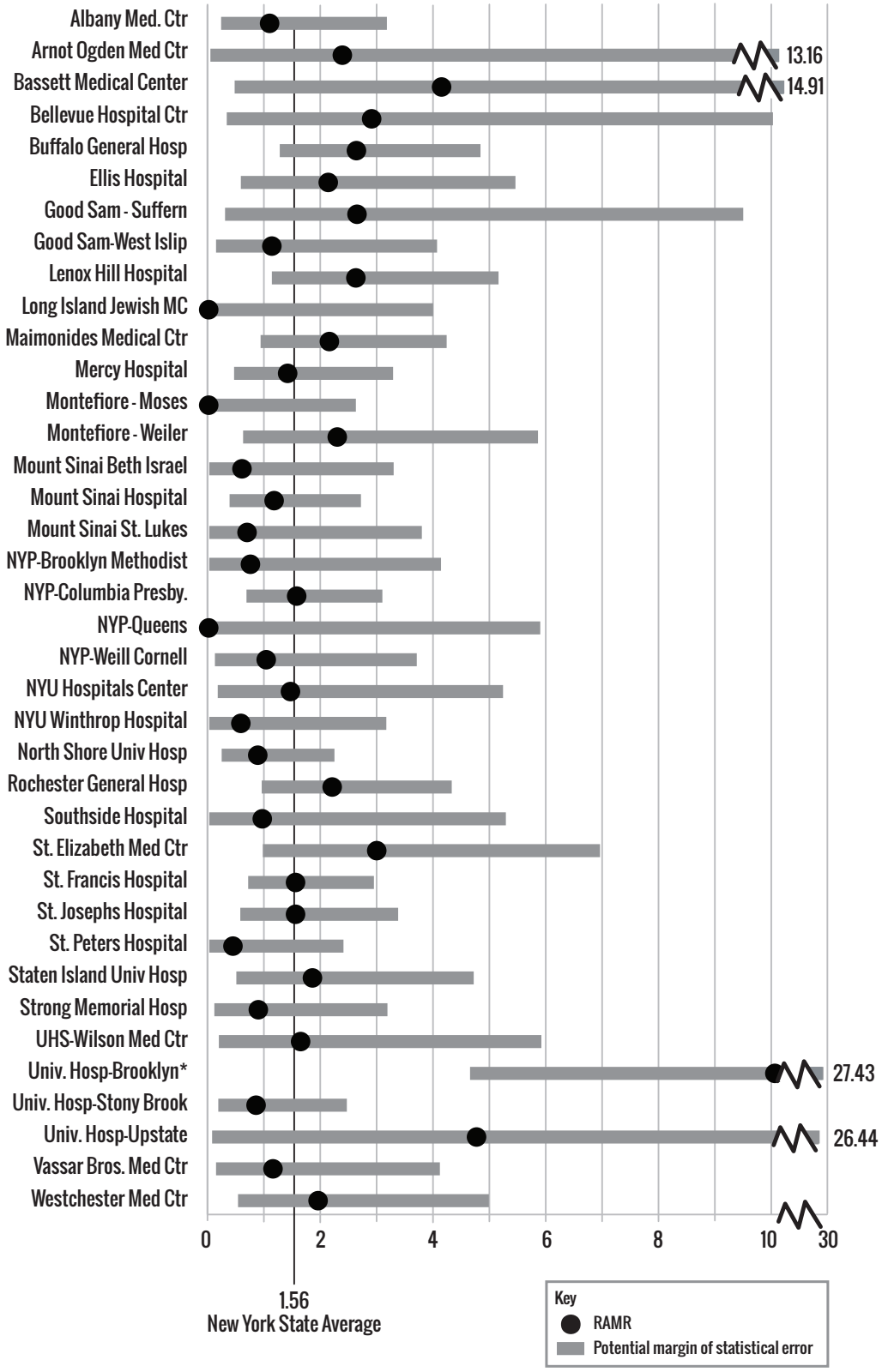
(Listed Alphabetically by Hospital)

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med. Ctr	260	3	1.15	1.66	1.08	(0.22, 3.16)
Arnot Ogden Med Ctr	80	1	1.25	0.82	2.37	(0.03,13.16)
Bassett Medical Center	74	2	2.70	1.02	4.13	(0.46,14.91)
Bellevue Hospital Ctr	113	2	1.77	0.95	2.89	(0.32,10.42)
Buffalo General Hosp	474	10	2.11	1.25	2.62	(1.26, 4.82)
Ellis Hospital	185	4	2.16	1.58	2.12	(0.57, 5.44)
Good Sam - Suffern	108	2	1.85	1.10	2.63	(0.29, 9.48)
Good Sam-West Islip	199	2	1.01	1.39	1.12	(0.13, 4.05)
Lenox Hill Hospital	259	8	3.09	1.84	2.61	(1.12, 5.14)
Long Island Jewish MC	97	0	0.00	1.48	0.00	(0.00, 3.98)
Maimonides Medical Ctr	255	8	3.14	2.28	2.14	(0.92, 4.22)
Mercy Hospital	391	5	1.28	1.42	1.40	(0.45, 3.27)
Montefiore - Moses	176	0	0.00	1.24	0.00	(0.00, 2.61)
Montefiore - Weiler	194	4	2.06	1.41	2.28	(0.61, 5.84)
Mount Sinai Beth Israel	210	1	0.48	1.26	0.59	(0.01, 3.28)
Mount Sinai Hospital	398	5	1.26	1.69	1.16	(0.37, 2.70)
Mount Sinai St. Lukes	146	1	0.68	1.57	0.68	(0.01, 3.78)
NYP-Brooklyn Methodist	110	1	0.91	1.91	0.74	(0.01, 4.12)
NYP-Columbia Presby.	387	8	2.07	2.06	1.56	(0.67, 3.08)
NYP-Queens	117	0	0.00	0.83	0.00	(0.00, 5.88)
NYP-Weill Cornell	196	2	1.02	1.56	1.02	(0.11, 3.69)
NYU Hospitals Center	183	2	1.09	1.18	1.45	(0.16, 5.22)
NYU Winthrop Hospital	208	1	0.48	1.32	0.57	(0.01, 3.15)
North Shore Univ Hosp	421	4	0.95	1.70	0.87	(0.23, 2.23)
Rochester General Hosp	355	8	2.25	1.60	2.19	(0.94, 4.31)
Southside Hospital	170	1	0.59	0.97	0.95	(0.01, 5.27)
St. Elizabeth Med Ctr	166	5	3.01	1.57	2.98	(0.96, 6.94)
St. Francis Hospital	481	9	1.87	1.88	1.54	(0.70, 2.93)
St. Josephs Hospital	382	6	1.57	1.59	1.54	(0.56, 3.36)
St. Peters Hospital	344	1	0.29	1.05	0.43	(0.01, 2.39)
Staten Island Univ Hosp	185	4	2.16	1.83	1.84	(0.49, 4.70)
Strong Memorial Hosp	203	2	0.99	1.75	0.88	(0.10, 3.17)
UHS-Wilson Med Ctr	142	2	1.41	1.34	1.63	(0.18, 5.90)
Univ. Hosp-Brooklyn	36	6	16.67	2.06	12.60 *	(4.60,27.43)
Univ. Hosp-Stony Brook	297	3	1.01	1.88	0.84	(0.17, 2.45)
Univ. Hosp-Upstate	31	1	3.23	1.06	4.75	(0.06,26.44)
Vassar Bros. Med Ctr	174	2	1.15	1.57	1.14	(0.13, 4.10)
Westchester Med Ctr	149	4	2.68	2.15	1.94	(0.52, 4.97)
STATEWIDE TOTAL	**8356**	**130**	**1.56**			

* 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, 2015 Discharges



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

Table 2

30-Day Observed, Expected and Risk-Adjusted Readmission Rates for Isolated CABG Surgery in New York State, 2015 Discharges

(Listed Alphabetically by Hospital)

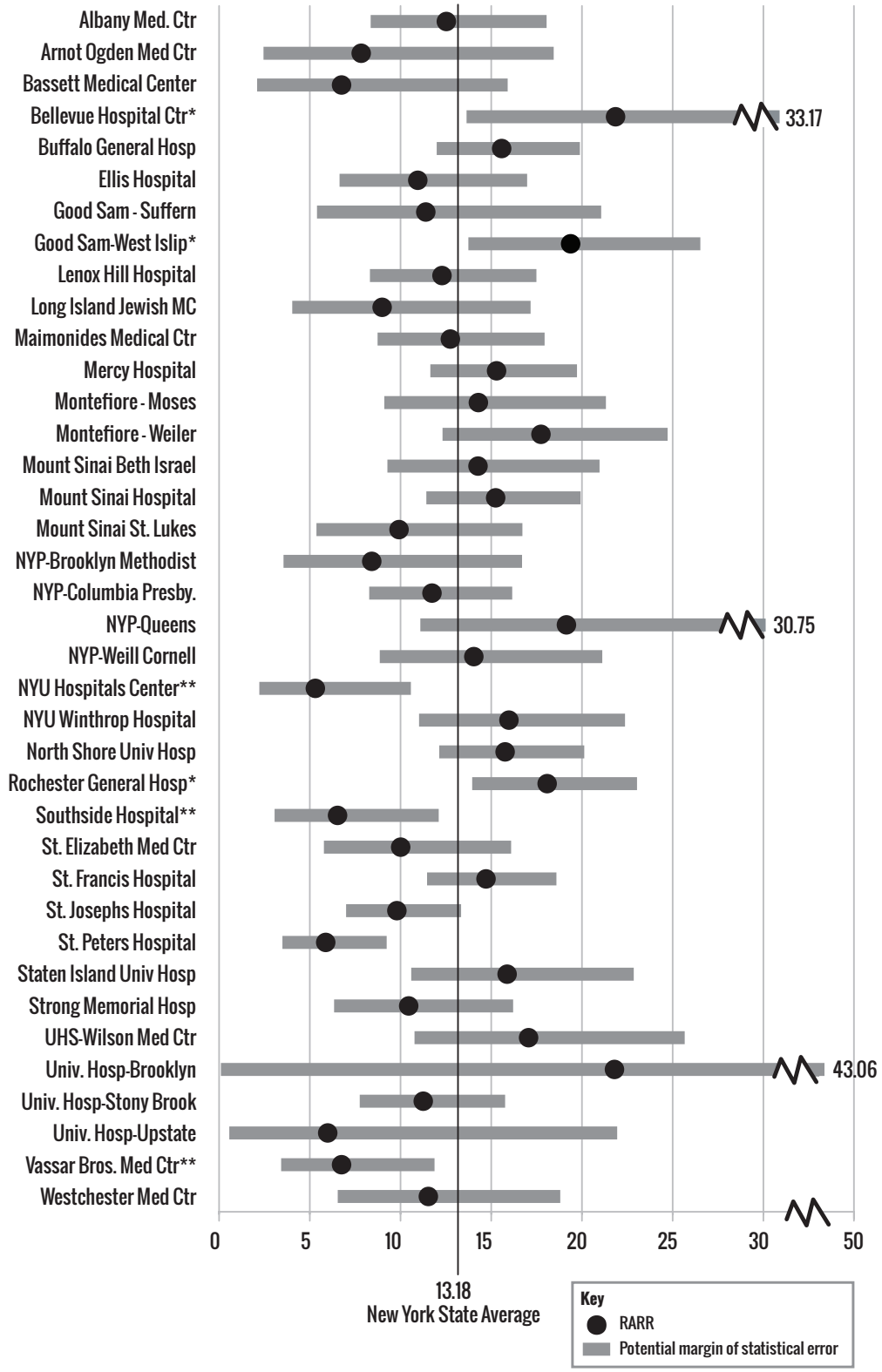
Hospital	Cases	Readmits	ORR	ERR	RARR	95% CI for RARR
Albany Med. Ctr	231	29	12.55	13.12	12.61	(8.45,18.12)
Arnot Ogden Med Ctr	73	5	6.85	11.38	7.93	(2.56,18.51)
Bassett Medical Center	72	5	6.94	13.37	6.85	(2.21,15.98)
Bellevue Hospital Ctr	112	22	19.64	11.82	21.91*	(13.72,33.17)
Buffalo General Hosp	441	65	14.74	12.41	15.65	(12.08,19.95)
Ellis Hospital	178	20	11.24	13.42	11.04	(6.74,17.05)
Good Sam - Suffern	94	10	10.64	12.21	11.48	(5.50,21.12)
Good Sam-West Islip	196	39	19.90	13.49	19.44*	(13.82,26.57)
Lenox Hill Hospital	246	31	12.60	13.42	12.37	(8.41,17.56)
Long Island Jewish MC	97	9	9.28	13.46	9.08	(4.14,17.24)
Maimonides Medical Ctr	248	33	13.31	13.68	12.83	(8.83,18.01)
Mercy Hospital	384	60	15.63	13.40	15.37	(11.73,19.79)
Montefiore - Moses	172	24	13.95	12.80	14.37	(9.20,21.38)
Montefiore - Weiler	185	35	18.92	14.00	17.81	(12.40,24.77)
Mount Sinai Beth Israel	197	26	13.20	12.12	14.35	(9.37,21.03)
Mount Sinai Hospital	361	54	14.96	12.87	15.32	(11.51,19.99)
Mount Sinai St. Lukes	140	14	10.00	13.17	10.01	(5.47,16.79)
NYP-Brooklyn Methodist	106	8	7.55	11.69	8.51	(3.66,16.77)
NYP-Columbia Presby.	310	38	12.26	13.66	11.82	(8.37,16.23)
NYP-Queens	114	17	14.91	10.23	19.21	(11.18,30.75)
NYP-Weill Cornell	166	23	13.86	12.94	14.12	(8.95,21.18)
NYU Hospitals Center	172	8	4.65	11.33	5.41**	(2.33,10.66)
NYU Winthrop Hospital	202	34	16.83	13.82	16.05	(11.11,22.43)
North Shore Univ Hosp	409	65	15.89	13.23	15.84	(12.22,20.19)
Rochester General Hosp	345	66	19.13	13.90	18.15*	(14.03,23.09)
Southside Hospital	165	10	6.06	12.05	6.63**	(3.17,12.19)
St. Elizabeth Med Ctr	161	17	10.56	13.78	10.10	(5.88,16.17)
St. Francis Hospital	468	71	15.17	13.52	14.79	(11.55,18.66)
St. Josephs Hospital	373	41	10.99	14.65	9.89	(7.10,13.42)
St. Peters Hospital	328	19	5.79	12.78	5.98**	(3.60, 9.33)
Staten Island Univ Hosp	172	29	16.86	13.93	15.95	(10.68,22.91)
Strong Memorial Hosp	194	20	10.31	12.89	10.54	(6.44,16.28)
UHS-Wilson Med Ctr	134	23	17.16	13.20	17.13	(10.86,25.71)
Univ. Hosp-Brooklyn	32	8	25.00	15.08	21.85	(9.41,43.06)
Univ. Hosp-Stony Brook	285	34	11.93	13.87	11.34	(7.85,15.84)
Univ. Hosp-Upstate	30	2	6.67	14.42	6.09	(0.68,22.00)
Vassar Bros. Med Ctr	170	12	7.06	13.59	6.85**	(3.53,11.96)
Westchester Med Ctr	142	16	11.27	12.78	11.62	(6.64,18.87)
STATEWIDE TOTAL	**7905**	**1042**	**13.18**			

* 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

30-Day Risk-Adjusted Readmission Rates for Isolated CABG in New York State, 2015 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.

