

New York State

Adult Cardiac Surgery

2018-2021

August 2026



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of Health**

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Executive Summary

For over thirty years, the New York State Department of Health has publicly reported the outcomes for cardiac surgery patients at all hospitals in the state. The data that serve as the basis for this report are collected by the Department of Health cooperatively with hospitals throughout the state as part of the Cardiac Surgery Reporting System (CSRS).

What is included in this report?

This report presents the risk-adjusted in-hospital/30-day mortality results for hospitals performing coronary artery bypass graft (CABG) surgery, surgical repair or replacement of the valves in the heart, and transcatheter aortic valve replacement (TAVR). It also includes hospitals' risk-adjusted 30-day readmission results for CABG patients. In addition to results for hospitals, the report presents in-hospital/30-day mortality results for surgeons performing CABG and valve surgery.

This report is based on data for patients discharged between December 1, 2017 and November 30, 2019, and from June 1 – November 30, 2021. All cases discharged between December 1, 2019 and May 30, 2021 were excluded due to the COVID-19 pandemic.

Key Findings

In total, 57,237 cardiac surgeries and transcatheter valve replacements are analyzed in this report. This total includes cardiac surgery other than CABG and valve surgery, such as repairs of aortic aneurysm, traumatic cardiac injury, and congenital conditions, and transcatheter valve replacement of valves other than the aortic valve. These “Other” surgeries and transcatheter valve replacements are included as part of the total procedural volume for hospitals and surgeons, but they are not included in the outcome assessment because of low volume and variation in presentation and complexity.

- Isolated CABG surgery represented 37.25 percent of all adult cardiac surgery and transcatheter valve replacements included in this report.
- Valve or combined valve with CABG surgery represented 24.06 percent of all adult cardiac surgery and transcatheter valve replacements for the same period.
- TAVR represented 24.31 percent of all cardiac surgeries and transcatheter valve replacements reported.
- For CABG discharges from June – November 2021, the in-hospital/30-day mortality rate of 1.32 percent is slightly lower than the 1.62 percent observed in 2019. The 30-day readmission rate for these patients was 11.23 percent.
- For patients undergoing valve repair or replacement surgery with or without CABG at the same time who were discharged from December 2017 to November 2019 and June to November 2021, the in-hospital/30-day mortality rate of 2.67 percent is slightly higher than the 2.57 percent observed for 2017-2019.

Section 1: Introduction

For over thirty years, the New York State 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 this 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 (**Table 1, Table 3, and Table 5**).
- Readmission rates, adjusted for patient severity of illness, following CABG at NYS hospitals (**Table 2**).
- Mortality rates, adjusted for patient severity of illness, following CABG and/or valve surgery for surgeons performing the procedure (**Table 6 and Table 7**).
- Volume (number of cases) of all cardiac surgery for NYS hospitals and surgeons (**Table 4a, Table 4b, and Table 8**).
- Description of the patient risk factors associated with mortality for CABG and valve surgery and TAVR, and those associated with readmissions after CABG surgery (**Appendix 1 – Appendix 6**).

The data that serve as the basis for this report are collected by the 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 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 NYS 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 report does not include data after 2021. 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, sex 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.

Section 2: 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 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.

Section 3: 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 the physician performing the procedure.

The most common heart valve surgeries involve the aortic and mitral valves. Patients undergoing heart valve 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.

Section 4: 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:

- 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.

Section 5: Patient Population

This report is based on data for patients discharged between December 1, 2017 and November 30, 2019, and also from June 1 – November 30, 2021, as provided by all nonfederal hospitals in NYS where cardiac surgery is performed. All patients discharged between December 1, 2019 and May 30, 2021 have been excluded from this report due to the COVID-19 pandemic.

Each “reporting year” begins on December 1 of the prior calendar year and extends through November 30th (for example, the 2018 reporting year includes discharges from December 1, 2017 through November 30, 2018). 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 cardiac surgery discharges from the previous December allows for meaningful comparison of 12-month volume as found in previous reports. The analysis for 2021 includes patients discharged from June 1, 2021 through November 30, 2021; a period of only six-months due to pandemic-era reporting exclusions.

For the purposes of this report, the term cardiac surgery refers to CABG, valve surgery and other cardiac surgery as defined on [page 40](#). In total there were 58,435 cardiac surgery discharges (i.e., cases) during the reporting 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. Any case that qualifies for exclusion for more than one reason is counted only once, under the first applicable exclusion. In total, 1198 cases were excluded (2.05 percent of all cardiac surgery discharges during the reporting period).

Patients residing outside the United States were excluded because these patients could not be followed after hospital discharge. This accounted for 162 excluded cases (0.28% of all cardiac surgery discharges during the reporting period).

Patients with multiple cardiac surgery discharges within 30 days of death can only be counted once. The case associated with the first discharge is retained for analysis and subsequent discharges are excluded. This accounted for 1 excluded case.

Beginning with patients discharged in 2006, the Department of Health, with the advice of the Cardiac Advisory Committee, began a trial period of excluding data from publicly released reports for any patients meeting the Cardiac Data System definition of pre-operative cardiogenic shock (now called refractory 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 50](#). 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 patients with refractory cardiogenic shock where appropriate without concern over a detrimental impact on their reported outcomes. In total, 490 cases with refractory cardiogenic shock were excluded (0.84 percent of all cardiac surgery discharges during the reporting period).

In addition, patients discharged from June 1, 2021 – November 30, 2021 with COVID-19 were excluded from analysis. This includes patients with a history of COVID-19, as well as those that were COVID-19 positive during the cardiac surgery admission and those that died after discharge but within 30-days of surgery and had documentation of post-discharge COVID-19. This accounted for 545 cases (0.93% of all cardiac surgery discharges during the reporting period).

After all of the above exclusions, there were 57,237 cardiac surgery discharges analyzed in this report. Isolated CABG surgery represented 37.25 percent of all adult cardiac surgery discharges included in this report. Valve or combined valve/CABG surgery represented 24.06 percent of all adult cardiac surgery discharges for the same period. TAVR represented 24.31 percent of all cardiac surgery discharges reported. Total cardiac surgery, isolated CABG, valve surgery, and other cardiac surgery volumes are tabulated in **Table 8** by hospital and surgeon for the reporting period.

While there were 3,861 CABG cases included in the mortality analysis for 2021 discharges, some additional exclusions were required for the readmission analysis. Patients residing outside NYS were excluded because there is no reliable way to track out-of-state readmissions. This accounted for 176 cases. Readmission is impossible for patients that die during the same admission as their index CABG. This accounted for 36 excluded cases. Patients who were transferred to another acute care facility after CABG or who left the hospital against medical advice are not eligible for readmission analysis. This accounted for 17 and 7 excluded cases, respectively.

In total, the number of additional excluded cases was 236, leaving 3,625 cases to be examined for 30-day readmission rates.

Note on Hospitals Not Continuously Performing Cardiac Surgery During the Reporting Period

- University Hospital at SUNY Downstate closed their cardiac surgery program in July 2019.
- Arnot Ogden Medical Center did not perform cardiac surgery cases after September 2020.
- White Plains Hospital began performing cardiac surgery in November 2021.

Section 6: Risk Adjustment for Assessing Hospital and Surgeon Performance

Hospital and surgeon performance is associated with 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 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 same is true when comparing the performance of individual surgeons. The following describes how the Department of Health adjusts for patient risk in assessing hospital and surgeon outcomes.

Data Collection, Data Validation and Identifying Deaths and Readmissions

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 risk factors are reported to the Cardiac Surgery Reporting System (CSRS).

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.

There are two primary outcomes in this report: In-Hospital/30-Day Mortality and 30-Day Readmission. Both are defined below. An in-hospital death is defined as a patient who died during the same acute care admission as CABG, valve surgery, or TAVR, even if they lived for more than thirty days after the procedure. Patients discharged to hospice care who expire within thirty days of going to hospice are also analyzed as an in-hospital mortality.

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. Please note, National Death Index data were used only to identify deaths after discharge for cases in the 2018 and 2019 reporting years.

Thirty-day readmission is defined as an unplanned admission to a NYS non-Federal hospital within 30 days of discharge from the index hospitalization. Unplanned readmissions are identified using criteria published by the Center for Medicare and Medicaid Services. Patients readmitted with COVID-19 were not counted as a readmission in this report.

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.

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 their history, weighing the important health factors for that person based on the experiences of thousands of patients who have undergone the same procedures since 1989. All clinical conditions widely recognized as important risk factors for each patient are combined to create a risk profile. For example, an 80-year-old patient with renal failure requiring dialysis has a very different risk profile than a 40-year-old with no renal failure.

The statistical analyses conducted by the Department of Health consist of determining which of the risk factors collected are significantly related to death following CABG, valve surgery or TAVR (and readmission after CABG) and determining how to weigh the significant risk factors to predict the chance each patient will have of dying (or being readmitted), given their specific characteristics.

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.

Predicting Patient Mortality Rates for Hospitals and Surgeons

The mortality rate for each hospital is predicted using the relevant statistical models. This is accomplished by summing the predicted probabilities of death for each of the hospital's patients and dividing by the number of patients at that hospital. The resulting rate is an estimate of what the hospital's mortality rate would have been if the hospital'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 at that hospital. The process of predicting a surgeon's predicted mortality rate is exactly the same as described above for hospitals.

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 (hospital's or surgeon'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, adjusted for differences among providers in patient severity of illness.

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. The ratio is then multiplied by the overall statewide mortality rate to obtain the provider's RAMR.

There is no Statewide EMR or RAMR, because the statewide data is not risk-adjusted. The Statewide OMR serves as the basis for comparison for each provider'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 used to identify results that are significantly different from the Statewide rate. A more detailed explanation of Confidence Intervals is provided under Definition of Key Terms on [page 17](#).

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 verify the presence of key risk factors. When significant coding problems are discovered, hospitals are required to correct these data and are subsequently monitored.

Although there are reasons that RAMRs presented here may not be a perfect reflection of quality of care, the Department of Health provides this information as a potentially useful tool in supporting patient decision making.

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

Patient risk of 30-day readmission after CABG is assessed using the same methods used for assessing mortality risk as described above. Potential risk factors are considered and those that statistical analyses show to be 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.

This analysis is based on unplanned readmissions, and may include readmissions not 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 hospital'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 been able to identify opportunities to alter medical care processes to improve outcomes.

Section 7: 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 the same as the statewide mix. It is obtained by first dividing the OMR by the EMR, and then multiplying by the relevant statewide mortality rate.

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 the same as the statewide mix. It is obtained by first dividing the ORR by the ERR, and then multiplying that quotient by the statewide readmission rate.

Confidence Intervals are used to identify which providers 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. Providers with significantly higher rates than expected after adjusting for risk are those where the confidence interval range falls entirely above the statewide mortality rate. Providers 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.

Section 8: 2021 Hospital Outcomes for CABG Surgery

Table 1 and **Figure 1** present the CABG surgery results for the 35 hospitals performing this operation in NYS in the 2021 reporting period. The table contains, for each hospital, the number of isolated CABG cases (CABG operations with no other major heart surgery earlier in the hospital stay) for patients discharged in June through November 2021, 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 3861 CABG surgeries was 1.32 percent. In-hospital/30-day OMRs ranged from 0.00 percent to 4.35 percent. The range of EMRs, which measure patient severity of illness, was 0.66 percent to 2.09 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 4.72 percent. No hospitals had RAMRs that were significantly higher or lower than the statewide rate.

The 2021 in-hospital/30-day mortality rate of 1.32 percent for Isolated CABG is slightly lower than the 1.62 percent observed in 2019.

The in-hospital OMR for 2021 Isolated CABG discharges (not shown in **Table 1**) was 0.98 percent for all 3,861 patients included in the analysis.

Figure 1 provides a visual representation of the data displayed in **Table 1**. For each hospital, the dot represents the RAMR and the gray bar represents the confidence interval, or potential statistical error, for the RAMR. The 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 35 hospitals performing CABG in NYS in the 2021 reporting period. The table contains, for each hospital, the number of CABG cases discharged from June – November 2021 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 3,625 CABGs included in this 2021 (June – November) analysis was 11.23 percent. Observed readmission rates ranged from 0.00 percent to 19.75 percent. The range in ERRs, which measure patient severity of illness, was between 6.69 percent and 15.61 percent. The RARRs, which measure hospital performance, range from 0.00 percent to 21.15 percent.

Based on confidence intervals for RARRs, one hospital (Maimonides Medical Center in Brooklyn) had a RARR that was significantly higher than the statewide average. Four hospitals (Good Samaritan University Hospital in West Islip, NYU Langone Health in Manhattan, St. Elizabeth Medical Center in Utica, and Staten Island University Hospital) 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 NYS, June – November 2021 Discharges**

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med Ctr	114	4	3.51	1.13	4.09	(1.10, 10.48)
Bassett Med Ctr	23	1	4.35	1.65	3.48	(0.05, 19.35)
Bellevue Hosp Ctr	60	0	0.00	1.08	0.00	(0.00, 7.48)
Buffalo General Med Ctr	242	2	0.83	1.34	0.82	(0.09, 2.95)
Ellis Hosp	67	2	2.99	1.29	3.05	(0.34, 11.00)
Good Sam – Suffern	38	0	0.00	1.40	0.00	(0.00, 9.08)
Good Sam Univ Hosp	90	3	3.33	1.55	2.84	(0.57, 8.30)
Lenox Hill Hosp	202	0	0.00	1.39	0.00	(0.00, 1.72)
Maimonides Med Ctr	84	0	0.00	1.31	0.00	(0.00, 4.40)
Mercy Hospital – Buffalo	123	2	1.63	1.08	1.99	(0.22, 7.20)
Montefiore – Moses	183	1	0.55	1.05	0.69	(0.01, 3.83)
Montefiore – Weiler	5	0	0.00	0.66	0.00	(0.00, 100.0)
Mount Sinai Hosp	127	3	2.36	1.04	2.99	(0.60, 8.75)
Mount Sinai Morningside	112	2	1.79	0.79	2.98	(0.33, 10.74)
NYP – Brooklyn Methodist	37	1	2.70	0.97	3.67	(0.05, 20.44)
NYP – Columbia Presby	174	2	1.15	1.31	1.16	(0.13, 4.20)
NYP – NY Weill Cornell	94	1	1.06	1.37	1.03	(0.01, 5.72)
NYP – Queens	35	0	0.00	1.02	0.00	(0.00, 13.54)
NYU Langone Health	128	1	0.78	1.13	0.91	(0.01, 5.07)
NYU Langone – Long Island	78	0	0.00	1.70	0.00	(0.00, 3.66)
North Shore Univ Hosp	264	2	0.76	1.23	0.82	(0.09, 2.95)
Rochester General Hosp	202	8	3.96	2.09	2.50	(1.08, 4.93)
South Shore Univ Hosp	91	0	0.00	0.87	0.00	(0.00, 6.10)
St. Elizabeth Med Ctr	57	0	0.00	1.96	0.00	(0.00, 4.33)
St. Francis Hosp	204	0	0.00	1.26	0.00	(0.00, 1.89)
St. Joseph's Hosp	297	6	2.02	1.74	1.53	(0.56, 3.33)
St. Peter's Hosp	196	3	1.53	1.26	1.60	(0.32, 4.67)
Staten Island Univ Hosp	79	0	0.00	1.39	0.00	(0.00, 4.43)
Strong Memorial Hosp	102	4	3.92	1.10	4.72	(1.27, 12.08)
UHS Wilson Med Ctr	58	0	0.00	1.16	0.00	(0.00, 7.18)
Univ Hosp – Stony Brook	70	0	0.00	1.06	0.00	(0.00, 6.53)
Univ Hosp – Upstate	62	1	1.61	1.43	1.49	(0.02, 8.29)
Vassar Bros Med Ctr	57	0	0.00	1.20	0.00	(0.00, 7.07)
Westchester Med Ctr	101	2	1.98	1.36	1.93	(0.22, 6.97)
White Plains Hosp	5	0	0.00	0.66	0.00	(0.00, 100.0)
Statewide Total	3861	51	1.32			

Figure 1

In-Hospital/30-Day Risk-Adjusted Mortality Rates for Isolated CABG in NYS, June – November 2021 Discharges