2013-2015 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 2013-2015. The table contains, for each hospital, the combined number of Valve Only and Valve/CABG operations resulting in 2013-2015 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 22,129 combined Valve Only and Valve/CABG procedures performed at the 40 hospitals was 3.03 percent. The OMRs ranged from 0.00 percent to 11.11 percent. The range of EMRs, which measure patient severity of illness, was 1.33 percent to 4.41 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 10.88 percent. Five hospitals (Mercy Hospital in Buffalo, St. Elizabeth Medical Center in Utica, Strong Memorial Hospital in Rochester, United Health Services - Wilson in Johnson City and University Hospital - Brooklyn) had RAMRs that were significantly higher than the statewide rate. Four hospital (Long Island Jewish in New Hyde Park, Maimonides Medical Center in Brooklyn, St. Joseph's Hospital in Syracuse, and Vassar Brothers Medical Center in Poughkeepsie) had RAMRs that were 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 2013-2015. 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 2013-2015 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 2013-2015 in-hospital/30-day OMR of 3.03 percent for Valve and Valve/CABG surgeries is lower than the 3.18 percent observed for 2012-2014. The in-hospital OMR for 2013-2015 valve surgeries (not shown in Table 3) is 2.53 percent for the 22,129 patients included in this analysis.

Table 5 presents the results for transcatheter aortic valve replacement (TAVR) procedures performed at the 24 hospitals performing TAVR during the 2013-2015 discharge period. The table contains, for each hospital, the number of TAVR procedures resulting in 2013-2015 discharges, the number of in-hospital/30-day deaths, the OMR, the EMR based on the statistical model presented in Appendix 5, the RAMR and a 95 percent confidence interval for the RAMR. Please note, some hospitals listed in Table 5 began performing the procedure during the 2013-2015 reporting period and the number of cases listed does not represent a full three year's program activity. Other hospitals have begun performing the procedure more recently.

As indicated in Table 5, the overall in-hospital/30-day mortality rate for the 5,554 TAVR procedures performed at the 24 hospitals was 4.75 percent. The OMRs ranged from 0.00 percent to 8.41 percent. The range of EMRs, which measure patient severity of illness, was 3.44 percent to 7.45 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 8.07 percent. One hospital (Mt. Sinai Hospital in Manhattan) had a RAMR that was statistically higher than the statewide rate. One hospital (NY Presbyterian at Columbia in Manhattan) had a RAMR that was statistically lower than the statewide rate.

Table 3

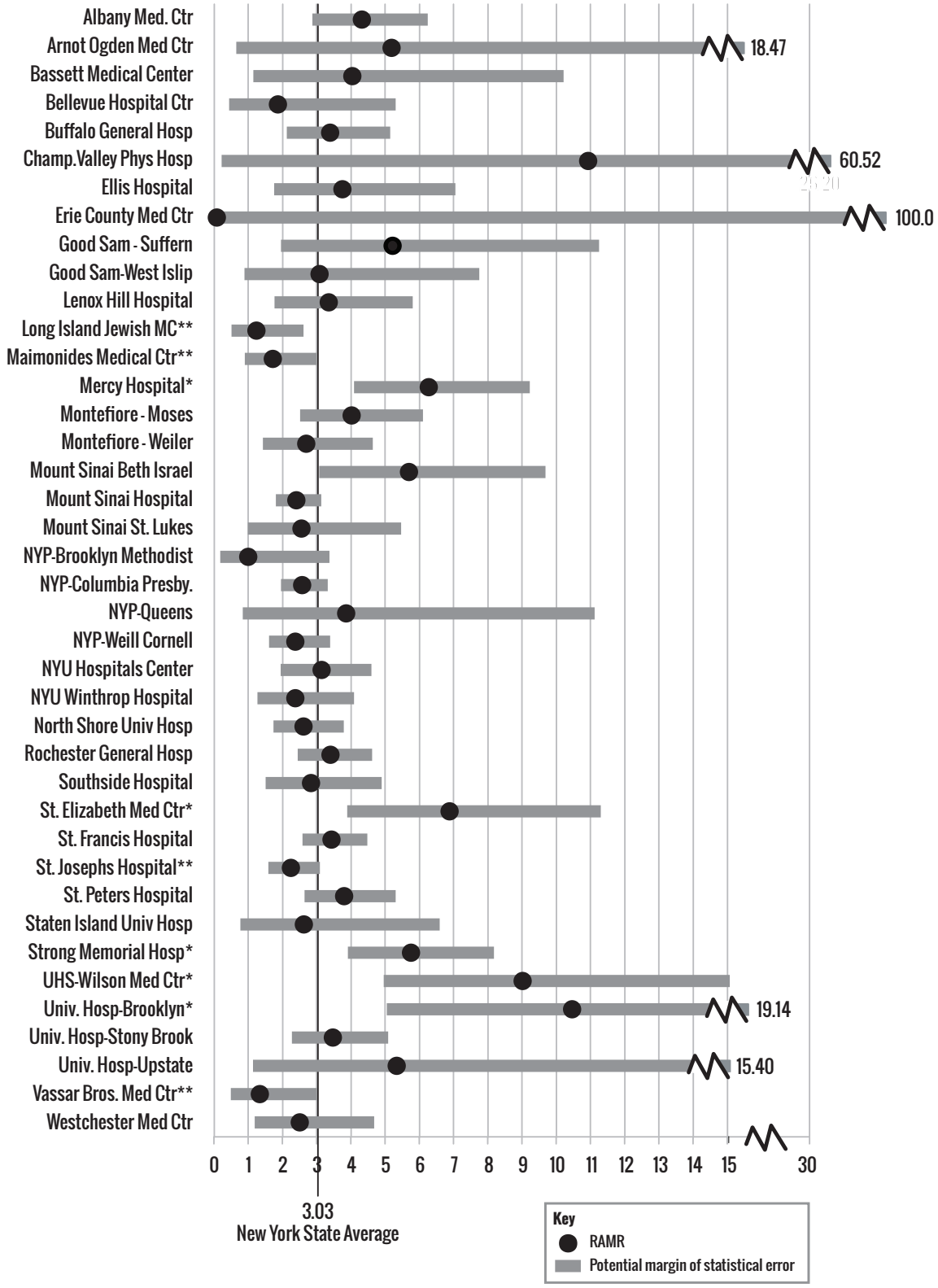
In-hospital/30-Day Observed, Expected, and Risk-Adjusted Mortality Rates for Valve or Valve/CABG Surgery in New York State, 2013 - 2015 Discharges

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med. Ctr	668	27	4.04	2.89	4.25	(2.80, 6.18)
Arnot Ogden Med Ctr	66	2	3.03	1.80	5.12	(0.57,18.47)
Bassett Medical Center	137	4	2.92	2.23	3.97	(1.07,10.16)
Bellevue Hospital Ctr	244	3	1.23	2.08	1.79	(0.36, 5.24)
Buffalo General Hosp	779	21	2.70	2.46	3.32	(2.05, 5.08)
Champ.Valley Phys Hosp	21	1	4.76	1.33	10.88	(0.14,60.52)
Ellis Hospital	284	9	3.17	2.61	3.68	(1.68, 6.99)
Erie County Med Ctr	4	0	0.00	1.89	0.00	(0.00,100.0)
Good Sam - Suffern	132	6	4.55	2.68	5.15	(1.88,11.20)
Good Sam-West Islip	147	4	2.72	2.75	3.01	(0.81, 7.69)
Lenox Hill Hospital	444	12	2.70	2.50	3.28	(1.69, 5.74)
Long Island Jewish MC	416	6	1.44	3.75	1.16 **	(0.43, 2.54)
Maimonides Medical Ctr	461	11	2.39	4.41	1.64 **	(0.82, 2.93)
Mercy Hospital	538	25	4.65	2.27	6.21 *	(4.02, 9.17)
Montefiore - Moses	448	21	4.69	3.60	3.95	(2.44, 6.04)
Montefiore - Weiler	340	12	3.53	4.09	2.62	(1.35, 4.57)
Mount Sinai Beth Israel	229	13	5.68	3.06	5.63	(3.00, 9.63)
Mount Sinai Hospital	2151	51	2.37	3.09	2.33	(1.73, 3.06)
Mount Sinai St. Lukes	275	6	2.18	2.67	2.48	(0.91, 5.40)
NYP-Brooklyn Methodist	180	2	1.11	3.68	0.92	(0.10, 3.30)
NYP-Columbia Presby.	2103	55	2.62	3.17	2.50	(1.88, 3.25)
NYP-Queens	101	3	2.97	2.38	3.79	(0.76,11.07)
NYP-Weill Cornell	1200	28	2.33	3.08	2.30	(1.53, 3.32)
NYU Hospitals Center	1330	25	1.88	1.86	3.07	(1.99, 4.53)
NYU Winthrop Hospital	517	12	2.32	3.05	2.30	(1.19, 4.02)
North Shore Univ Hosp	879	26	2.96	3.53	2.54	(1.66, 3.72)
Rochester General Hosp	1081	39	3.61	3.28	3.33	(2.37, 4.55)
Southside Hospital	362	12	3.31	3.64	2.76	(1.43, 4.83)
St. Elizabeth Med Ctr	288	15	5.21	2.31	6.82 *	(3.82,11.25)
St. Francis Hospital	1474	52	3.53	3.18	3.36	(2.51, 4.41)
St. Josephs Hospital	1356	35	2.58	3.61	2.17 **	(1.51, 3.02)
St. Peters Hospital	869	33	3.80	3.09	3.73	(2.57, 5.24)
Staten Island Univ Hosp	171	4	2.34	2.78	2.55	(0.69, 6.53)
Strong Memorial Hosp	629	30	4.77	2.54	5.69 *	(3.84, 8.12)
UHS-Wilson Med Ctr	230	14	6.09	2.06	8.96 *	(4.89,15.03)
Univ. Hosp-Brooklyn	90	10	11.11	3.24	10.41 *	(4.98,19.14)
Univ. Hosp-Stony Brook	669	25	3.74	3.33	3.40	(2.20, 5.02)
Univ. Hosp-Upstate	71	3	4.23	2.43	5.27	(1.06,15.40)
Vassar Bros. Med Ctr	436	5	1.15	2.76	1.26 **	(0.41, 2.94)
Westchester Med Ctr	309	9	2.91	3.64	2.43	(1.11, 4.61)
STATEWIDE TOTAL	**22129**	**671**	**3.03**			

* 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, 2013-2015 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 Surgery in New York State, 2013-2015 Discharges

Hospital	Aortic Valve Replace Surgery	Aortic Valve and CABG	Mitral Valve Replace Surgery	Mitral Replace and CABG	Mitral Valve Repair Surgery	Mitral Repair and CABG	Multiple Valve Surgery	Multiple Valve and CABG	Total Valve or Valve/ CABG
Albany Med. Ctr	255	144	41	12	86	33	72	25	668
Arnot Ogden Med Ctr	27	26	2	1	7	0	3	0	66
Bassett Medical Center	58	54	2	2	4	6	4	7	137
Bellevue Hospital Ctr	97	13	70	5	12	3	39	5	244
Buffalo General Hosp	307	240	71	25	68	29	18	21	779
Champ.Valley Phys Hosp	14	7	0	0	0	0	0	0	21
Ellis Hospital	113	96	18	13	14	11	12	7	284
Erie County Med Ctr	0	2	0	0	1	0	1	0	4
Good Sam - Suffern	39	42	13	4	16	6	6	6	132
Good Sam-West Islip	51	44	4	5	11	15	12	5	147
Lenox Hill Hospital	137	47	66	8	98	18	61	9	444
Long Island Jewish MC	103	73	43	20	68	30	59	20	416
Maimonides Medical Ctr	132	77	105	32	19	13	78	5	461
Mercy Hospital	198	152	51	27	72	5	28	5	538
Montefiore - Moses	132	66	83	30	38	22	63	14	448
Montefiore - Weiler	82	61	63	22	17	34	43	18	340
Mount Sinai Beth Israel	62	45	26	12	19	14	37	14	229
Mount Sinai Hospital	449	157	42	12	199	81	1056	155	2151
Mount Sinai St. Lukes	46	39	26	9	76	32	36	11	275
NYP-Brooklyn Methodist	63	29	33	9	5	2	32	7	180
NYP-Columbia Presby.	807	373	213	60	260	71	265	54	2103
NYP-Queens	41	22	21	4	6	4	2	1	101
NYP-Weill Cornell	479	185	122	34	136	23	180	41	1200
NYU Hospitals Center	488	102	84	13	436	27	164	16	1330
NYU Winthrop Hospital	177	91	81	38	47	35	24	24	517
North Shore Univ Hosp	302	181	118	41	66	28	115	28	879
Rochester General Hosp	410	257	71	26	121	79	74	43	1081
Southside Hospital	106	76	37	16	45	19	46	17	362
St. Elizabeth Med Ctr	91	78	19	12	33	25	21	9	288
St. Francis Hospital	536	305	93	30	172	88	180	70	1474
St. Josephs Hospital	402	278	101	59	211	74	152	79	1356
St. Peters Hospital	282	248	36	23	53	57	116	54	869
Staten Island Univ Hosp	70	36	20	14	19	1	8	3	171
Strong Memorial Hosp	271	140	60	8	90	13	35	12	629
UHS-Wilson Med Ctr	110	77	16	5	7	3	7	5	230
Univ. Hosp-Brooklyn	25	10	20	3	6	8	16	2	90
Univ. Hosp-Stony Brook	234	189	47	22	53	39	54	31	669
Univ. Hosp-Upstate	30	13	9	3	7	3	5	1	71
Vassar Bros. Med Ctr	155	121	54	19	32	13	24	18	436
Westchester Med Ctr	93	69	34	20	26	20	36	11	309
Total	**7474**	**4265**	**2015**	**698**	**2656**	**984**	**3184**	**853**	**22129**
STATEWIDE MORTALITY RATE (%)	**1.81**	**2.95**	**3.92**	**8.45**	**0.72**	**3.35**	**4.93**	**7.39**	**3.03**

Table 5

In-hospital/30-Day Observed, Expected and Risk-Adjusted Mortality Rates for TAVR in New York State, 2013-2015 Discharges (Listed Alphabetically by Hospital)

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med. Ctr	339	13	3.83	4.19	4.35	(2.31, 7.44)
Buffalo General Hosp	238	9	3.78	4.52	3.97	(1.81, 7.55)
Lenox Hill Hospital	128	8	6.25	4.91	6.05	(2.60,11.92)
Long Island Jewish MC	141	5	3.55	4.94	3.41	(1.10, 7.96)
Maimonides Medical Ctr	151	7	4.64	4.16	5.29	(2.12,10.90)
Mercy Hospital	7	0	0.00	5.40	0.00	(0.00,46.14)
Montefiore - Moses	115	7	6.09	5.24	5.52	(2.21,11.38)
Montefiore - Weiler	17	1	5.88	3.47	8.07	(0.11,44.88)
Mount Sinai Hospital	452	33	7.30	4.78	7.26 *	(4.99,10.19)
NYP-Brooklyn Methodist	40	3	7.50	4.73	7.54	(1.52,22.04)
NYP-Columbia Presby.	959	34	3.55	5.63	2.99 **	(2.07, 4.18)
NYP-Weill Cornell	329	16	4.86	4.31	5.37	(3.06, 8.71)
NYU Hospitals Center	322	12	3.73	3.44	5.15	(2.66, 8.99)
NYU Winthrop Hospital	537	20	3.72	4.45	3.97	(2.43, 6.14)
North Shore Univ Hosp	323	16	4.95	4.77	4.94	(2.82, 8.02)
Rochester General Hosp	4	0	0.00	7.45	0.00	(0.00,58.52)
Southside Hospital	116	4	3.45	3.79	4.33	(1.16,11.08)
St. Francis Hospital	542	26	4.80	4.87	4.68	(3.06, 6.86)
St. Josephs Hospital	278	18	6.47	4.74	6.50	(3.85,10.27)
St. Peters Hospital	68	5	7.35	4.33	8.07	(2.60,18.84)
Strong Memorial Hosp	159	13	8.18	5.20	7.47	(3.97,12.78)
UHS-Wilson Med Ctr	38	0	0.00	4.19	0.00	(0.00,10.94)
Univ. Hosp-Stony Brook	107	9	8.41	4.99	8.01	(3.66,15.21)
Westchester Med Ctr	144	5	3.47	5.55	2.97	(0.96, 6.94)
STATEWIDE TOTAL	**5554**	**264**	**4.75**			

* 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.

2013-2015 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 2013-2015. In addition, the final two columns provide the number of Isolated CABG, Valve and Valve/CABG procedures and the RAMR for these patients in 2013-2015 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 2013-2015, (b) performed at least one cardiac operation in each of the years, 2013-2015. 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 2013-2015 are noted in Table 6 and listed under all hospitals in which they performed these operations; their results are also 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, 2013-2015 Discharges

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	No of Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
STATEWIDE TOTAL	**24466**	**377**	**1.54**				**46595**	**2.25**
Albany Med. Ctr								
#Akujuo A C	172	2	1.16	1.48	1.21	(0.14, 4.37)	268	3.76
Bennett E	36	1	2.78	1.28	3.35	(0.04,18.62)	220	3.28
Britton L	103	0	0.00	1.46	0.00	(0.00, 3.75)	234	1.38
Depan H	174	2	1.15	2.66	0.67	(0.07, 2.41)	347	2.41
Devejian N	.	.	.	.	.	(. , .)	1	0.00
Miller S	169	2	1.18	2.02	0.90	(0.10, 3.27)	244	1.46
All Others	62	2	3.23	1.16	4.30	(0.48,15.51)	70	4.32
Total	**716**	**9**	**1.26**	**1.85**	**1.05**	**(0.48, 1.99)**	**1384**	**2.49**
Arnot Ogden Med Ctr								
#Hoffman D	63	1	1.59	0.83	2.96	(0.04,16.46)	80	2.80
Metzdorff M T	80	2	2.50	0.86	4.49	(0.50,16.20)	100	6.44
All Others	86	2	2.33	1.17	3.07	(0.34,11.07)	115	4.36
Total	**229**	**5**	**2.18**	**0.97**	**3.48**	**(1.12, 8.12)**	**295**	**4.63**

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
Bassett Medical Center								
#Choumarov K	1	0	0.00	0.70	0.00	(0.00,100.0)	1	0.00
Kelley J	158	2	1.27	1.18	1.65	(0.18, 5.95)	248	2.21
All Others	102	1	0.98	1.29	1.17	(0.02, 6.51)	149	3.10
Total	**261**	**3**	**1.15**	**1.22**	**1.45**	**(0.29, 4.23)**	**398**	**2.52**
Bellevue Hospital Ctr								
#Balsam L B	121	1	0.83	1.07	1.19	(0.02, 6.61)	244	1.19
##Culliford A	56	2	3.57	0.98	5.61	(0.63,20.25)	91	4.26
##Deanda A	67	0	0.00	1.11	0.00	(0.00, 7.59)	115	0.00
#Grossi E	1	0	0.00	0.35	0.00	(0.00,100.0)	1	0.00
##Loulmet D F	.	.	.	.	.	(. , .)	4	100.00
##Zias E	1	0	0.00	5.02	0.00	(0.00,100.0)	1	0.00
All Others	62	0	0.00	0.96	0.00	(0.00, 9.54)	96	0.00
Total	**308**	**3**	**0.97**	**1.05**	**1.43**	**(0.29, 4.17)**	**552**	**1.62**
Buffalo General Hosp								
Aldridge J	189	7	3.70	1.54	3.70	(1.48, 7.62)	210	5.49 *
#Ashraf M	607	12	1.98	1.28	2.38	(1.23, 4.15)	740	2.99
##Downing S W	7	1	14.29	1.05	20.95	(0.27,100.0)	9	8.39
Grosner G	568	8	1.41	1.29	1.68	(0.72, 3.30)	1191	2.45
Total	**1371**	**28**	**2.04**	**1.32**	**2.38** *	**(1.58, 3.44)**	**2150**	**2.96**
Champ.Valley Phys Hosp								
#Cahill A T	46	1	2.17	0.82	4.07	(0.05,22.64)	66	6.90
All Others	21	1	4.76	0.73	10.11	(0.13,56.25)	22	14.24
Total	**67**	**2**	**2.99**	**0.79**	**5.80**	**(0.65,20.95)**	**88**	**8.33**
Ellis Hospital								
#Choumarov K	217	3	1.38	1.59	1.34	(0.27, 3.92)	279	2.16
Reich H	122	2	1.64	1.58	1.60	(0.18, 5.78)	249	2.27
Singh C	229	2	0.87	1.59	0.85	(0.10, 3.06)	324	2.16
Total	**568**	**7**	**1.23**	**1.59**	**1.20**	**(0.48, 2.47)**	**852**	**2.19**
Erie County Med Ctr								
##Downing S W	22	0	0.00	1.05	0.00	(0.00,24.37)	26	0.00
Total	**22**	**0**	**0.00**	**1.05**	**0.00**	**(0.00,24.37)**	**26**	**0.00**
Good Sam - Suffern								
Elmann E M	44	0	0.00	1.93	0.00	(0.00, 6.64)	83	2.23
#Lundy E F	30	1	3.33	2.52	2.04	(0.03,11.34)	38	2.17
Somberg E D	140	1	0.71	0.99	1.11	(0.01, 6.19)	176	4.01
All Others	99	3	3.03	1.28	3.65	(0.73,10.67)	148	3.60
Total	**313**	**5**	**1.60**	**1.36**	**1.81**	**(0.58, 4.22)**	**445**	**3.17**
Good Sam-West Islip								
#Lamendola C	147	4	2.72	1.49	2.81	(0.76, 7.19)	248	3.86
#Rovensky M	202	0	0.00	1.10	0.00	(0.00, 2.55)	248	0.00 **
All Others	1	0	0.00	0.65	0.00	(0.00,100.0)	1	0.00
Total	**350**	**4**	**1.14**	**1.26**	**1.40**	**(0.38, 3.57)**	**497**	**2.13**

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	1.08	0.00	(0.00,100.0)	9	0.00
Hemli J M	24	1	4.17	1.05	6.12	(0.08,34.07)	25	8.19
##Loulmet D F	3	0	0.00	0.92	0.00	(0.00,100.0)	7	0.00
Patel N C	625	10	1.60	1.42	1.74	(0.83, 3.20)	877	2.51
#Scheinerman S J	37	2	5.41	1.23	6.79	(0.76,24.50)	62	4.34
##Zias E	.	.	.	.	.	(. , .)	1	0.00
All Others	67	3	4.48	2.14	3.22	(0.65, 9.41)	221	3.42
Total	**758**	**16**	**2.11**	**1.46**	**2.23**	**(1.27, 3.62)**	**1202**	**2.84**
Long Island Jewish MC								
#Graver L	180	3	1.67	2.20	1.17	(0.23, 3.41)	427	0.97 **
##Hartman A	3	0	0.00	0.58	0.00	(0.00,100.0)	7	0.00
Meyer D B	.	.	.	.	.	(. , .)	2	0.00
#Palazzo R	184	0	0.00	1.42	0.00	(0.00, 2.16)	248	0.46
#Scheinerman S J	103	2	1.94	2.01	1.48	(0.17, 5.36)	201	1.69
All Others	2	0	0.00	1.40	0.00	(0.00,100.0)	3	0.00
Total	**472**	**5**	**1.06**	**1.84**	**0.89**	**(0.29, 2.07)**	**888**	**1.02** **
Maimonides Medical Ctr								
Abrol S	113	3	2.65	2.33	1.75	(0.35, 5.12)	203	0.84
Crooke G	99	1	1.01	1.61	0.97	(0.01, 5.39)	160	0.54
Jacobowitz I	234	1	0.43	2.09	0.31	(0.00, 1.75)	340	0.90
Ribakove G	93	2	2.15	1.79	1.85	(0.21, 6.69)	185	2.95
Saunders P	63	1	1.59	1.94	1.26	(0.02, 7.03)	77	2.65
Stephens G A	15	1	6.67	3.87	2.65	(0.03,14.75)	44	4.88
#Tak V M	2	1	50.00	8.03	9.60	(0.13,53.39)	6	8.66
Vaynblat M	127	3	2.36	1.69	2.16	(0.43, 6.30)	192	1.75
Total	**746**	**13**	**1.74**	**2.00**	**1.34**	**(0.72, 2.30)**	**1207**	**1.53**
Mercy Hospital								
Adkins M	217	3	1.38	1.59	1.34	(0.27, 3.91)	270	3.03
#Ashraf M	1	0	0.00	0.46	0.00	(0.00,100.0)	1	0.00
Bell-Thomson J	351	8	2.28	1.33	2.64	(1.14, 5.21)	686	4.29 *
##Downing S W	433	8	1.85	1.59	1.79	(0.77, 3.53)	572	3.33
All Others	47	0	0.00	1.23	0.00	(0.00, 9.74)	58	0.00
Total	**1049**	**19**	**1.81**	**1.49**	**1.88**	**(1.13, 2.93)**	**1587**	**3.56** *
Montefiore - Moses								
#Bello R A	11	1	9.09	3.92	3.57	(0.05,19.87)	13	4.54
#D Alessandro D A	195	2	1.03	1.55	1.02	(0.11, 3.69)	329	2.07
#Derose J J	7	0	0.00	1.30	0.00	(0.00,61.99)	11	11.30
#Goldstein D J	138	0	0.00	1.11	0.00	(0.00, 3.69)	246	2.04
#Jakobleff W A	144	2	1.39	1.62	1.32	(0.15, 4.78)	184	4.17
#Michler R E	75	1	1.33	1.31	1.57	(0.02, 8.74)	231	1.93
Weinstein S	.	.	.	.	.	(. , .)	2	0.00
All Others	1	0	0.00	0.28	0.00	(0.00,100.0)	3	0.00
Total	**571**	**6**	**1.05**	**1.47**	**1.10**	**(0.40, 2.40)**	**1019**	**2.48**