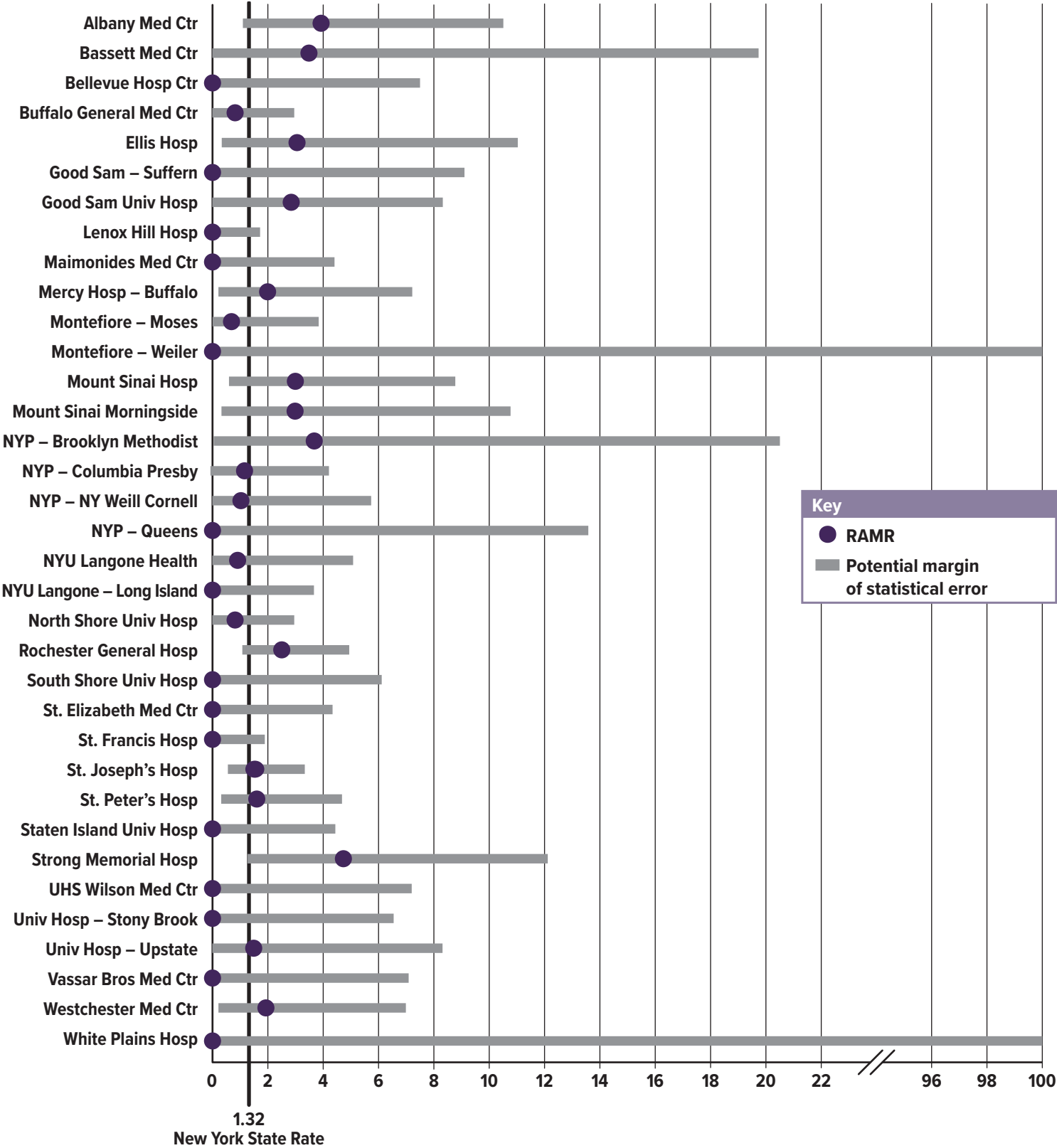


Table 2**30-Day Observed, Expected and Risk-Adjusted Readmission Rates for Isolated CABG Surgery in NYS, June – November 2021 Discharges**

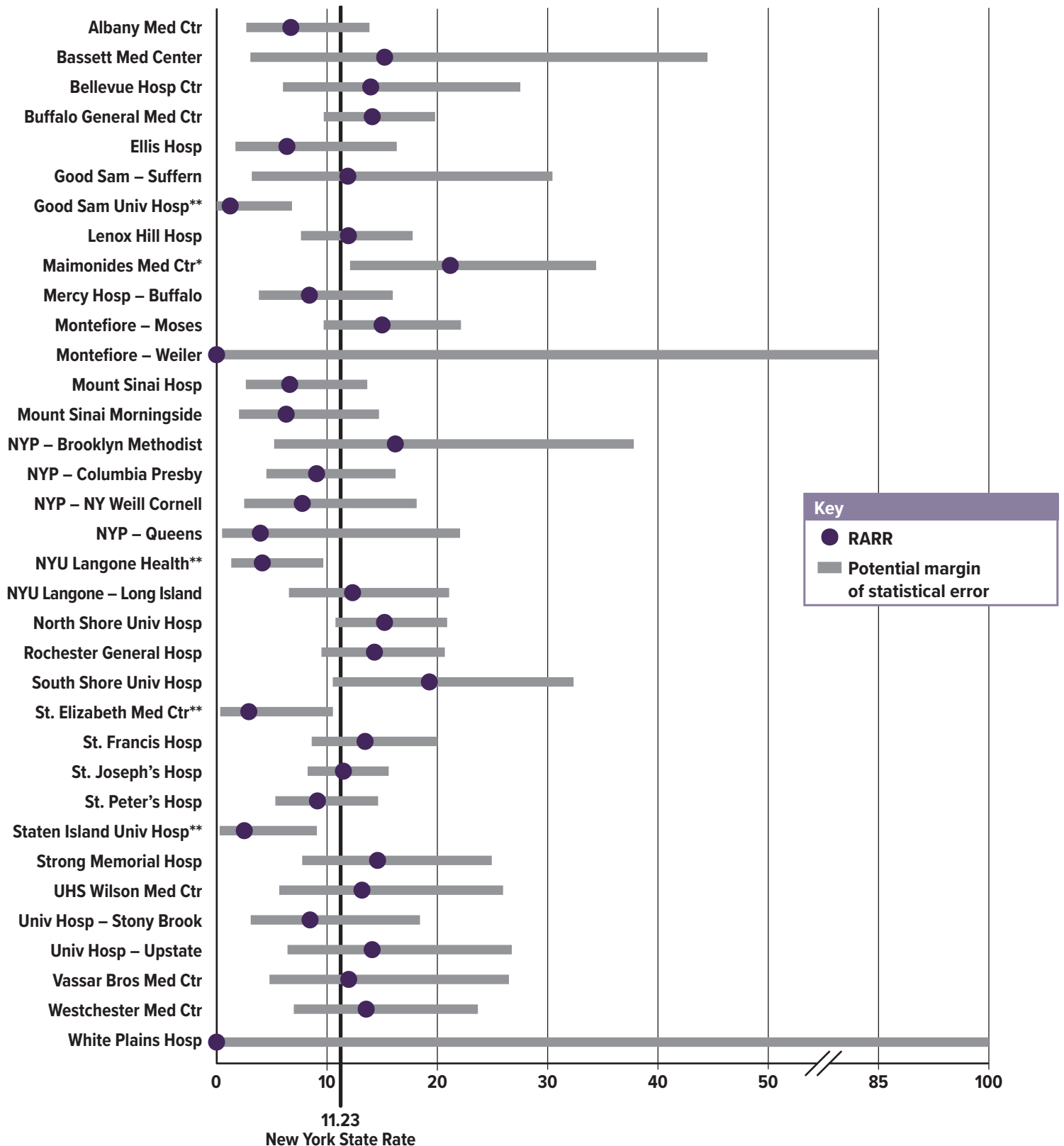
Hospital	Cases	Readmits	ORR	Err	RARR	95% CI for RARR
Albany Med Ctr	101	7	6.93	11.59	6.72	(2.69, 13.84)
Bassett Med Ctr	22	3	13.64	10.07	15.21	(3.06, 44.43)
Bellevue Hosp Ctr	59	8	13.56	10.91	13.95	(6.01, 27.49)
Buffalo General Med Ctr	235	33	14.04	11.19	14.09	(9.70, 19.78)
Ellis Hosp	65	4	6.15	10.85	6.37	(1.71, 16.31)
Good Sam – Suffern	34	4	11.76	11.12	11.88	(3.19, 30.40)
Good Sam Univ Hosp	87	1	1.15	10.51	1.23**	(0.02, 6.83)
Lenox Hill Hosp	193	24	12.44	11.70	11.93	(7.64, 17.75)
Maimonides Med Ctr	81	16	19.75	10.49	21.15*	(12.08, 34.35)
Mercy Hospital – Buffalo	119	9	7.56	10.10	8.40	(3.83, 15.95)
Montefiore – Moses	175	25	14.29	10.71	14.98	(9.69, 22.12)
Montefiore – Weiler	5	0	0.00	9.68	0.00	(0.00, 85.10)
Mount Sinai Hosp	112	7	6.25	10.60	6.62	(2.65, 13.64)
Mount Sinai Morningside	99	5	5.05	9.00	6.30	(2.03, 14.70)
NYP – Brooklyn Methodist	36	5	13.89	9.64	16.18	(5.21, 37.76)
NYP – Columbia Presby.	138	11	7.97	9.89	9.05	(4.51, 16.20)
NYP – NY Weill Cornell	69	5	7.25	10.49	7.76	(2.50, 18.11)
NYP – Queens	35	1	2.86	8.10	3.96	(0.05, 22.04)
NYU Langone Health	119	5	4.20	11.40	4.14**	(1.33, 9.66)
NYU Langone – Long Island	76	13	17.11	15.61	12.31	(6.55, 21.05)
North Shore Univ Hosp	260	38	14.62	10.79	15.20	(10.76, 20.87)
Rochester General Hosp	191	28	14.66	11.52	14.29	(9.49, 20.66)
South Shore Univ Hosp	88	14	15.91	9.28	19.26	(10.52, 32.31)
St. Elizabeth Med Ctr	57	2	3.51	13.51	2.92**	(0.33, 10.53)
St. Francis Hosp	196	24	12.24	10.23	13.44	(8.61, 19.99)
St. Joseph's Hosp	285	41	14.39	14.07	11.48	(8.24, 15.58)
St. Peter's Hosp	179	17	9.50	11.68	9.13	(5.32, 14.62)
Staten Island Univ Hosp	78	2	2.56	11.45	2.51**	(0.28, 9.08)
Strong Memorial Hosp	94	13	13.83	10.66	14.57	(7.75, 24.91)
UHS Wilson Med Ctr	55	8	14.55	12.41	13.16	(5.67, 25.93)
Univ Hosp – Stony Brook	68	6	8.82	11.71	8.46	(3.09, 18.41)
Univ Hosp – Upstate	60	9	15.00	11.96	14.08	(6.42, 26.72)
Vassar Bros Med Ctr	54	7	12.96	12.17	11.96	(4.79, 24.64)
Westchester Med Ctr	96	12	12.50	10.37	13.54	(6.99, 23.65)
White Plains Hosp	4	0	0.00	6.69	0.00	(0.00, 100.0)
Statewide Total	3625	407	11.23			