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 - Weiler								
#Bello R A	201	2	1.00	1.51	1.02	(0.11, 3.67)	294	1.98
#D Alessandro D A	1	0	0.00	0.37	0.00	(0.00,100.0)	3	0.00
#Derose J J	298	3	1.01	1.23	1.26	(0.25, 3.69)	499	1.90
#Goldstein D J	54	2	3.70	1.11	5.15	(0.58,18.60)	84	3.15
#Jakobleff W A	2	0	0.00	0.38	0.00	(0.00,100.0)	3	0.00
#Michler R E	2	0	0.00	0.70	0.00	(0.00,100.0)	15	0.00
All Others	11	1	9.09	2.23	6.28	(0.08,34.92)	11	9.16
Total	**569**	**8**	**1.41**	**1.33**	**1.63**	**(0.70, 3.21)**	**909**	**2.10**
Mount Sinai Beth Israel								
##Culliford A	.	.	.	.	.	(. , .)	3	45.24
##Deanda A	.	.	.	.	.	(. , .)	1	0.00
##Galloway A	.	.	.	.	.	(. , .)	1	0.00
#Hoffman D	84	1	1.19	1.33	1.38	(0.02, 7.67)	109	2.12
##Loulmet D F	.	.	.	.	.	(. , .)	1	0.00
#Puskas J D	188	4	2.13	1.14	2.86	(0.77, 7.33)	276	3.72
##Tranbaugh R	252	2	0.79	1.35	0.90	(0.10, 3.26)	344	2.82
##Zias E	1	0	0.00	0.45	0.00	(0.00,100.0)	5	0.00
All Others	32	1	3.13	2.79	1.72	(0.02, 9.59)	46	4.14
Total	**557**	**8**	**1.44**	**1.36**	**1.63**	**(0.70, 3.20)**	**786**	**3.24**
Mount Sinai Hospital								
Adams D H	8	0	0.00	1.13	0.00	(0.00,62.51)	1041	0.52 **
Anyanwu A C	57	1	1.75	1.20	2.26	(0.03,12.57)	159	4.10
Boateng P	19	0	0.00	0.75	0.00	(0.00,39.70)	59	3.27
#Chikwe J Y	143	5	3.50	1.09	4.96 *	(1.60,11.57)	225	3.47
El-Eshmawi A M	7	0	0.00	0.65	0.00	(0.00,100.0)	34	5.95
Filsoufi F	279	2	0.72	1.08	1.02	(0.12, 3.70)	412	2.67
#Puskas J D	42	0	0.00	1.09	0.00	(0.00,12.36)	47	0.00
Reddy R C	263	2	0.76	1.76	0.67	(0.07, 2.40)	387	1.14
Stelzer P	42	0	0.00	0.92	0.00	(0.00,14.67)	330	1.50
#Stewart A S	89	3	3.37	1.39	3.73	(0.75,10.89)	283	3.90
Tannous H J	65	0	0.00	0.98	0.00	(0.00, 8.83)	103	0.00
Varghese R	84	2	2.38	0.96	3.80	(0.43,13.73)	152	2.34
All Others	22	0	0.00	2.09	0.00	(0.00,12.30)	39	1.93
Total	**1120**	**15**	**1.34**	**1.26**	**1.63**	**(0.91, 2.70)**	**3271**	**1.84**
Mount Sinai St. Lukes								
Balaram S K	114	1	0.88	2.69	0.50	(0.01, 2.79)	176	1.22
#Chikwe J Y	49	0	0.00	0.99	0.00	(0.00,11.71)	91	1.50
#Swistel D	190	4	2.11	1.90	1.70	(0.46, 4.36)	361	2.10
Total	**353**	**5**	**1.42**	**2.03**	**1.07**	**(0.35, 2.51)**	**628**	**1.70**
NYP-Brooklyn Methodist								
#Gulkarov I M	146	1	0.68	1.48	0.71	(0.01, 3.97)	247	0.71
Tortolani A	105	2	1.90	1.28	2.29	(0.26, 8.25)	159	2.24
##Tranbaugh R	14	0	0.00	1.21	0.00	(0.00,33.40)	18	0.00
#Worku B M	42	0	0.00	2.68	0.00	(0.00, 5.02)	63	0.00
Total	**307**	**3**	**0.98**	**1.56**	**0.96**	**(0.19, 2.81)**	**487**	**0.98**

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
NYP-Columbia Presby.								
Argenziano M	215	0	0.00	1.11	0.00	(0.00, 2.38)	521	0.90
Bacchetta M D	.	.	.	.	.	(. , .)	1	0.00
#Bacha E	.	.	.	.	.	(. , .)	4	0.00
Borger M A	19	0	0.00	3.24	0.00	(0.00, 9.18)	137	1.77
#Chai P J	.	.	.	.	.	(. , .)	3	0.00
George I	129	3	2.33	2.18	1.64	(0.33, 4.80)	290	2.66
Naka Y	253	3	1.19	1.52	1.20	(0.24, 3.52)	450	1.84
Quaegebeur J	.	.	.	.	.	(. , .)	2	0.00
Smith C	167	0	0.00	1.26	0.00	(0.00, 2.69)	794	2.17
#Stewart A S	45	1	2.22	2.37	1.44	(0.02, 8.04)	153	2.84
Takayama H	333	6	1.80	2.33	1.19	(0.43, 2.59)	596	1.64
#Williams M R	21	0	0.00	1.07	0.00	(0.00,25.20)	316	0.79 **
All Others	19	1	5.26	2.22	3.65	(0.05,20.33)	37	2.23
Total	**1201**	**14**	**1.17**	**1.77**	**1.02**	**(0.55, 1.70)**	**3304**	**1.76 ** **
NYP-Queens								
#Lang S	261	2	0.77	0.91	1.30	(0.15, 4.70)	360	2.37
All Others	7	0	0.00	0.75	0.00	(0.00,100.0)	9	0.00
Total	**268**	**2**	**0.75**	**0.90**	**1.27**	**(0.14, 4.60)**	**369**	**2.33**
NYP-Weill Cornell								
#Bacha E	.	.	.	.	.	(. , .)	5	0.00
#Chai P J	.	.	.	.	.	(. , .)	3	0.00
Girardi L	273	1	0.37	1.19	0.48	(0.01, 2.64)	962	1.63
#Gulkarov I M	5	0	0.00	3.37	0.00	(0.00,33.53)	9	0.00
Isom O	3	0	0.00	0.55	0.00	(0.00,100.0)	25	0.00
Krieger K	188	3	1.60	1.63	1.51	(0.30, 4.41)	546	1.77
#Lang S	8	0	0.00	0.83	0.00	(0.00,85.46)	20	0.00
Salemi A	72	0	0.00	1.23	0.00	(0.00, 6.36)	169	1.20
##Tranbaugh R	.	.	.	.	.	(. , .)	1	0.00
#Worku B M	.	.	.	.	.	(. , .)	1	0.00
All Others	15	1	6.67	3.23	3.19	(0.04,17.72)	23	5.47
Total	**564**	**5**	**0.89**	**1.41**	**0.97**	**(0.31, 2.27)**	**1764**	**1.65**
NYU Hospitals Center								
#Balsam L B	2	0	0.00	0.67	0.00	(0.00,100.0)	8	5.31
##Culliford A	48	0	0.00	0.66	0.00	(0.00,17.80)	101	1.34
##Deanda A	5	0	0.00	0.40	0.00	(0.00,100.0)	21	0.00
##Galloway A	64	0	0.00	0.85	0.00	(0.00,10.43)	549	2.62
#Grossi E	6	0	0.00	0.68	0.00	(0.00,100.0)	14	0.00
##Loulmet D F	57	0	0.00	0.71	0.00	(0.00,13.89)	431	1.69
Malhotra S P	.	.	.	.	.	(. , .)	2	0.00
Mosca R S	.	.	.	.	.	(. , .)	5	0.00
#Swistel D	10	0	0.00	1.04	0.00	(0.00,54.32)	30	0.00
#Williams M R	8	0	0.00	1.02	0.00	(0.00,69.35)	88	4.94
##Zias E	272	3	1.10	0.91	1.87	(0.37, 5.45)	544	1.52
All Others	15	0	0.00	0.93	0.00	(0.00,40.39)	24	5.21
Total	**487**	**3**	**0.62**	**0.85**	**1.12**	**(0.22, 3.26)**	**1817**	**2.18**

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
NYU Winthrop Hospital								
Goncalves J A	132	2	1.52	1.44	1.62	(0.18, 5.86)	331	2.07
Kokotos W J	170	2	1.18	1.23	1.47	(0.17, 5.31)	326	1.07
Salhab K F	124	1	0.81	1.48	0.84	(0.01, 4.68)	156	2.37
Schubach S	167	0	0.00	1.30	0.00	(0.00, 2.61)	289	0.97
All Others	31	0	0.00	1.38	0.00	(0.00,13.18)	39	2.95
Total	**624**	**5**	**0.80**	**1.35**	**0.92**	**(0.29, 2.14)**	**1141**	**1.58**
North Shore Univ Hosp								
Esposito R	241	2	0.83	1.31	0.97	(0.11, 3.51)	425	1.87
##Fernandez H A	.	.	.	.	.	(. , .)	1	0.00
#Graver L	53	1	1.89	3.59	0.81	(0.01, 4.51)	113	0.55
Hall M	109	1	0.92	2.66	0.53	(0.01, 2.95)	183	1.60
##Hartman A	76	0	0.00	1.17	0.00	(0.00, 6.34)	278	1.42
#Kalimi R	83	2	2.41	1.87	1.98	(0.22, 7.15)	186	1.61
#Palazzo R	40	0	0.00	1.18	0.00	(0.00,11.99)	60	2.30
#Pogo G	100	4	4.00	1.86	3.31	(0.89, 8.48)	166	4.60
##Taylor J	13	0	0.00	0.60	0.00	(0.00,72.40)	22	0.00
Vatsia S	174	5	2.87	1.35	3.28	(1.06, 7.65)	295	2.54
Yu P J	66	0	0.00	1.62	0.00	(0.00, 5.28)	104	2.24
All Others	7	0	0.00	0.78	0.00	(0.00,100.0)	8	0.00
Total	**962**	**15**	**1.56**	**1.69**	**1.42**	**(0.79, 2.34)**	**1841**	**1.95**
Rochester General Hosp								
Cheeran D	486	8	1.65	1.82	1.39	(0.60, 2.74)	919	2.11
Kirshner R	424	5	1.18	1.42	1.28	(0.41, 2.99)	1051	2.56
All Others	67	2	2.99	1.32	3.48	(0.39,12.56)	88	3.46
Total	**977**	**15**	**1.54**	**1.61**	**1.47**	**(0.82, 2.42)**	**2058**	**2.37**
Southside Hospital								
##Fernandez H A	6	0	0.00	1.26	0.00	(0.00,74.90)	12	0.00
##Hartman A	40	2	5.00	1.80	4.27	(0.48,15.43)	153	3.32
#Kalimi R	215	3	1.40	1.82	1.18	(0.24, 3.46)	369	1.39
Manetta F	184	1	0.54	1.75	0.48	(0.01, 2.66)	254	0.86
#Pogo G	32	1	3.13	1.36	3.54	(0.05,19.70)	46	5.69
##Taylor J	1	0	0.00	0.47	0.00	(0.00,100.0)	1	0.00
All Others	15	1	6.67	2.47	4.16	(0.05,23.13)	20	8.12
Total	**493**	**8**	**1.62**	**1.77**	**1.41**	**(0.61, 2.78)**	**855**	**2.05**
St. Elizabeth Med Ctr								
#Akujuo A C	5	0	0.00	0.97	0.00	(0.00,100.0)	11	12.33
#Cahill A T	10	0	0.00	1.30	0.00	(0.00,43.51)	12	0.00
El Amir N	206	4	1.94	1.31	2.29	(0.62, 5.86)	319	3.55
Joyce F	315	7	2.22	1.40	2.45	(0.98, 5.04)	476	4.69 *
All Others	21	2	9.52	1.53	9.57	(1.07,34.54)	27	8.72
Total	**557**	**13**	**2.33**	**1.36**	**2.63**	**(1.40, 4.51)**	**845**	**4.41 ***

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. Francis Hospital								
Bercow N	470	14	2.98	2.00	2.29	(1.25, 3.85)	806	2.96
Colangelo R	603	8	1.33	1.30	1.57	(0.67, 3.09)	1136	2.21
#Lamendola C	118	1	0.85	1.60	0.82	(0.01, 4.54)	210	2.35
#Lundy E F	192	4	2.08	2.32	1.38	(0.37, 3.54)	271	1.96
Robinson N	135	3	2.22	1.48	2.31	(0.46, 6.75)	554	2.87
#Rovensky M	34	0	0.00	2.42	0.00	(0.00, 6.88)	44	0.00
All Others	70	2	2.86	2.77	1.59	(0.18, 5.73)	75	2.17
Total	**1622**	**32**	**1.97**	**1.75**	**1.74**	**(1.19, 2.45)**	**3096**	**2.51**
St. Josephs Hospital								
Green G R	233	4	1.72	1.67	1.59	(0.43, 4.07)	530	1.31
Lutz C J	238	4	1.68	1.84	1.41	(0.38, 3.60)	570	1.50
Marvasti M	160	1	0.63	2.64	0.37	(0.00, 2.03)	347	0.96
Nazem A	264	2	0.76	1.55	0.75	(0.08, 2.72)	493	2.02
Zhou Z	274	6	2.19	1.66	2.03	(0.74, 4.42)	585	2.21
Total	**1169**	**17**	**1.45**	**1.81**	**1.24**	**(0.72, 1.98)**	**2525**	**1.67 ****
St. Peters Hospital								
Edwards N	165	2	1.21	0.92	2.03	(0.23, 7.31)	413	2.81
Karavas A N	352	3	0.85	1.29	1.02	(0.20, 2.98)	424	1.78
Saifi J	160	2	1.25	2.02	0.95	(0.11, 3.45)	505	3.04
Terrien C M	310	5	1.61	1.52	1.64	(0.53, 3.82)	514	1.92
Total	**987**	**12**	**1.22**	**1.42**	**1.32**	**(0.68, 2.31)**	**1856**	**2.48**
Staten Island Univ Hosp								
McGinn J	308	6	1.95	1.53	1.97	(0.72, 4.28)	427	2.33
Rosell F M	259	0	0.00	1.68	0.00 **	(0.00, 1.30)	298	0.78
Wohler A M	49	3	6.12	1.56	6.04	(1.21,17.65)	62	6.19
All Others	3	1	33.33	0.79	65.27	(0.85,100.0)	3	95.27
Total	**619**	**10**	**1.62**	**1.59**	**1.57**	**(0.75, 2.88)**	**790**	**2.16**
Strong Memorial Hosp								
Alfieris G	.	.	.	.	.	(. , .)	2	0.00
Gensini P F	.	.	.	.	.	(. , .)	9	0.00
Hicks G	89	3	3.37	1.57	3.31	(0.67, 9.68)	138	5.89 *
Knight P	460	6	1.30	1.59	1.26	(0.46, 2.74)	963	2.94
Massey H	79	3	3.80	1.37	4.29	(0.86,12.52)	138	6.69 *
All Others	36	1	2.78	1.42	3.02	(0.04,16.80)	43	3.77
Total	**664**	**13**	**1.96**	**1.55**	**1.94**	**(1.03, 3.32)**	**1293**	**3.68 ***
UHS-Wilson Med Ctr								
Wong K	200	6	3.00	1.40	3.29	(1.20, 7.16)	318	4.69 *
Yousuf M	236	7	2.97	1.61	2.85	(1.14, 5.87)	348	5.94 *
Total	**436**	**13**	**2.98**	**1.51**	**3.04 ***	**(1.62, 5.19)**	**666**	**5.36 ***
Univ. Hosp-Brooklyn								
#Tak V M	73	4	5.48	1.82	4.65	(1.25,11.90)	144	7.90 *
All Others	43	5	11.63	2.36	7.60 *	(2.45,17.73)	62	8.70 *
Total	**116**	**9**	**7.76**	**2.02**	**5.93 ***	**(2.70,11.25)**	**206**	**8.13 ***

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
Univ. Hosp-Stony Brook								
Bilfinger T	26	2	7.69	3.54	3.34	(0.38,12.07)	35	5.77
##Fernandez H A	269	2	0.74	1.50	0.77	(0.09, 2.76)	454	1.35
Gupta S	151	1	0.66	1.31	0.78	(0.01, 4.33)	306	2.32
McLarty A	4	0	0.00	1.29	0.00	(0.00,100.0)	5	0.00
Seifert F	77	2	2.60	1.48	2.70	(0.30, 9.76)	98	6.02
##Taylor J	293	1	0.34	1.63	0.32	(0.00, 1.80)	591	1.61
Total	**820**	**8**	**0.98**	**1.57**	**0.96**	**(0.41, 1.88)**	**1489**	**2.11**
Univ. Hosp-Upstate								
Dunton R F	51	3	5.88	2.03	4.46	(0.90,13.02)	70	4.79
Fink G W	72	0	0.00	1.33	0.00	(0.00, 5.89)	122	1.97
All Others	2	0	0.00	1.10	0.00	(0.00,100.0)	4	41.60
Total	**125**	**3**	**2.40**	**1.62**	**2.29**	**(0.46, 6.69)**	**196**	**3.60**
Vassar Bros. Med Ctr								
Sarabu M	115	2	1.74	1.38	1.94	(0.22, 7.01)	327	1.14
Shahani R B	159	2	1.26	1.56	1.24	(0.14, 4.48)	249	1.31
Zakow P	204	1	0.49	1.84	0.41	(0.01, 2.29)	338	0.99
All Others	19	0	0.00	1.61	0.00	(0.00,18.48)	19	0.00
Total	**497**	**5**	**1.01**	**1.63**	**0.95**	**(0.31, 2.21)**	**933**	**1.12** **
Westchester Med Ctr								
Kai M	126	2	1.59	1.98	1.23	(0.14, 4.46)	192	2.30
Lafaro R	57	1	1.75	1.08	2.51	(0.03,13.95)	88	1.38
Lansman S	20	0	0.00	1.39	0.00	(0.00,20.26)	35	0.00
Malekan R	192	2	1.04	1.92	0.84	(0.09, 3.02)	264	1.38
Spielvogel D	175	6	3.43	1.93	2.73	(1.00, 5.95)	278	2.83
Tang G H L	1	0	0.00	0.77	0.00	(0.00,100.0)	23	4.18
Total	**571**	**11**	**1.93**	**1.83**	**1.62**	**(0.81, 2.90)**	**880**	**2.07**
STATEWIDE TOTAL	**24466**	**377**	**1.54**				**46595**	**2.25**

* 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, 2013-2015.

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Akujuo A C	**177**	**2**	**1.13**	**1.46**	**1.19**	**(0.13, 4.29)**	**279**	**4.04**
Albany Med. Ctr	172	2	1.16	1.48	1.21	(0.14, 4.37)	268	3.76
St. Elizabeth Med Ctr	5	0	0.00	0.97	0.00	(0.00,100.0)	11	12.33
Ashraf M	**608**	**12**	**1.97**	**1.28**	**2.38**	**(1.23, 4.15)**	**741**	**2.99**
Buffalo General Hosp	607	12	1.98	1.28	2.38	(1.23, 4.15)	740	2.99
Mercy Hospital	1	0	0.00	0.46	0.00	(0.00,100.0)	1	0.00
Bacha E	**.**	**.**	**.**	**.**	**.**	**(. , .)**	**9**	**0.00**
NYP-Columbia Presby.	.	.	.	.	.	(. , .)	4	0.00
NYP-Weill Cornell	.	.	.	.	.	(. , .)	5	0.00
Balsam L B	**123**	**1**	**0.81**	**1.07**	**1.18**	**(0.02, 6.54)**	**252**	**1.60**
Bellevue Hospital Ctr	121	1	0.83	1.07	1.19	(0.02, 6.61)	244	1.19
NYU Hospitals Center	2	0	0.00	0.67	0.00	(0.00,100.0)	8	5.31
Bello R A	**212**	**3**	**1.42**	**1.63**	**1.33**	**(0.27, 3.90)**	**307**	**2.15**
Montefiore - Moses	11	1	9.09	3.92	3.57	(0.05,19.87)	13	4.54
Montefiore - Weiler	201	2	1.00	1.51	1.02	(0.11, 3.67)	294	1.98
Cahill A T	**56**	**1**	**1.79**	**0.91**	**3.03**	**(0.04,16.85)**	**78**	**5.32**
Champ.Valley Phys Hosp	46	1	2.17	0.82	4.07	(0.05,22.64)	66	6.90
St. Elizabeth Med Ctr	10	0	0.00	1.30	0.00	(0.00,43.51)	12	0.00
Chai P J	**.**	**.**	**.**	**.**	**.**	**(. , .)**	**6**	**0.00**
NYP-Columbia Presby.	.	.	.	.	.	(. , .)	3	0.00
NYP-Weill Cornell	.	.	.	.	.	(. , .)	3	0.00
Chikwe J Y	**192**	**5**	**2.60**	**1.06**	**3.78**	**(1.22, 8.83)**	**316**	**2.92**
Mount Sinai Hospital	143	5	3.50	1.09	4.96 *	(1.60,11.57)	225	3.47
Mount Sinai St. Lukes	49	0	0.00	0.99	0.00	(0.00,11.71)	91	1.50
Choumarov K	**218**	**3**	**1.38**	**1.58**	**1.34**	**(0.27, 3.92)**	**280**	**2.15**
Bassett Medical Center	1	0	0.00	0.70	0.00	(0.00,100.0)	1	0.00
Ellis Hospital	217	3	1.38	1.59	1.34	(0.27, 3.92)	279	2.16
Culliford A	**104**	**2**	**1.92**	**0.83**	**3.55**	**(0.40,12.83)**	**195**	**3.40**
Bellevue Hospital Ctr	56	2	3.57	0.98	5.61	(0.63,20.25)	91	4.26
Mount Sinai Beth Israel	.	.	.	.	.	(. , .)	3	45.24
NYU Hospitals Center	48	0	0.00	0.66	0.00	(0.00,17.80)	101	1.34
D Alessandro D A	**196**	**2**	**1.02**	**1.54**	**1.02**	**(0.11, 3.69)**	**332**	**2.01**
Montefiore - Moses	195	2	1.03	1.55	1.02	(0.11, 3.69)	329	2.07
Montefiore - Weiler	1	0	0.00	0.37	0.00	(0.00,100.0)	3	0.00

Table 7 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Deanda A	**72**	**0**	**0.00**	**1.06**	**0.00**	**(0.00, 7.39)**	**137**	**0.00**
Bellevue Hospital Ctr	67	0	0.00	1.11	0.00	(0.00, 7.59)	115	0.00
Mount Sinai Beth Israel	.	.	.	.	.	(. , .)	1	0.00
NYU Hospitals Center	5	0	0.00	0.40	0.00	(0.00,100.0)	21	0.00
Derose J J	**305**	**3**	**0.98**	**1.23**	**1.23**	**(0.25, 3.60)**	**510**	**2.07**
Montefiore - Moses	7	0	0.00	1.30	0.00	(0.00,61.99)	11	11.30
Montefiore - Weiler	298	3	1.01	1.23	1.26	(0.25, 3.69)	499	1.90
Downing S W	**462**	**9**	**1.95**	**1.56**	**1.93**	**(0.88, 3.66)**	**607**	**3.49**
Buffalo General Hosp	7	1	14.29	1.05	20.95	(0.27,100.0)	9	8.39
Erie County Med Ctr	22	0	0.00	1.05	0.00	(0.00,24.37)	26	0.00
Mercy Hospital	433	8	1.85	1.59	1.79	(0.77, 3.53)	572	3.33
Fernandez H A	**275**	**2**	**0.73**	**1.49**	**0.75**	**(0.08, 2.71)**	**467**	**1.33**
North Shore Univ Hosp	.	.	.	.	.	(. , .)	1	0.00
Southside Hospital	6	0	0.00	1.26	0.00	(0.00,74.90)	12	0.00
Univ. Hosp-Stony Brook	269	2	0.74	1.50	0.77	(0.09, 2.76)	454	1.35
Galloway A	**66**	**0**	**0.00**	**0.85**	**0.00**	**(0.00,10.03)**	**559**	**2.55**
Lenox Hill Hospital	2	0	0.00	1.08	0.00	(0.00,100.0)	9	0.00
Mount Sinai Beth Israel	.	.	.	.	.	(. , .)	1	0.00
NYU Hospitals Center	64	0	0.00	0.85	0.00	(0.00,10.43)	549	2.62
Goldstein D J	**192**	**2**	**1.04**	**1.11**	**1.45**	**(0.16, 5.23)**	**330**	**2.42**
Montefiore - Moses	138	0	0.00	1.11	0.00	(0.00, 3.69)	246	2.04
Montefiore - Weiler	54	2	3.70	1.11	5.15	(0.58,18.60)	84	3.15
Graver L	**233**	**4**	**1.72**	**2.52**	**1.05**	**(0.28, 2.69)**	**540**	**0.87** **
Long Island Jewish MC	180	3	1.67	2.20	1.17	(0.23, 3.41)	427	0.97 **
North Shore Univ Hosp	53	1	1.89	3.59	0.81	(0.01, 4.51)	113	0.55
Grossi E	**7**	**0**	**0.00**	**0.63**	**0.00**	**(0.00,100.0)**	**15**	**0.00**
Bellevue Hospital Ctr	1	0	0.00	0.35	0.00	(0.00,100.0)	1	0.00
NYU Hospitals Center	6	0	0.00	0.68	0.00	(0.00,100.0)	14	0.00
Gulkarov I M	**151**	**1**	**0.66**	**1.54**	**0.66**	**(0.01, 3.68)**	**256**	**0.67**
NYP-Brooklyn Methodist	146	1	0.68	1.48	0.71	(0.01, 3.97)	247	0.71
NYP-Weill Cornell	5	0	0.00	3.37	0.00	(0.00,33.53)	9	0.00
Hartman A	**119**	**2**	**1.68**	**1.37**	**1.89**	**(0.21, 6.83)**	**438**	**2.18**
Long Island Jewish MC	3	0	0.00	0.58	0.00	(0.00,100.0)	7	0.00
North Shore Univ Hosp	76	0	0.00	1.17	0.00	(0.00, 6.34)	278	1.42
Southside Hospital	40	2	5.00	1.80	4.27	(0.48,15.43)	153	3.32
Hoffman D	**147**	**2**	**1.36**	**1.11**	**1.88**	**(0.21, 6.79)**	**189**	**2.30**
Arnot Ogden Med Ctr	63	1	1.59	0.83	2.96	(0.04,16.46)	80	2.80
Mount Sinai Beth Israel	84	1	1.19	1.33	1.38	(0.02, 7.67)	109	2.12
Jakobleff W A	**146**	**2**	**1.37**	**1.60**	**1.32**	**(0.15, 4.77)**	**187**	**4.13**
Montefiore - Moses	144	2	1.39	1.62	1.32	(0.15, 4.78)	184	4.17
Montefiore - Weiler	2	0	0.00	0.38	0.00	(0.00,100.0)	3	0.00