*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 NYS, June – November 2021 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.

Section 9: 2018-2021 Hospital Outcomes for Valve Surgery

Table 3 and **Figure 3** present the combined Valve Only and Valve/CABG surgery results for the 36 hospitals performing these operations in NYS during this reporting period. The table contains, for each hospital, the combined number of Valve Only and Valve/CABG operations resulting in discharges from December 2017 through November 2019 and June – November 2021. 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 13,769 combined Valve Only and Valve/CABG procedures performed at the 36 hospitals was 2.67 percent. The OMRs ranged from 0.00 percent to 12.20 percent. The range of EMRs, which measure patient severity of illness, was 1.70 percent to 4.64 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 14.66 percent. Five hospitals (Albany Medical Center, Arnot Ogden Medical Center in Elmira, Rochester General Hospital, Strong Memorial Hospital in Rochester, and University Hospital-Downstate in Brooklyn) had RAMRs that were significantly higher than the statewide rate. Three hospitals (Mount Sinai Hospital in Manhattan, South Shore University Hospital in Bayshore, and St. Joseph's Hospital in Syracuse) 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.

In this report, valve surgeries are separated into six separate groups and further classified by whether or not CABG was performed at the same time. The six groups are: Aortic Valve Replacement (AVR), Mitral Valve Replacement (MVR), Mitral Valve Repair, Multiple Valve surgery where one of the valve procedures was MVR, Multiple Valve surgery with AVR but not MVR, and Multiple Valve surgery with repair of the Mitral and Tricuspid valves without other valve procedures.

Table 4a presents valve surgery without CABG performed at the 36 cardiac surgery hospitals in NYS during this reporting period. The table contains, for each hospital, the number of valve operations resulting in discharges from December 2017 through November 2019 and June – November 2021. In addition to the hospital volumes, the in-hospital/30-day Statewide Mortality Rate is given for each group. **Table 4b** includes the same information for each of the Valve surgery groups when performed at the same time as CABG. Unless otherwise specified, when the report refers to Valve or Valve/CABG procedures it is referring to the cases included in **Tables 4a** and **4b**.

The in-hospital/30-day OMR of 2.67 percent for Valve and Valve/CABG surgeries in this reporting period is slightly higher than the 2.57 percent observed for 2017-2019. The in-hospital OMR for this reporting period for valve surgeries (not shown in **Table 3**) is 2.27 percent for the 13,769 patients included in this analysis.

Table 5 presents the results for transcatheter aortic valve replacement (TAVR) procedures performed at the 33 hospitals performing TAVR during the reporting period. The table contains, for each hospital, the number of TAVR procedures resulting in discharges from December 2017 through November 2019 and June – November 2021. 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 2018-2021 reporting period. Other hospitals may have begun performing the procedure more recently than the timeframe covered by this report.

As indicated in **Table 5**, the overall in-hospital/30-day mortality rate for the 13,916 TAVR procedures performed at the 33 hospitals was 2.08 percent. The OMRs ranged from 0.00 percent to 6.67 percent. The range of EMRs, which measure patient severity of illness, was 1.20 percent to 2.61 percent.

The RAMRs, which are used to measure performance, ranged from 0.00 percent to 11.52 percent. Two hospitals (Albany Medical Center and Buffalo General Hospital) had RAMRs that were statistically higher than the statewide rate. One hospital (University Hospital at Stony Brook) 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 NYS, 2018-2019 and June – November 2021 Discharges**