Table 7 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Kalimi R	**298**	**5**	**1.68**	**1.83**	**1.41**	**(0.45, 3.29)**	**555**	**1.45**
North Shore Univ Hosp	83	2	2.41	1.87	1.98	(0.22, 7.15)	186	1.61
Southside Hospital	215	3	1.40	1.82	1.18	(0.24, 3.46)	369	1.39
Lamendola C	**265**	**5**	**1.89**	**1.54**	**1.89**	**(0.61, 4.40)**	**458**	**3.10**
Good Sam-West Islip	147	4	2.72	1.49	2.81	(0.76, 7.19)	248	3.86
St. Francis Hospital	118	1	0.85	1.60	0.82	(0.01, 4.54)	210	2.35
Lang S	**269**	**2**	**0.74**	**0.90**	**1.27**	**(0.14, 4.58)**	**380**	**2.11**
NYP-Queens	261	2	0.77	0.91	1.30	(0.15, 4.70)	360	2.37
NYP-Weill Cornell	8	0	0.00	0.83	0.00	(0.00,85.46)	20	0.00
Loulmet D F	**60**	**0**	**0.00**	**0.72**	**0.00**	**(0.00,13.01)**	**443**	**2.08**
Bellevue Hospital Ctr	.	.	.	.	.	(. , .)	4	100.00
Lenox Hill Hospital	3	0	0.00	0.92	0.00	(0.00,100.0)	7	0.00
Mount Sinai Beth Israel	.	.	.	.	.	(. , .)	1	0.00
NYU Hospitals Center	57	0	0.00	0.71	0.00	(0.00,13.89)	431	1.69
Lundy E F	**222**	**5**	**2.25**	**2.35**	**1.48**	**(0.48, 3.45)**	**309**	**1.99**
Good Sam - Suffern	30	1	3.33	2.52	2.04	(0.03,11.34)	38	2.17
St. Francis Hospital	192	4	2.08	2.32	1.38	(0.37, 3.54)	271	1.96
Michler R E	**77**	**1**	**1.30**	**1.29**	**1.55**	**(0.02, 8.61)**	**246**	**1.77**
Montefiore - Moses	75	1	1.33	1.31	1.57	(0.02, 8.74)	231	1.93
Montefiore - Weiler	2	0	0.00	0.70	0.00	(0.00,100.0)	15	0.00
Palazzo R	**224**	**0**	**0.00**	**1.38**	**0.00**	**(0.00, 1.83)**	**308**	**0.77**
Long Island Jewish MC	184	0	0.00	1.42	0.00	(0.00, 2.16)	248	0.46
North Shore Univ Hosp	40	0	0.00	1.18	0.00	(0.00,11.99)	60	2.30
Pogo G	**132**	**5**	**3.79**	**1.74**	**3.35**	**(1.08, 7.83)**	**212**	**4.81**
North Shore Univ Hosp	100	4	4.00	1.86	3.31	(0.89, 8.48)	166	4.60
Southside Hospital	32	1	3.13	1.36	3.54	(0.05,19.70)	46	5.69
Puskas J D	**230**	**4**	**1.74**	**1.13**	**2.36**	**(0.64, 6.05)**	**323**	**3.16**
Mount Sinai Beth Israel	188	4	2.13	1.14	2.86	(0.77, 7.33)	276	3.72
Mount Sinai Hospital	42	0	0.00	1.09	0.00	(0.00,12.36)	47	0.00
Rovensky M	**236**	**0**	**0.00**	**1.29**	**0.00**	**(0.00, 1.86)**	**292**	**0.00** **
Good Sam-West Islip	202	0	0.00	1.10	0.00	(0.00, 2.55)	248	0.00 **
St. Francis Hospital	34	0	0.00	2.42	0.00	(0.00, 6.88)	44	0.00
Scheinerman S J	**140**	**4**	**2.86**	**1.81**	**2.44**	**(0.66, 6.24)**	**263**	**2.12**
Lenox Hill Hospital	37	2	5.41	1.23	6.79	(0.76,24.50)	62	4.34
Long Island Jewish MC	103	2	1.94	2.01	1.48	(0.17, 5.36)	201	1.69
Stewart A S	**134**	**4**	**2.99**	**1.72**	**2.67**	**(0.72, 6.84)**	**436**	**3.42**
Mount Sinai Hospital	89	3	3.37	1.39	3.73	(0.75,10.89)	283	3.90
NYP-Columbia Presby.	45	1	2.22	2.37	1.44	(0.02, 8.04)	153	2.84
Swistel D	**200**	**4**	**2.00**	**1.86**	**1.66**	**(0.45, 4.24)**	**391**	**2.03**
Mount Sinai St. Lukes	190	4	2.11	1.90	1.70	(0.46, 4.36)	361	2.10
NYU Hospitals Center	10	0	0.00	1.04	0.00	(0.00,54.32)	30	0.00

Table 7 continued

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Tak V M	**75**	**5**	**6.67**	**1.98**	**5.18** *	**(1.67,12.09)**	**150**	**7.95** *
Maimonides Medical Ctr	2	1	50.00	8.03	9.60	(0.13,53.39)	6	8.66
Univ. Hosp-Brooklyn	73	4	5.48	1.82	4.65	(1.25,11.90)	144	7.90 *
Taylor J	**307**	**1**	**0.33**	**1.58**	**0.32**	**(0.00, 1.77)**	**614**	**1.57**
North Shore Univ Hosp	13	0	0.00	0.60	0.00	(0.00,72.40)	22	0.00
Southside Hospital	1	0	0.00	0.47	0.00	(0.00,100.0)	1	0.00
Univ. Hosp-Stony Brook	293	1	0.34	1.63	0.32	(0.00, 1.80)	591	1.61
Tranbaugh R	**266**	**2**	**0.75**	**1.35**	**0.86**	**(0.10, 3.11)**	**363**	**2.69**
Mount Sinai Beth Israel	252	2	0.79	1.35	0.90	(0.10, 3.26)	344	2.82
NYP-Brooklyn Methodist	14	0	0.00	1.21	0.00	(0.00,33.40)	18	0.00
NYP-Weill Cornell	.	.	.	.	.	(. , .)	1	0.00
Williams M R	**29**	**0**	**0.00**	**1.05**	**0.00**	**(0.00,18.48)**	**404**	**1.37**
NYP-Columbia Presby.	21	0	0.00	1.07	0.00	(0.00,25.20)	316	0.79 **
NYU Hospitals Center	8	0	0.00	1.02	0.00	(0.00,69.35)	88	4.94
Worku B M	**42**	**0**	**0.00**	**2.68**	**0.00**	**(0.00, 5.02)**	**64**	**0.00**
NYP-Brooklyn Methodist	42	0	0.00	2.68	0.00	(0.00, 5.02)	63	0.00
NYP-Weill Cornell	.	.	.	.	.	(. , .)	1	0.00
Zias E	**274**	**3**	**1.09**	**0.92**	**1.82**	**(0.37, 5.33)**	**551**	**1.49**
Bellevue Hospital Ctr	1	0	0.00	5.02	0.00	(0.00,100.0)	1	0.00
Lenox Hill Hospital	.	.	.	.	.	(. , .)	1	0.00
Mount Sinai Beth Israel	1	0	0.00	0.45	0.00	(0.00,100.0)	5	0.00
NYU Hospitals Center	272	3	1.10	0.91	1.87	(0.37, 5.45)	544	1.52

* 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, 2013-2015

Table 8 presents, for each hospital and for each surgeon performing at least 200 cardiac operations in any hospital in 2013-2015 and/or performing one or more cardiac operations in each of the years 2013-2015, 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 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, 2013-2015.

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Albany Med. Ctr				
Akujuo A C	172	96	31	299
Bennett E	36	184	305	525
Britton L	103	131	116	350
Depan H	174	173	38	385
Devejian N	0	1	13	14
Miller S	169	75	26	270
All Others	62	8	10	80
Total	**716**	**668**	**539**	**1923**
Arnot Ogden Med Ctr				
Hoffman D	63	17	2	82
Metzdorff M T	80	20	0	100
All Others	86	29	4	119
Total	**229**	**66**	**6**	**301**
Bassett Medical Center				
Choumarov K	1	0	0	1
Kelley J	158	90	23	271
All Others	102	47	8	157
Total	**261**	**137**	**31**	**429**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Bellevue Hospital Ctr				
Balsam L B	121	123	38	282
Culliford A	56	35	10	101
Deanda A	67	48	45	160
Grossi E	1	0	1	2
Loulmet D F	0	4	3	7
Zias E	1	0	1	2
All Others	62	34	24	120
Total	**308**	**244**	**122**	**674**
Buffalo General Hosp				
Aldridge J	189	21	89	299
Ashraf M	607	133	166	906
Downing S W	7	2	2	11
Grosner G	568	623	188	1379
Total	**1371**	**779**	**445**	**2595**
Champ.Valley Phys Hosp				
Cahill A T	46	20	3	69
All Others	21	1	0	22
Total	**67**	**21**	**3**	**91**
Ellis Hospital				
Choumarov K	217	62	16	295
Reich H	122	127	24	273
Singh C	229	95	11	335
Total	**568**	**284**	**51**	**903**
Erie County Med Ctr				
Downing S W	22	4	3	29
All Others	0	0	3	3
Total	**22**	**4**	**6**	**32**
Good Sam - Suffern				
Elmann E M	44	39	2	85
Lundy E F	30	8	1	39
Somberg E D	140	36	0	176
All Others	99	49	6	154
Total	**313**	**132**	**9**	**454**
Good Sam-West Islip				
Lamendola C	147	101	18	266
Rovensky M	202	46	8	256
All Others	1	0	0	1
Total	**350**	**147**	**26**	**523**
Lenox Hill Hospital				
Galloway A	2	7	0	9
Hemli J M	24	1	5	30
Loulmet D F	3	4	0	7
Patel N C	625	252	47	924
Scheinerman S J	37	25	18	80
Zias E	0	1	0	1
All Others	67	154	311	532
Total	**758**	**444**	**381**	**1583**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Long Island Jewish MC				
Graver L	180	247	42	469
Hartman A	3	4	1	8
Meyer D B	0	2	15	17
Palazzo R	184	64	85	333
Scheinerman S J	103	98	88	289
All Others	2	1	19	22
Total	**472**	**416**	**250**	**1138**
Maimonides Medical Ctr				
Abrol S	113	90	74	277
Crooke G	99	61	126	286
Jacobowitz I	234	106	84	424
Ribakove G	93	92	63	248
Saunders P	63	14	45	122
Stephens G A	15	29	6	50
Tak V M	2	4	1	7
Vaynblat M	127	65	33	225
Total	**746**	**461**	**432**	**1639**
Mercy Hospital				
Adkins M	217	53	10	280
Ashraf M	1	0	0	1
Bell-Thomson J	351	335	69	755
Downing S W	433	139	56	628
All Others	47	11	9	67
Total	**1049**	**538**	**144**	**1731**
Montefiore - Moses				
Bello R A	11	2	17	30
D Alessandro D A	195	134	78	407
Derose J J	7	4	112	123
Goldstein D J	138	108	95	341
Jakobleff W A	144	40	11	195
Michler R E	75	156	30	261
Weinstein S	0	2	15	17
All Others	1	2	22	25
Total	**571**	**448**	**380**	**1399**
Montefiore - Weiler				
Bello R A	201	93	38	332
D Alessandro D A	1	2	3	6
Derose J J	298	201	60	559
Goldstein D J	54	30	9	93
Jakobleff W A	2	1	2	5
Michler R E	2	13	0	15
All Others	11	0	10	21
Total	**569**	**340**	**122**	**1031**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Mount Sinai Beth Israel				
Culliford A	0	3	0	3
Deanda A	0	1	1	2
Galloway A	0	1	0	1
Hoffman D	84	25	10	119
Loulmet D F	0	1	0	1
Puskas J D	188	88	16	292
Tranbaugh R	252	92	23	367
Zias E	1	4	0	5
All Others	32	14	6	52
Total	**557**	**229**	**56**	**842**
Mount Sinai Hospital				
Adams D H	8	1033	77	1118
Anyanwu A C	57	102	335	494
Boateng P	19	40	11	70
Chikwe J Y	143	82	47	272
El-Eshmawi A M	7	27	6	40
Filsoufi F	279	133	18	430
Puskas J D	42	5	4	51
Reddy R C	263	124	78	465
Stelzer P	42	288	337	667
Stewart A S	89	194	334	617
Tannous H J	65	38	6	109
Varghese R	84	68	18	170
All Others	22	17	64	103
Total	**1120**	**2151**	**1335**	**4606**
Mount Sinai St. Lukes				
Balaram S K	114	62	27	203
Chikwe J Y	49	42	12	103
Swistel D	190	171	25	386
Total	**353**	**275**	**64**	**692**
NYP-Brooklyn Methodist				
Gulkarov I M	146	101	49	296
Tortolani A	105	54	4	163
Tranbaugh R	14	4	2	20
Worku B M	42	21	12	75
All Others	0	0	38	38
Total	**307**	**180**	**105**	**592**
NYP-Columbia Presby.				
Argenziano M	215	306	37	558
Bacchetta M D	0	1	154	155
Bacha E	0	4	121	125
Borger M A	19	118	111	248
Chai P J	0	3	58	61
George I	129	161	504	794
Naka Y	253	197	186	636
Quaegebeur J	0	2	61	63
Smith C	167	627	76	870
Stewart A S	45	108	96	249

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
NYP-Columbia Presby., *continued*				
Takayama H	333	263	185	781
Williams M R	21	295	521	837
All Others	19	18	144	181
Total	**1201**	**2103**	**2254**	**5558**
NYP-Queens				
Lang S	261	99	23	383
All Others	7	2	3	12
Total	**268**	**101**	**26**	**395**
NYP-Weill Cornell				
Bacha E	0	5	17	22
Chai P J	0	3	5	8
Girardi L	273	689	720	1682
Gulkarov I M	5	4	1	10
Isom O	3	22	0	25
Krieger K	188	358	22	568
Lang S	8	12	1	21
Salemi A	72	97	369	538
Tranbaugh R	0	1	0	1
Worku B M	0	1	0	1
All Others	15	8	11	34
Total	**564**	**1200**	**1146**	**2910**
NYU Hospitals Center				
Balsam L B	2	6	29	37
Culliford A	48	53	16	117
Deanda A	5	16	31	52
Galloway A	64	485	53	602
Grossi E	6	8	34	48
Loulmet D F	57	374	94	525
Malhotra S P	0	2	11	13
Mosca R S	0	5	21	26
Swistel D	10	20	5	35
Williams M R	8	80	268	356
Zias E	272	272	48	592
All Others	15	9	7	31
Total	**487**	**1330**	**617**	**2434**
NYU Winthrop Hospital				
Goncalves J A	132	199	638	969
Kokotos W J	170	156	61	387
Salhab K F	124	32	10	166
Schubach S	167	122	0	289
All Others	31	8	0	39
Total	**624**	**517**	**709**	**1850**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
North Shore Univ Hosp				
Esposito R	241	184	225	650
Fernandez H A	0	1	0	1
Graver L	53	60	6	119
Hall M	109	74	21	204
Hartman A	76	202	92	370
Kalimi R	83	103	17	203
Palazzo R	40	20	20	80
Pogo G	100	66	23	189
Taylor J	13	9	0	22
Vatsia S	174	121	53	348
Yu P J	66	38	63	167
All Others	7	1	14	22
Total	**962**	**879**	**534**	**2375**
Rochester General Hosp				
Cheeran D	486	433	123	1042
Kirshner R	424	627	92	1143
All Others	67	21	2	90
Total	**977**	**1081**	**217**	**2275**
Southside Hospital				
Fernandez H A	6	6	0	12
Hartman A	40	113	61	214
Kalimi R	215	154	68	437
Manetta F	184	70	61	315
Pogo G	32	14	7	53
Taylor J	1	0	0	1
All Others	15	5	1	21
Total	**493**	**362**	**198**	**1053**
St. Elizabeth Med Ctr				
Akujuo A C	5	6	1	12
Cahill A T	10	2	0	12
El Amir N	206	113	35	354
Joyce F	315	161	12	488
All Others	21	6	1	28
Total	**557**	**288**	**49**	**894**
St. Francis Hospital				
Bercow N	470	336	154	960
Colangelo R	603	533	46	1182
Lamendola C	118	92	18	228
Lundy E F	192	79	10	281
Robinson N	135	419	458	1012
Rovensky M	34	10	2	46
All Others	70	5	4	79
Total	**1622**	**1474**	**692**	**3788**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
St. Josephs Hospital				
Green G R	233	297	173	703
Lutz C J	238	332	140	710
Marvasti M	160	187	42	389
Nazem A	264	229	66	559
Zhou Z	274	311	193	778
Total	**1169**	**1356**	**614**	**3139**
St. Peters Hospital				
Edwards N	165	248	77	490
Karavas A N	352	72	26	450
Saifi J	160	345	82	587
Terrien C M	310	204	60	574
Total	**987**	**869**	**245**	**2101**
Staten Island Univ Hosp				
McGinn J	308	119	11	438
Rosell F M	259	39	24	322
Wohler A M	49	13	21	83
All Others	3	0	0	3
Total	**619**	**171**	**56**	**846**
Strong Memorial Hosp				
Alfieris G	0	2	20	22
Gensini P F	0	9	48	57
Hicks G	89	49	45	183
Knight P	460	503	273	1236
Massey H	79	59	143	281
All Others	36	7	34	77
Total	**664**	**629**	**563**	**1856**
UHS-Wilson Med Ctr				
Wong K	200	118	29	347
Yousuf M	236	112	34	382
Total	**436**	**230**	**63**	**729**
Univ. Hosp-Brooklyn				
Tak V M	73	71	9	153
All Others	43	19	10	72
Total	**116**	**90**	**19**	**225**
Univ. Hosp-Stony Brook				
Bilfinger T	26	9	12	47
Fernandez H A	269	185	93	547
Gupta S	151	155	98	404
McLarty A	4	1	38	43
Seifert F	77	21	2	100
Taylor J	293	298	109	700
Total	**820**	**669**	**352**	**1841**
Univ. Hosp-Upstate				
Dunton R F	51	19	4	74
Fink G W	72	50	33	155
All Others	2	2	4	8
Total	**125**	**71**	**41**	**237**

Table 8 continued

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Vassar Bros. Med Ctr				
Sarabu M	115	212	50	377
Shahani R B	159	90	20	269
Zakow P	204	134	29	367
All Others	19	0	1	20
Total	**497**	**436**	**100**	**1033**
Westchester Med Ctr				
Kai M	126	66	78	270
Lafaro R	57	31	17	105
Lansman S	20	15	24	59
Malekan R	192	72	111	375
Spielvogel D	175	103	86	364
Tang G H L	1	22	134	157
All Others	0	0	5	5
Total	**571**	**309**	**455**	**1335**
TOTAL	**24466**	**22129**	**13457**	**60052**

Criteria Used in Reporting Significant Risk Factors (2015)

Based on Documentation in Medical Records

Patient Risk Factor	Definitions
Demographic	
Body Surface Area	Body surface area (BSA) is a function of height and weight and increases for larger heights and weights. The statistical formula used to calculate BSA in this report is: BSA (m^2) =0.0003207 x $H^{0.3}$ x $W^{(0.7285 - (0.0188 \times LOG))}$ Where H is Height in centimeters and W is Weight in grams.
Body Mass Index	Body Mass Index (BMI) is a measure of body size 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. The formula for BMI is: BMI=Weight/$Height^2$ where Height is height in meters (m) and Weight is weight in kilograms (kg).
Hemodynamic State	**Determined in the immediate pre-operative period, defined as the period prior to anesthesia taking responsibility for the patient.**
Non-Refractory Cardiogenic Shock	Non-Refractory Cardiogenic Shock is defined as an episode of systolic blood pressure <90 mmHg and/or cardiac index < 2.2 L/min /m2 determined to be secondary to cardiac dysfunction and the requirement for parenteral inotropic or vasopressor agents or mechanical support (e.g., IABP, extracorporeal circulation, VAD) to maintain blood pressure and cardiac index above those specified levels. (Definition adopted in 2015) Prior to 2015 the risk factor was called “Unstable” and defined as follows: Patient requires pharmacologic or mechanical support to maintain blood pressure or cardiac index.
Refractory Cardiogenic Shock	Refractory Cardiogenic Shock is defined as an episode of systolic blood pressure <80 mm Hg and/or cardiac index < 2.0 L/min /m2 determined to be secondary to cardiac dysfunction despite the use of parenteral inotropic or vasopressor agents or mechanical support (e.g., IABP, extracorporeal circulation, VADs). (Definition adopted in 2015.) Prior to 2015 the risk factor was called Shock and defined as follows: Acute hypotension (systolic blood pressure < 80 mmHg) or low cardiac index (< 2.0 liters/min/m2), despite pharmacologic or mechanical support. Records with this risk factor were excluded from all analyses in this report.

Patient Risk Factor	Definitions
Comorbidities	
Cerebrovascular Disease	Cerebrovascular disease prior to surgery documented by any one of the following: • 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. Does not include neurological disease processes such as metabolic and/or anoxic ischemic encephalopathy.
Chronic Lung Disease	The patient has chronic lung disease with pre-operative findings of one of the following: • Mild - FEV_1 60% to 75% of predicted, and/or on chronic inhaled or oral bronchodilator therapy. • Moderate - FEV_1 50% to 59% of predicted, and/or on chronic steroid therapy aimed at lung disease. • Severe - FEV_1 <50% predicted, and/or Room Air pO_2 < 60 or Room Air pCO_2 > 50.
Congestive Heart Failure (CHF), Current	Within 2 weeks prior to the procedure, the patient has a clinical diagnosis of CHF and symptoms requiring treatment for CHF. Note: Physician diagnosis of CHF may be based on one of the following: • Paroxysmal nocturnal dyspnea (PND) • Dyspnea on exertion (DOE) due to heart failure • Chest X-Ray showing pulmonary congestion Documentation must include the presence of a diagnosis of CHF, evidence of symptoms, and treatment for CHF.
Congestive Heart Failure (CHF), Past	Between 2 weeks and 6 months prior to the procedure, the patient has a clinical diagnosis / past medical history of CHF and ongoing treatment for CHF. Note: Physician diagnosis of CHF may be based on one of the following: • Paroxysmal nocturnal dyspnea (PND) • Dyspnea on exertion (DOE) due to heart failure • Chest X-Ray showing pulmonary congestion Documentation must include a diagnosis of CHF and evidence of treatment for CHF. Patient's clinical status may be compensated.

Patient Risk Factor	Definitions
Comorbidities, *continued*	
Diabetes	The patient has a history of diabetes diagnosed and/or treated by a physician. For patients with Diabetes, indicate the patient's diabetes control method as presented on admission. Patients placed on a pre-procedure diabetic pathway of insulin drip at admission but whose diabetes was controlled by diet or oral methods are not coded as being treated with insulin. Choose the most aggressive therapy from the order below • Insulin: insulin treatment (includes any combination with insulin) • Other subcutaneous medications (e.g., GLP-1 agonist) • Oral: treatment with oral agent (includes oral agent with or without diet treatment) • Diet only: Treatment with diet only • None: no treatment for diabetes • Other: other adjunctive treatment, non-oral/insulin/diet • Unknown.
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.
Hepatic Failure	The patient has cirrhosis or other liver disease and has a bilirubin > 2 mg/dL and a serum albumin < 3.5 g/dL.
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 serum creatinine was in the indicated range.
Renal Failure Requiring Dialysis	The patient is currently (prior to surgery) undergoing dialysis.

Patient Risk Factor	Definitions
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.
STEMI	The patient presented with a ST-elevation myocardial infarction (STEMI) or its equivalent as documented in the medical record. STEMIs are characterized by the presence of both criteria: a. ECG evidence of STEM b. Cardiac biomarkers (creatinine kinase-myocardial band, Troponin T or I) exceed the upper limit of normal according to the individual hospital's laboratory parameters with a clinical presentation which is consistent or suggestive of ischemia.
Previous Procedures	
Previous Organ Transplant	The patient has had any organ transplant prior to the current cardiac surgery. This includes, but is not limited to, heart, lung, kidney, and liver transplants.
Previous PCI	The patient has had a Percutaneous Coronary Intervention prior to the current cardiac surgery.
Previous PCI, this episode with Emergency Transfer	Prior to this cardiac surgery and during the same episode of care, the patient underwent PCI and required immediate surgery after PCI or diagnostic catheterization.
Previous Valve Surgery or Intervention	Prior to this cardiac surgery, the patient has previously undergone surgery or catheter based intervention for valve repair or replacement.
Previous CABG Surgery with Patent Grafts	Prior to this cardiac surgery, the patient has previously undergone CABG surgery and at least one graft remains patent (open for blood flow).
Any Previous Cardiac Surgery	Prior to this cardiac surgery, the patient has previously undergone any previous Cardiac Surgery. This would include a previous catheter-based valve repair or replacement but not other catheter-based interventions.
Vessels Diseased	
Left Main Disease	The patient has at least a 50 percent blockage in the Left Main Coronary Artery.

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 rotoblaters and ultrasound are sometimes used.

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

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

coronary artery bypass graft surgery (CABG) – A procedure in which a vein or artery from another part of the body is used to create an alternate path for blood to flow to the heart muscle, bypassing the arterial blockage. Typically, a section of one of the large saphenous veins in the leg, the radial artery in the arm or the mammary artery in the chest is used to construct the bypass. One or more bypasses may be performed during a single operation. When no other major heart surgery (such as valve replacement) is included, the operation is referred to as an isolated CABG. The average number of bypass grafts created during CABG is three or four. Generally, all significantly blocked arteries are bypassed unless they enter areas of the heart that are permanently damaged by previous heart attacks. Five or more bypasses are occasionally created. Multiple bypasses are often performed to provide several alternate routes for the blood flow and to improve the long-term success of the procedure, not necessarily because the patient’s condition is more severe.

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

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

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

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

incompetent valves – A valve that does not close tightly.

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

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

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

risk factors for heart disease – Certain risk factors have been found to increase the likelihood of developing heart disease. Some are controllable or avoidable and some cannot be controlled. The biggest heart disease risk factors are heredity, gender and age, none of which can be controlled. Men are much more likely to develop heart disease than women before the age of 55, although it is the number one killer of both men and women. Some controllable risk factors that contribute to a higher likelihood of developing coronary artery disease are high cholesterol levels, cigarette smoking, high blood pressure (hypertension), obesity, a sedentary lifestyle or lack of exercise, diabetes and poor stress management.

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

stenotic valve – A valve that does not open fully.

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

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

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

Appendix 1
Risk Factors for CABG In-Hospital / 30-Day Deaths in New York State in 2015

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 2015 are presented in Appendix Table 1.

Roughly speaking, the odds ratio for a risk factor represents the number of times more likely to die in the hospital during or after CABG or after discharge but within 30 days of the surgery a patient with that risk factor is than a patient without the risk factor, all other risk factors being the same. For example, the odds ratio for the risk factor Peripheral Vascular Disease is 2.713. This means that a patient who has Peripheral Vascular Disease prior to surgery is approximately 2.713 times as likely to die in the hospital or after discharge within 30 days of surgery as a patient who does not have Peripheral Vascular Disease but who has the same other significant risk factors.

For all of the risk factors in the table except Age: Number of years greater than 60, Body Surface Area and Renal Failure, there are only two possibilities: having the risk factor and not having it.

For age, the odds ratio roughly represents the number of times more likely to die a patient who is older than 60 is compared to a patient who is one year younger but otherwise has the same significant risk factors. Thus, the chance of in-hospital / 30-day death for a patient undergoing CABG who is 66 years old is approximately 1.072 times that of a patient 65 years old undergoing CABG, if all other risk factors are the same. All patients age 60 and younger have roughly the same odds of in-hospital / 30-day mortality if their other risk factors are identical.

Body surface area (BSA) is a function of height and weight and increases for larger heights and weights. This model includes terms for both BSA and BSA-squared, reflecting the complex relationship between BSA and in-hospital/ 30-day mortality. The quadratic function of BSA (BSA-squared) used in this statistical model reflects the fact that patients with very high 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.

Renal Failure is subdivided into three groups. The first group represents patients with serum creatinine greater than 1.5 m/dL who are not on dialysis. The second group includes patients with renal failure on dialysis. These groups are relative to patients who are not on dialysis and whose last pre-operative serum creatinine values were not greater than 1.5 mg/dL.

Appendix Table 1

Multivariable Risk Factor Equation for CABG In-Hospital / 30-Day Deaths in New York State in 2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 60	—	0.0692	<.0001	1.072
Body Surface Area ($10m^2$)	—	-0.8304	0.0045	—
Body Surface Area – squared ($100m^4$)	—	0.0197	0.0050	—
Ventricular Function				
Ejection Fraction < 30%	6.70	0.9016	0.0002	2.463
STEMI < 24 hours	1.33	1.9011	<.0001	6.693
Hemodynamic State				
Non-Refractory Shock	0.57	1.9465	<.0001	7.004
Comorbidities				
Peripheral Vascular Disease	12.37	0.9981	<.0001	2.713
Congestive Heart Failure, within 2 weeks	15.58	0.7827	0.0002	2.187
Chronic Lung Disease, Severe	3.70	0.6734	0.0275	1.961
Diabetes	49.13	0.6533	0.0013	1.922
Renal Failure				
No Renal Failure	89.41	— Reference —		1.000
Creatinine > 1.5 mg/dl	7.30	0.7876	0.0013	2.198
Requiring Dialysis	3.29	1.1257	0.0003	3.082
Previous Procedures				
Previous CABG with Patent Grafts	1.04	1.5693	0.0014	4.803
Previous Organ Transplant	0.51	1.4140	0.0149	4.113

Intercept = 2.3943
C Statistic = 0.830

Appendix 2
Risk Factors for CABG 30-Day Readmissions in New York State in 2015

The significant pre-procedural risk factors for 30-day readmissions following CABG in 2015 are presented in the table that follows. Female, Ejection Fraction, Cerebrovascular Disease, Chronic Lung Disease, and Previous PCI are interpreted in the same way as Peripheral Vascular Disease in Appendix 1. The patient either has the risk factor or does not.