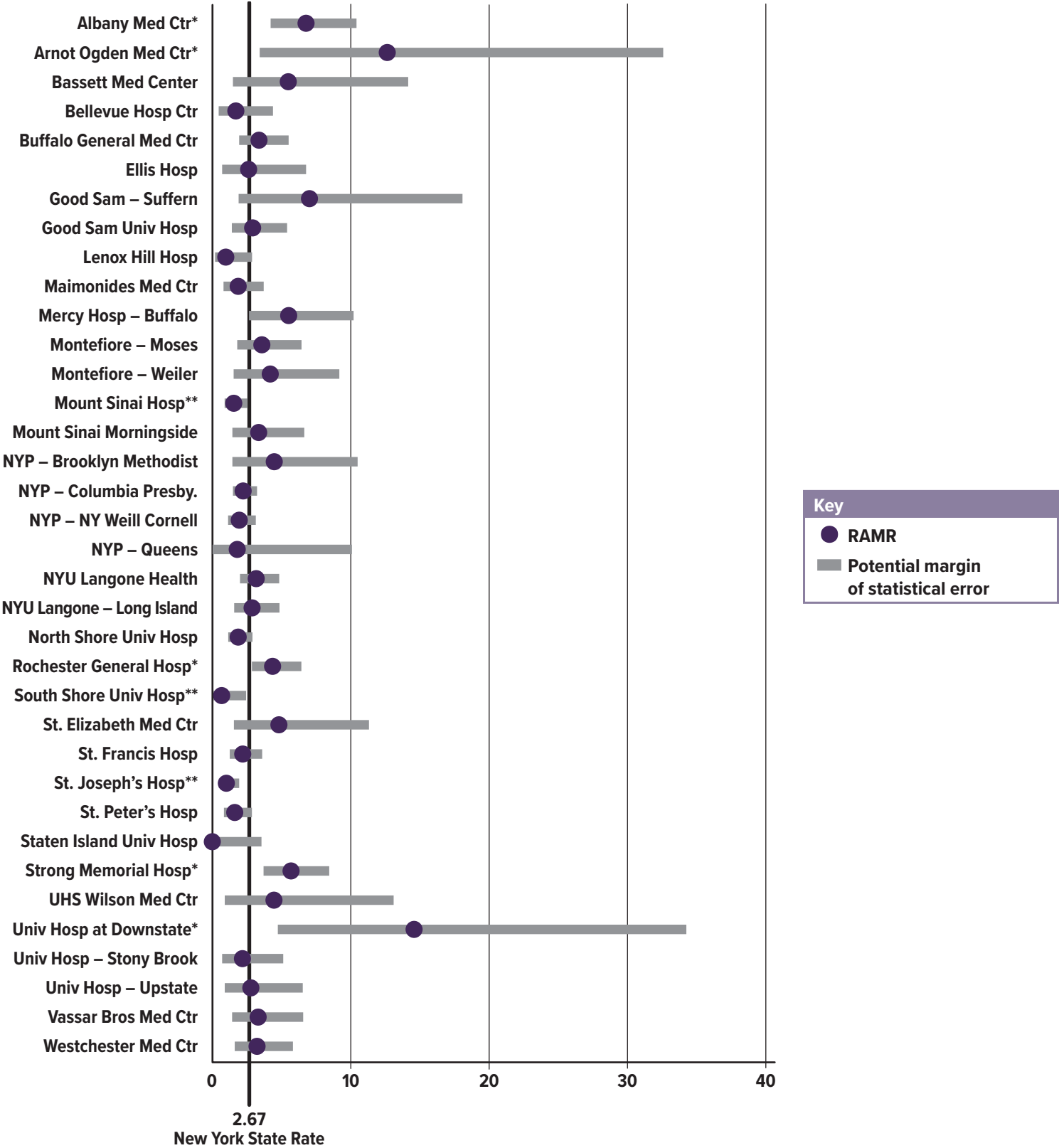
Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med Ctr	368	21	5.71	2.24	6.81*	(4.21, 10.41)
Arnot Ogden Med Ctr	43	4	9.30	1.96	12.71*	(3.42, 32.55)
Bassett Med Ctr	60	4	6.67	3.23	5.52	(1.49, 14.14)
Bellevue Hosp Ctr	205	4	1.95	3.05	1.71	(0.46, 4.38)
Buffalo General Med Ctr	567	16	2.82	2.22	3.39	(1.94, 5.51)
Ellis Hosp	162	4	2.47	2.50	2.64	(0.71, 6.77)
Good Sam – Suffern	53	4	7.55	2.86	7.06	(1.90, 18.06)
Good Sam Univ Hosp	284	10	3.52	3.21	2.93	(1.41, 5.40)
Lenox Hill Hosp	336	3	0.89	2.43	0.98	(0.20, 2.87)
Maimonides Med Ctr	245	8	3.27	4.64	1.88	(0.81, 3.71)
Mercy Hospital – Buffalo	205	10	4.88	2.35	5.55	(2.65, 10.20)
Montefiore – Moses	306	11	3.59	2.67	3.60	(1.80, 6.44)
Montefiore – Weiler	182	6	3.30	2.09	4.21	(1.54, 9.17)
Mount Sinai Hosp	1466	16	1.09	1.88	1.56**	(0.89, 2.53)
Mount Sinai Morningside	265	8	3.02	2.39	3.37	(1.45, 6.64)
NYP – Brooklyn Methodist	96	5	5.21	3.10	4.50	(1.45, 10.49)
NYP – Columbia Presby.	1110	28	2.52	3.01	2.24	(1.49, 3.23)
NYP – NY Weill Cornell	798	17	2.13	2.90	1.96	(1.14, 3.14)
NYP – Queens	64	1	1.56	2.31	1.81	(0.02, 10.08)
NYU Langone Health	1083	22	2.03	1.70	3.19	(2.00, 4.83)
NYU Langone – Long Island	279	14	5.02	4.64	2.89	(1.58, 4.85)
North Shore Univ Hosp	770	20	2.60	3.70	1.88	(1.15, 2.90)
Rochester General Hosp	518	26	5.02	3.06	4.38*	(2.86, 6.42)
South Shore Univ Hosp	315	2	0.63	2.51	0.68**	(0.08, 2.44)
St. Elizabeth Med Ctr	105	5	4.76	2.63	4.84	(1.56, 11.31)
St. Francis Hosp	705	16	2.27	2.74	2.21	(1.26, 3.60)
St. Joseph's Hosp	861	9	1.05	2.73	1.02**	(0.47, 1.94)
St. Peter's Hosp	617	12	1.94	3.18	1.63	(0.84, 2.86)
Staten Island Univ Hosp	142	0	0.00	1.95	0.00	(0.00, 3.55)
Strong Memorial Hosp	599	25	4.17	1.95	5.72*	(3.70, 8.44)
UHS Wilson Med Ctr	89	3	3.37	2.01	4.48	(0.90, 13.09)
Univ Hosp at Downstate	41	5	12.20	2.22	14.66*	(4.73, 34.22)
Univ Hosp – Stony Brook	174	5	2.87	3.50	2.19	(0.71, 5.12)
Univ Hosp – Upstate	174	5	2.87	2.74	2.80	(0.90, 6.53)
Vassar Bros Med Ctr	230	8	3.48	2.79	3.33	(1.43, 6.56)
Westchester Med Ctr	252	11	4.37	3.59	3.25	(1.62, 5.82)
Statewide Total	13,769	368	2.67			

*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 NYS, 2018-2021 Reporting Period 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 4a

Hospital Volume for Valve Surgery without CABG in NYS, 2018-2019 and June – November 2021 Discharges

Hospital	Aortic Valve Replace (AVR) or Repair	Mitral Valve Replace (MVR)	Mitral Valve Repair	Multiple Valve			Total
				Includes MVR	Includes AVR w/o MVR	Mitral and Tricuspid Repair	
Albany Med Ctr	115	34	52	15	6	11	233
Arnot Ogden Med Ctr	24	3	0	0	0	0	27
Bassett Med Ctr	25	1	6	1	1	0	34
Bellevue Hosp Ctr	72	37	19	41	4	0	173
Buffalo General Med Ctr	200	51	84	21	9	5	370
Ellis Hospital	67	16	10	10	1	1	105
Good Sam – Suffern	13	2	7	4	0	0	26
Good Sam Univ Hosp	79	22	26	18	9	5	159
Lenox Hill Hospital	82	48	90	23	14	13	270
Maimonides Med Ctr	44	37	5	61	4	5	156
Mercy Hospital – Buffalo	60	18	12	14	2	1	107
Montefiore – Moses	82	59	34	31	6	5	217
Montefiore – Weiler	56	26	18	13	8	4	125
Mount Sinai Hospital	189	27	200	173	76	591	1256
Mount Sinai Morningside	81	25	24	16	12	12	170
NYP – Brooklyn Methodist	31	14	8	14	2	2	71
NYP – Columbia Presby	374	103	167	131	40	26	841
NYP – NY Weill Cornell	238	72	148	94	32	21	605
NYP – Queens	25	11	3	12	0	0	51
NYU Langone Health	204	137	463	85	41	36	966
NYU Langone – Long Island	58	56	23	32	9	5	183
North Shore Univ Hosp	177	136	80	102	17	20	532
Rochester General Hosp	144	49	65	25	19	9	311
South Shore Univ Hosp	87	38	52	16	6	3	202
St. Elizabeth Med Ctr	36	8	7	8	0	0	59
St. Francis Hosp	217	63	99	62	36	18	495
St. Joseph's Hosp	241	69	187	42	14	22	575
St. Peter's Hosp	179	34	48	29	29	9	328
Staten Island Univ Hosp	46	9	28	5	3	2	93
Strong Memorial Hosp	301	46	117	32	9	5	510
UHS Wilson Med Ctr	44	8	10	2	1	0	65
Univ Hosp at Downstate	15	7	11	0	0	0	33
Univ Hosp – Stony Brook	34	10	28	8	7	9	96
Univ Hosp – Upstate	55	33	20	11	6	4	129
Vassar Bros Med Ctr	57	21	49	16	2	2	147
Westchester Med Ctr	48	26	28	18	5	3	128
Statewide Total	3800	1356	2228	1185	430	849	9848
Statewide Mortality Rate (%)	1.47	3.10	0.90	5.91	3.02	0.71	2.10

Table 4b**Hospital Volume for Valve with CABG Surgeries in NYS, 2018-2019 and June – November 2021 Discharges**

Hospital	Aortic Valve Replace (AVR) w/CABG	Mitral Valve Replace (MVR) w/CABG	Mitral Valve Repair w/CABG	Multiple Valve w/CABG			TOTAL
				Includes MVR	Includes AVR w/o MVR	Mitral and Tricuspid Repair	
Albany Med Ctr	93	18	21	1	1	1	135
Arnot Ogden Med Ctr	11	3	1	1	0	0	16
Bassett Med Ctr	22	1	3	0	0	0	26
Bellevue Hosp Ctr	16	12	2	1	1	0	32
Buffalo General Med Ctr	150	17	23	3	4	0	197
Ellis Hosp	46	5	4	2	0	0	57
Good Sam – Suffern	17	2	6	1	1	0	27
Good Sam Univ Hosp	82	9	19	8	6	1	125
Lenox Hill Hosp	37	8	15	2	3	1	66
Maimonides Med Ctr	40	25	9	14	1	0	89
Mercy Hosp – Buffalo	73	7	11	6	1	0	98
Montefiore – Moses	50	25	5	8	1	0	89
Montefiore – Weiler	32	5	17	1	1	1	57
Mount Sinai Hosp	86	1	26	21	12	64	210
Mount Sinai Morningside	46	9	29	2	6	3	95
NYP – Brooklyn Methodist	11	10	3	0	0	1	25
NYP – Columbia Presby	166	33	31	25	6	8	269
NYP – NY Weill Cornell	110	18	30	17	10	8	193
NYP – Queens	9	3	0	1	0	0	13
NYU Langone Health	62	19	25	5	4	2	117
NYU Langone – Long Island	44	27	17	4	4	0	96
North Shore Univ Hosp	101	54	52	22	5	4	238
Rochester General Hosp	121	20	47	9	6	4	207
South Shore Univ Hosp	66	12	26	5	3	1	113
St. Elizabeth Med Ctr	36	3	2	3	1	1	46
St. Francis Hosp	137	29	23	11	8	2	210
St. Joseph's Hosp	149	32	75	10	15	5	286
St. Peter's Hosp	180	10	53	21	21	4	289
Staten Island Univ Hosp	33	4	11	0	1	0	49
Strong Memorial Hosp	77	6	4	2	0	0	89
UHS Wilson Med Ctr	21	2	0	1	0	0	24
Univ Hosp at Downstate	2	1	5	0	0	0	8
Univ Hosp – Stony Brook	49	4	17	0	7	1	78
Univ Hosp – Upstate	27	9	9	0	0	0	45
Vassar Bros Med Ctr	54	7	16	4	1	1	83
Westchester Med Ctr	81	19	11	8	3	2	124
Statewide Total	2337	469	648	219	133	115	3921
Statewide Mortality Rate (%)	2.82	6.61	3.24	15.07	4.51	3.48	4.11

Table 5
In-Hospital/30-Day Observed, Expected and Risk-Adjusted Mortality Rates for Transcatheter Aortic Valve Replacement (TAVR) in NYS, 2018-2019 and June – November 2021 Discharges

Hospital	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR
Albany Med Ctr	902	35	3.88	2.61	3.08*	(2.15, 4.29)
Bassett Med Ctr	53	0	0.00	1.28	0.00	(0.00,11.23)
Buffalo General Med Ctr	1015	31	3.05	2.00	3.17*	(2.16, 4.50)
Ellis Hosp	159	3	1.89	2.24	1.75	(0.35, 5.10)
Good Sam – Suffern	26	0	0.00	1.42	0.00	(0.00,20.58)
Good Sam Univ Hosp	191	1	0.52	2.46	0.44	(0.01, 2.46)
Lenox Hill Hosp	351	4	1.14	1.87	1.27	(0.34, 3.24)
Maimonides Med Ctr	226	6	2.65	2.28	2.42	(0.88, 5.27)
Mercy Hosp – Buffalo	243	4	1.65	1.62	2.11	(0.57, 5.40)
Montefiore – Moses	24	1	4.17	1.56	5.54	(0.07,30.82)
Montefiore – Weiler	334	4	1.20	1.85	1.34	(0.36, 3.43)
Mount Sinai Hosp	870	22	2.53	2.13	2.46	(1.54, 3.73)
Mount Sinai Morningside	104	1	0.96	2.00	1.00	(0.01, 5.56)
NYP – Brooklyn Methodist	103	2	1.94	2.22	1.82	(0.20, 6.56)
NYP – Columbia Presby.	1157	22	1.90	2.42	1.63	(1.02, 2.47)
NYP – NY Weill Cornell	537	8	1.49	1.80	1.72	(0.74, 3.39)
NYP – Queens	15	1	6.67	1.20	11.52	(0.15,64.08)
NYU Langone Health	1063	13	1.22	1.77	1.43	(0.76, 2.45)
NYU Langone – Long Island	642	24	3.74	2.44	3.19	(2.04, 4.74)
North Shore Univ Hosp	717	16	2.23	2.09	2.22	(1.27, 3.60)
Rochester General Hosp	608	12	1.97	1.92	2.14	(1.10, 3.74)
South Shore Univ Hosp	289	7	2.42	1.95	2.58	(1.04, 5.32)
St. Elizabeth Med Ctr	152	2	1.32	1.77	1.54	(0.17, 5.56)
St. Francis Hosp	1253	20	1.60	2.09	1.58	(0.97, 2.45)
St. Joseph's Hosp	557	12	2.15	2.17	2.06	(1.06, 3.60)
St. Peter's Hosp	300	3	1.00	2.00	1.04	(0.21, 3.04)
Staten Island Univ Hosp	138	0	0.00	2.08	0.00	(0.00, 2.65)
Strong Memorial Hosp	440	12	2.73	1.93	2.94	(1.52, 5.13)
UHS Wilson Med Ctr	285	2	0.70	1.71	0.85	(0.10, 3.08)
Univ Hosp – Stony Brook	453	3	0.66	2.00	0.69**	(0.14, 2.01)
Univ Hosp – Upstate	27	0	0.00	1.29	0.00	(0.00,21.83)
Vassar Bros Med Ctr	349	11	3.15	1.83	3.58	(1.79, 6.41)
Westchester Med Ctr	333	7	2.10	2.13	2.05	(0.82, 4.23)
Statewide Total	13,916	289	2.08			

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

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

Section 10: 2018-2021 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 this reporting period. In addition, the final two columns provide the number of Isolated CABG, Valve and Valve/CABG procedures and the RAMR for these patients in the same time period for each of the 36 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 the reporting period, (b) performed at least one cardiac operation in each of the years, 2018, 2019 and 2021 (June – November). A cardiac operation is defined as any reportable adult cardiac operation and includes procedures other than CABG and Valve surgery, such as TAVR, surgery for congenital conditions, and other cardiac surgery.