The interpretation for Age is the same as that presented in Appendix 1 except in this instance risk increases for each year older than 55.

Body Mass Index (BMI) is a relationship of weight to height. It is a measure of body size 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. The quadratic function of BMI (BMI-squared) used in the statistical model reflects the fact that patients with very high and very low BMIs tend to have higher risks of readmission than patients with intermediate levels of BMI. 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.

Previous MI is categorized in four groups. Two groups represent patients who have experienced a STEMI either in the six hours before surgery or from six hours to seven days before surgery. A third group represents patients who have previously experienced any MI except a STEMI within seven days before surgery. The odds ratios for all three of these groups are relative to patients who have never experienced an MI.

In this model, Diabetes is categorized in three groups. One group includes patients who have diabetes and are treated with insulin. Another group includes patients whose diabetes is not treated prior to admission (that is, no diet control, oral medication, insulin or other treatments). The odds ratios for both of these groups are relative to patients who either do not have diabetes or who have diabetes but are receiving therapy other than insulin (such as diet or oral medications).

Renal Failure is expressed in terms of renal failure with dialysis and elevated serum creatinine without dialysis. The odds ratios for all four Renal Failure categories are relative to patients with no dialysis and whose last serum creatinine measured prior to surgery was not greater than 1.2 mg/dL.

Appendix Table 2

Multivariable Risk Factor Equation for CABG / 30-Day Readmission in New York State in 2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 55	—	0.0158	<0.0001	1.016
Body Mass Index	—	-0.1022	0.0015	—
Body Mass Index - squared	—	0.0018	0.0001	—
Female	24.29	0.3175	<0.0001	1.374
Ventricular Function				
Ejection Fraction < 40%	16.39	0.2328	0.0076	1.262
Previous MI				
No Previous MI	51.70	— Reference —		1.000
STEMI, < 6 hours	0.52	0.8474	0.0309	2.334
STEMI, 6 hours – 7 days	2.69	0.4005	0.0401	1.493
Any other Previous MI	45.09	0.2018	0.0056	1.224
Comorbidities				
Cerebrovascular Disease	13.54	0.3225	0.0003	1.381
Chronic Lung Disease, Severe	3.69	0.7653	<0.0001	2.150
Diabetes				
No Diabetes or treatment other than Insulin	78.31	— Reference —		1.000
Diabetes on Insulin Therapy	17.38	0.2825	0.0012	1.326
Diabetes, Not treated	4.31	0.3424	0.0255	1.408
Renal Failure				
No Renal Failure	79.35	— Reference —		1.000
Creatinine 1.3-2.0 mg/dl	14.78	0.3576	0.0001	1.430
Creatinine 2.1-2.5 mg/dl	1.42	0.6535	0.0050	1.922
Creatinine > 2.5 mg/dl	1.24	0.8979	0.0002	2.454
Requiring Dialysis	3.21	1.0062	<0.0001	2.735
Previous Procedures				
Previous PCI	29.10	0.1776	0.0167	1.194

Intercept = -1.3124
C Statistic = 0.651

Appendix 3
Risk Factors For Valve Surgery In-Hospital / 30-Day Mortality in 2013-2017

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve surgery in the 2013-2015 time period are presented in the table that follows.

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 1.043 times as likely die in the hospital or within 30 days of discharge.

The odds ratio for type of valve surgery roughly represents the number of times more likely to die in the hospital during or after that particular surgery or after discharge but within 30 days a patient with a specific valve surgery is 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 roughly 1.687 times as likely to die in the hospital during or after surgery or after discharge but within 30 days of surgery as a patient with aortic valve replacement surgery, all other significant risk factors being the same.

The interpretation of renal failure in this model is similar to that provided in Appendix 2 except in this case there are only two levels of elevated serum creatinine.

All other variables can be interpreted in the same way as previously described.

Table 3

Multivariable Risk Factor Equation for Valve Surgery In-Hospital / 30-Day Deaths In NYS, 2013-2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age in years	—	0.0425	<.0001	1.043
Body Surface Area (10m^2)	—	-0.5661	0.0005	—
Body Surface Area – squared (100m^4)	—	0.0134	0.0009	—
Female	45.48	0.3883	0.0013	1.474
Type of Valve Surgery				
Aortic Valve Replacement	48.76	— Reference —		1.000
Mitral Valve Replacement	13.15	0.5232	0.0008	1.687
Mitral Valve Repair	17.33	-0.5408	0.0310	0.582
Multiple Valve Repair/Replacement	20.77	0.8355	<.0001	2.306
Hemodynamic State				
Non-Refractory Shock	0.50	1.1729	0.0019	3.231
Comorbidities				
Cerebrovascular Disease	11.87	0.3274	0.0140	1.387
Chronic Lung Disease, Severe	3.93	0.8386	<.0001	2.313
Congestive Heart Failure, within 2 weeks	33.32	0.3731	0.0009	1.452
Endocarditis	5.36	0.4258	0.0236	1.531
Peripheral Vascular Disease	6.66	0.4028	0.0137	1.496
Renal Failure				
No Renal Failure	90.35	— Reference —		1.000
Creatinine 1.6 – 2.0 mg/dl	5.02	0.6324	0.0003	1.882
Creatinine > 2.0 mg/dl	2.01	0.6511	0.0135	1.918
Requiring Dialysis	2.62	1.7137	<.0001	5.550
Previous Procedres				
Any Previous Valve Surgery or Intervention	11.94	0.3733	0.0058	1.453

Intercept = -1.8361

C Statistic = 0.783

Appendix 4
Risk Factors for Valve and CABG Surgery In-Hospital/30-Day Mortality in New York State in 2013-2015

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve and CABG surgery in the 2013-2015 time period are presented in the table that follows.

The odds ratio for Type of Valve with CABG surgery roughly represents the number of times more likely to die in the hospital during or after that particular surgery or after discharge but within 30 days a patient with a specific Valve with CABG surgery is than a patient who 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 2.311 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.

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 Valve with CABG patient with an ejection fraction of less than 30 percent is about 2.184 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.

Chronic Lung Disease is divided into three categories: patients with Moderate disease; patients with Severe disease; and patients with either no chronic lung disease or mild disease. The last group is the reference category.

All other risk factors are interpreted as described in Appendix 1-3.

Appendix Table 4

Multivariable Risk Factor Equation for Valve and CABG Surgery In-Hospital/ 30-Day Deaths in NYS, 2013-2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 65	—	0.0591	<.0001	1.061
Body Surface Area (10 m^2)	—	-0.7379	0.0008	—
Body Surface Area – squared (100 m^4)	—	0.0180	0.0010	—
Female	32.79	0.4259	0.0041	1.531
Type of Valve (with CABG)				
Aortic Valve Replacement	62.72	— Reference —		1.000
Mitral Valve Replacement	10.26	0.8379	<.0001	2.311
Mitral Valve Repair	14.47	-0.0393	0.8531	0.961
Multiple Valve Repair/Replacement	12.54	0.7489	<.0001	2.115
Ventricular Function				
Ejection Fraction				
Ejection Fraction 50% or greater	66.91	— Reference —		1.000
Ejection Fraction < 30%	8.68	0.7811	<.0001	2.184
Ejection Fraction 30 – 49%	24.41	0.3479	0.0178	1.416
STEMI within 7 days	1.32	1.0707	0.0028	2.917
Hemodynamic State				
Non-Refractory Shock	0.99	1.1675	0.0020	3.214
Comorbidities				
Chronic Lung Disease				
Chronic Lung Disease, None or Mild	86.84	— Reference —		1.000
Chronic Lung Disease, Moderate	6.76	0.4590	0.0352	1.582
Chronic Lung Disease, Severe	6.40	0.5493	0.0080	1.732
Renal Failure				
No Renal Failure	63.32	— Reference —		1.000
Renal Failure, Creatinine 1.2-1.5 mg/dl	22.68	0.4637	0.0037	1.590
Renal Failure, Creatinine 1.6-2.0 mg/dl	6.85	0.7024	0.0013	2.019
Renal Failure, Creatinine > 2.0 mg/dl	3.18	0.7989	0.0054	2.223
Renal Failure Requiring Dialysis	3.97	1.8594	<.0001	6.420
Previous Procedures				
Any Previous CABG Surgery	4.10	1.0064	<.0001	2.736
Previous Organ Transplant	0.78	1.2575	0.0028	3.517

Intercept = 2.5169
C Statistic = 0.752

Appendix 5
Multivariable Risk Factor Equation for TAVR In-Hospital / 30-Day Deaths in New York State in 2013-2015.

The significant pre-procedural risk factors for in-hospital/30-day mortality following TAVR in the 2013-2015 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 TAVR In-Hospital / 30-Day Deaths in New York State in 2013-2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 80	—	0.0551	0.0002	1.057
Body Surface Area (10 m^2)	—	-0.7366	<.0001	—
Body Surface Area – squared (100 m^4)	—	0.0178	0.0002	—
Ventricular Function				
Ejection Fraction < 30%	8.35	0.4824	0.0122	1.620
Comorbidities				
Cerebrovascular Disease, not TIA only	19.03	0.4119	0.0058	1.510
Congestive Heart Failure, within 2 weeks	54.23	0.4235	0.0020	1.527
Chronic Lung Disease, Severe	12.59	0.5221	0.0023	1.686
Extensive Aortic Atherosclerosis	2.72	0.8136	0.0038	2.256
Hepatic Failure	0.13	2.1973	0.0127	9.001
Renal Failure				
No Renal Failure	90.37	— Reference —		1.000
Creatinine 2.1 - 2.5 mg/dl	3.08	0.6428	0.0286	1.902
Creatinine > 2.5 mg/dl or Dialysis	6.55	0.9632	<.0001	2.620
Vessels Diseased				
Left Main Disease	2.57	0.7013	0.0178	2.016

Intercept = 3.4275

C Statistic = 0.668

Appendix 6
Risk Factors for Isolated CABG In-Hospital/30-Day Mortality in New York State 2013-2015

The significant pre-procedural risk factors for in-hospital/30-day mortality following isolated CABG in the 2013-2015 time period are presented in the table that follows. The risk factors in this model are interpreted as described in Appendices 1 – 5

Appendix Table 6

Multivariable Risk Factor Equation for CABG In-Hospital / 30-Day Deaths in New York State in 2013-2015.

		Logistic Regression		
Patient Risk Factor	**Prevalence (%)**	**Coefficient**	**P-Value**	**Odds Ratio**
Demographic				
Age: Number of years greater than 60	—	0.0563	<.0001	1.058
Body Mass Index	—	-0.0939	0.0363	—
Body Mass Index – squared	—	0.0016	0.0152	—
Female	24.26	0.2364	0.0415	1.267
Hemodynamic State				
Non-refractory Shock	0.70	1.2675	<.0001	3.552
Ventricular Function				
Ejection Fraction < 30%	7.48	0.7887	<.0001	2.201
Previous MI				
No Previous MI within 7 days	75.95	— Reference —		1.000
STEMI, < 6 hours	0.57	1.9170	<.0001	6.801
STEMI, 6-23 hours	0.84	1.7581	<.0001	5.801
STEMI, 1 – 7 days	2.80	0.8556	0.0003	2.353
NSTEMI, < 24 hours	1.25	0.7446	0.0346	2.106
NSTEMI, 1 – 7 days	18.59	0.2696	0.0393	1.309
Comorbidities				
Cerebrovascular Disease	14.21	0.3559	0.0053	1.427
Chronic Lung Disease, Severe	4.24	0.7921	<.0001	2.208
Congestive Heart Failure, within 2 weeks	15.29	0.5916	<.0001	1.807
Diabetes				
No Diabetes or treatment other than insulin	78.68	— Reference —		1.000
Diabetes, on Insulin Therapy	17.38	0.4959	0.0002	1.642
Diabetes, Not Treated	3.94	0.6588	0.0031	1.932
Extensive Aortic Atherosclerosis	3.30	0.4472	0.0205	1.564
Peripheral Vascular Disease	12.14	0.5541	<.0001	1.740
Renal Failure				
No Renal Failure	89.04	— Reference —		1.000
Renal Failure, Creatinine 1.6 – 2.5 mg/dl	6.39	0.4196	0.0124	1.521
Renal Failure, Creatinine > 2.5 mg/dl	1.26	1.0145	0.0002	2.758
Renal Failure Requiring Dialysis	3.31	1.0859	<.0001	2.962
Previous Procedures				
Previous Valve Surgery or Intervention	0.31	1.0190	0.0290	2.770
Previous CABG with Patent Grafts	1.28	1.3331	<.0001	3.793
Previous PCI this admission w/ emergency surgery after PCI or Dx Cath	0.47	1.1042	0.0051	3.017

Intercept = -4.5209
C Statistic = 0.808

NEW YORK STATE CARDIAC SURGERY CENTERS

Albany Medical Center
47 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
462 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***
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

Montefiore Medical Center @ Henry & Lucy Moses Division
111 East 210th Street
Bronx, New York 10467

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 10029

Mount Sinai St. Luke's
1111 Amsterdam Avenue
New York, New York 10025

NY Presbyterian / Queens
56-45 Main Street
Flushing, New York 11355

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

NY Presbyterian Hospital @ Columbia Presbyterian Center
630 West 168th Street
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

NYU Winthrop University Hospital
259 First Street
Mineola, New York 11501

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 13501

St. Francis Hospital
100 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 Clarkson Avenue
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
100 Woods Road
Valhalla, New York 10595

*** No longer performing cardiac surgery.

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