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 the reporting period 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 NYS, 2018-2019 and June – November 2021 Discharges

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
Albany Med Ctr								
Akujuo A C	151	3	1.99	1.16	2.60	(0.52, 7.59)	229	4.13
Britton L	84	2	2.38	1.26	2.85	(0.32, 10.29)	165	3.57
Samy S A	141	4	2.84	1.31	3.27	(0.88, 8.37)	236	5.50*
Singh C	142	6	4.23	1.73	3.68	(1.34, 8.01)	204	4.17
All Others	116	5	4.31	1.52	4.28	(1.38, 10.00)	168	5.61*
Total	634	20	3.15	1.40	3.40*	(2.08, 5.26)	1002	4.71*
Arnot Ogden Med Ctr								
All Others	91	1	1.10	0.99	1.67	(0.02, 9.29)	134	5.63
Total	91	1	1.10	0.99	1.67	(0.02, 9.29)	134	5.63
Bassett Med Center								
Daniel S R	64	2	3.13	1.51	3.13	(0.35, 11.30)	78	4.69
Kelley J	109	1	0.92	1.72	0.80	(0.01, 4.48)	153	1.93
All Others	5	0	0.00	0.88	0.00	(0.00, 100.0)	7	0.00
Total	178	3	1.69	1.62	1.57	(0.32, 4.59)	238	2.86
Bellevue Hosp Ctr								
##Hisamoto K	68	0	0.00	0.97	0.00	(0.00, 8.36)	132	0.00
#Kon Z N	2	0	0.00	0.80	0.00	(0.00,100.0)	8	0.00
#Loulmet D F	—	—	—	—	—	(. , .)	1	44.59
#Smith D E	51	0	0.00	1.12	0.00	(0.00, 9.66)	83	0.00
#Swistel D	8	0	0.00	2.40	0.00	(0.00, 28.88)	14	0.00
All Others	148	0	0.00	1.18	0.00	(0.00, 3.18)	244	1.15
Total	277	0	0.00	1.15	0.00	(0.00, 1.74)	482	0.83
Buffalo General Med Ctr								
Aldridge J	108	3	2.78	1.39	3.01	(0.60, 8.79)	142	4.57
Ashraf M	454	4	0.88	1.29	1.03	(0.28, 2.63)	541	1.32
Grosner G	555	5	0.90	1.21	1.13	(0.36, 2.63)	990	1.97
All Others	55	1	1.82	1.94	1.42	(0.02, 7.89)	66	1.50
Total	1172	13	1.11	1.29	1.30	(0.69, 2.22)	1739	2.06

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
Ellis Hosp								
Choumarov K	206	4	1.94	1.63	1.80	(0.48, 4.60)	293	2.04
Reich H	192	2	1.04	1.60	0.98	(0.11, 3.54)	267	1.67
##Sarabu M	5	1	20.00	1.27	23.75	(0.31, 100.0)	5	30.93
All Others	18	0	0.00	1.19	0.00	(0.00, 25.77)	18	0.00
Total	421	7	1.66	1.60	1.57	(0.63, 3.24)	583	2.01
Good Sam – Suffern								
Badami C D	124	2	1.61	1.45	1.68	(0.19, 6.06)	155	2.85
Passik C S	116	1	0.86	1.35	0.97	(0.01, 5.38)	138	2.79
Total	240	3	1.25	1.40	1.35	(0.27, 3.94)	293	2.82
Good Sam Univ Hosp								
Carter T I	164	3	1.83	1.69	1.63	(0.33, 4.77)	268	2.44
Lamendola C	41	2	4.88	1.94	3.80	(0.43, 13.71)	141	3.07
Rovensky M	288	11	3.82	1.84	3.14*	(1.56, 5.61)	368	3.07
Total	493	16	3.25	1.80	2.73*	(1.56, 4.43)	777	2.84
Lenox Hill Hosp								
#Brinster D R	25	1	4.00	1.25	4.85	(0.06, 26.99)	97	1.08
##Manetta F	1	0	0.00	0.52	0.00	(0.00, 100.0)	1	0.00
Patel N C	649	3	0.46	1.46	0.48**	(0.10, 1.40)	844	0.84**
Pirelli L	29	0	0.00	1.33	0.00	(0.00, 14.32)	50	0.00
Scheinerman S J	200	3	1.50	1.33	1.70	(0.34, 4.96)	243	1.53
All Others	13	0	0.00	1.31	0.00	(0.00, 32.58)	18	0.00
Total	917	7	0.76	1.42	0.81	(0.33, 1.67)	1253	0.93**
Maimonides Med Ctr								
Crooke G	57	1	1.75	2.63	1.01	(0.01, 5.60)	93	2.04
Jacobowitz I	245	0	0.00	1.68	0.00**	(0.00, 1.35)	341	0.64**
Ribakove G	65	2	3.08	1.59	2.92	(0.33, 10.55)	105	1.89
Saunders P	58	0	0.00	1.45	0.00	(0.00, 6.59)	69	0.00
Stephens G A	93	2	2.15	2.41	1.35	(0.15, 4.87)	134	1.48
Youdelman B A	59	0	0.00	1.60	0.00	(0.00, 5.86)	80	1.21
Total	577	5	0.87	1.85	0.71	(0.23, 1.65)	822	1.16
Mercy Hosp – Buffalo								
Downing S W	216	1	0.46	1.42	0.49	(0.01, 2.74)	337	1.38
Jain H B	333	5	1.50	1.23	1.84	(0.59, 4.30)	402	4.06*
##Joyce F	1	0	0.00	1.25	0.00	(0.00, 100.0)	1	0.00
##Karavas A N	70	0	0.00	1.24	0.00	(0.00, 6.38)	74	0.00
All Others	174	2	1.15	1.29	1.34	(0.15, 4.84)	185	1.55
Total	794	8	1.01	1.30	1.17	(0.50, 2.31)	999	2.34

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
Montefiore – Moses								
#Chau M L	10	0	0.00	0.78	0.00	(0.00, 70.72)	12	0.00
#Derose J J	53	0	0.00	1.02	0.00	(0.00, 10.26)	76	3.51
#Forest S J	136	2	1.47	1.64	1.35	(0.15, 4.88)	172	1.77
#Goldstein D J	158	3	1.90	1.44	1.99	(0.40, 5.81)	227	2.52
#Jakobleff W A	133	4	3.01	1.37	3.31	(0.89, 8.46)	175	2.63
#Michler R E	75	2	2.67	1.12	3.61	(0.41, 13.04)	184	3.10
Sugiura T	2	0	0.00	0.94	0.00	(0.00, 100.0)	2	0.00
All Others	81	2	2.47	1.54	2.42	(0.27, 8.74)	106	3.81
Total	648	13	2.01	1.40	2.17	(1.15, 3.70)	954	2.74
Montefiore – Weiler								
#Chau M L	30	5	16.67	1.32	19.09*	(6.15, 44.54)	48	13.45*
#Derose J J	246	6	2.44	1.08	3.41	(1.24, 7.42)	408	3.86*
#Forest S J	3	0	0.00	1.69	0.00	(0.00, 100.0)	3	0.00
#Goldstein D J	4	0	0.00	2.13	0.00	(0.00, 64.94)	5	0.00
#Jakobleff W A	6	0	0.00	0.58	0.00	(0.00, 100.0)	7	0.00
All Others	2	0	0.00	1.77	0.00	(0.00, 100.0)	2	0.00
Total	291	11	3.78	1.12	5.10*	(2.54, 9.12)	473	4.73*
Mount Sinai Hosp								
Adams D H	.	.	.	.	.	(. , .)	773	0.00**
Anyanwu A	47	0	0.00	1.86	0.00	(0.00, 6.34)	114	1.63
Boateng P	43	0	0.00	1.16	0.00	(0.00, 11.10)	135	0.00**
El-Eshmawi A M	21	0	0.00	1.24	0.00	(0.00, 21.26)	114	0.88
Filsoufi F	237	3	1.27	1.00	1.91	(0.38, 5.57)	323	1.56
Reddy R C	154	4	2.60	1.44	2.72	(0.73, 6.95)	210	3.82
Stelzer P	7	0	0.00	0.92	0.00	(0.00, 85.72)	120	3.19
Varghese R	152	2	1.32	1.22	1.62	(0.18, 5.86)	239	2.28
All Others	76	3	3.95	1.03	5.79	(1.16, 16.91)	175	2.66
Total	737	12	1.63	1.21	2.03	(1.05, 3.54)	2203	1.51
Mount Sinai Morningside								
Balaram S K	111	0	0.00	1.15	0.00	(0.00, 4.34)	205	0.96
DiLuozzo G	28	0	0.00	1.12	0.00	(0.00, 17.66)	55	7.78
Puskas J D	555	7	1.26	1.04	1.83	(0.73, 3.77)	679	2.29
All Others	46	1	2.17	1.27	2.58	(0.03, 14.36)	66	2.31
Total	740	8	1.08	1.07	1.52	(0.65, 3.00)	1005	2.20

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
NYP – Brooklyn Methodist								
Gambardella I	6	0	0.00	1.24	0.00	(0.00, 74.18)	8	0.00
#Tranbaugh R	132	6	4.55	1.29	5.34*	(1.95, 11.62)	179	6.84*
Worku B M	86	0	0.00	1.07	0.00	(0.00, 6.03)	133	0.00
Total	224	6	2.68	1.20	3.37	(1.23, 7.33)	320	3.82
NYP – Columbia Presby								
Argenziano M	223	1	0.45	1.37	0.49	(0.01, 2.74)	370	1.31
#Bacha E	—	—	—	—	—	(. , .)	6	0.00
Bapat V N	26	0	0.00	1.44	0.00	(0.00, 14.77)	174	1.22
George I	108	0	0.00	1.07	0.00	(0.00, 4.81)	327	1.70
#Naka Y	140	1	0.71	1.27	0.85	(0.01, 4.71)	209	0.98
Smith C	174	3	1.72	1.18	2.22	(0.45, 6.47)	430	1.39
Takayama H	255	7	2.75	1.48	2.81	(1.13, 5.79)	458	2.86
Takeda K	126	2	1.59	2.10	1.14	(0.13, 4.13)	184	1.49
All Others	6	0	0.00	1.39	0.00	(0.00, 66.59)	10	6.96
Total	1058	14	1.32	1.41	1.42	(0.77, 2.38)	2168	1.71
NYP – NY Weill Cornell								
#Bacha E	.	.	.	.	.	(. , .)	1	0.00
Girardi L	158	1	0.63	1.24	0.77	(0.01, 4.28)	557	1.68
Iannacone E M	38	0	0.00	1.91	0.00	(0.00, 7.63)	68	1.08
#Lang S	2	0	0.00	1.24	0.00	(0.00, 100.0)	4	0.00
Lau C	155	3	1.94	2.37	1.23	(0.25, 3.60)	245	1.52
#Naka Y	10	0	0.00	1.09	0.00	(0.00, 50.75)	23	6.20
Salemi A	15	0	0.00	1.52	0.00	(0.00, 24.24)	69	0.00
#Tranbaugh R	1	0	0.00	32.30	0.00	(0.00, 17.15)	2	0.00
All Others	55	0	0.00	1.26	0.00	(0.00, 7.98)	263	0.43
Total	434	4	0.92	1.78	0.78	(0.21, 2.00)	1232	1.34
NYP – Queens								
#Lang S	200	0	0.00	1.41	0.00	(0.00, 1.97)	236	0.00**
All Others	61	0	0.00	0.86	0.00	(0.00, 10.59)	89	1.88
Total	261	0	0.00	1.28	0.00	(0.00, 1.66)	325	0.41

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
NYU Langone Health								
Galloway A	29	1	3.45	1.43	3.65	(0.05, 20.32)	218	2.40
##Hisamoto K	8	1	12.50	0.70	27.10	(0.35, 100.0)	16	10.08
#Kon Z N	1	0	0.00	1.36	0.00	(0.00, 100.0)	1	0.00
#Loulmet D F	33	0	0.00	1.07	0.00	(0.00, 15.74)	435	2.66
Mosca R S	—	—	—	—	—	(. , .)	2	0.00
#Smith D E	50	0	0.00	1.59	0.00	(0.00, 6.98)	74	1.09
#Swistel D	96	2	2.08	1.17	2.69	(0.30, 9.72)	239	3.87
Vaynblat M	85	1	1.18	1.43	1.24	(0.02, 6.93)	145	1.98
Williams M R	4	0	0.00	0.91	0.00	(0.00, 100.0)	160	1.38
Zias E	309	3	0.97	1.19	1.23	(0.25, 3.59)	396	1.43
All Others	—	—	—	—	—	(., .)	12	0.00
Total	615	8	1.30	1.25	1.57	(0.68, 3.10)	1698	2.26
NYU Langone – Long Island								
Abrol S	239	4	1.67	1.88	1.34	(0.36, 3.44)	349	2.20
Kokotos W J	96	4	4.17	2.23	2.83	(0.76, 7.24)	158	2.59
Salhab K F	98	0	0.00	1.58	0.00	(0.00, 3.57)	157	1.08
Schubach S	141	0	0.00	1.49	0.00	(0.00, 2.63)	186	0.00
All Others	22	0	0.00	2.22	0.00	(0.00, 11.33)	25	3.00
Total	596	8	1.34	1.81	1.12	(0.48, 2.21)	875	1.82
North Shore Univ Hosp								
#Brinster D R	3	0	0.00	0.59	0.00	(0.00, 100.0)	6	0.00
Esposito R	105	3	2.86	1.56	2.77	(0.56, 8.10)	149	2.08
#Fernandez H A	46	0	0.00	1.53	0.00	(0.00, 7.88)	61	2.04
Hartman A	159	3	1.89	1.50	1.90	(0.38, 5.56)	373	1.95
##Manetta F	152	1	0.66	1.53	0.65	(0.01, 3.61)	195	0.56
Palazzo R	178	1	0.56	1.40	0.61	(0.01, 3.37)	220	1.00
Taylor J	328	3	0.91	1.60	0.86	(0.17, 2.51)	529	1.36
Vatsia S	157	3	1.91	1.50	1.93	(0.39, 5.63)	241	1.51
Yu P J	79	3	3.80	1.85	3.11	(0.62, 9.07)	113	2.76
All Others	113	1	0.88	1.42	0.94	(0.01, 5.25)	203	1.24
Total	1320	18	1.36	1.53	1.34	(0.80, 2.12)	2090	1.53

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
Rochester General Hosp								
Cheeran D	346	9	2.60	1.89	2.08	(0.95, 3.95)	540	2.70
Kirshner R	470	13	2.77	2.04	2.05	(1.09, 3.50)	711	3.29*
Park S J	101	1	0.99	1.85	0.81	(0.01, 4.49)	146	1.08
Prastein D J	119	5	4.20	1.92	3.30	(1.06, 7.70)	151	4.43
All Others	15	3	20.00	1.72	17.55*	(3.53, 51.29)	21	15.15*
Total	1051	31	2.95	1.95	2.28*	(1.55, 3.24)	1569	3.08*
South Shore Univ Hosp								
#Fernandez H A	124	3	2.42	1.47	2.48	(0.50, 7.24)	213	1.27
Hussain S T	72	1	1.39	2.13	0.98	(0.01, 5.48)	84	1.98
Kalimi R	187	1	0.53	1.44	0.56	(0.01, 3.11)	374	0.29**
##Manetta F	25	0	0.00	1.37	0.00	(0.00, 16.15)	33	4.35
All Others	47	0	0.00	1.17	0.00	(0.00, 10.06)	66	0.00
Total	455	5	1.10	1.53	1.09	(0.35, 2.53)	770	0.93**
St. Elizabeth Med Ctr								
##Joyce F	68	2	2.94	1.11	4.01	(0.45, 14.46)	95	4.01
##Karavas A N	27	0	0.00	1.81	0.00	(0.00, 11.36)	41	0.00
All Others	237	2	0.84	1.67	0.76	(0.09, 2.76)	301	2.12
Total	332	4	1.20	1.56	1.16	(0.31, 2.98)	437	2.23
St. Francis Hosp								
Bercow N	255	3	1.18	1.72	1.03	(0.21, 3.02)	404	2.50
Colangelo R	357	5	1.40	1.41	1.50	(0.48, 3.51)	525	1.05
Dimeo A C	391	3	0.77	1.69	0.68	(0.14, 2.00)	507	1.08
Henry M J	44	1	2.27	3.51	0.98	(0.01, 5.43)	58	2.11
Lundy E F	208	2	0.96	1.71	0.85	(0.10, 3.07)	258	0.83
Robinson N	12	0	0.00	1.47	0.00	(0.00, 31.37)	220	1.40
Total	1267	14	1.10	1.68	0.99	(0.54, 1.67)	1972	1.45
St. Joseph's Hosp								
Lutz C J	308	7	2.27	1.79	1.92	(0.77, 3.95)	611	1.44
#Marvasti M	149	4	2.68	1.90	2.14	(0.57, 5.47)	235	1.46
Nazem A	305	6	1.97	1.87	1.59	(0.58, 3.47)	431	2.11
Zhou Z	458	9	1.97	2.18	1.36	(0.62, 2.58)	792	1.15
All Others	67	0	0.00	2.09	0.00	(0.00, 3.96)	79	0.00
Total	1287	26	2.02	1.98	1.54	(1.01, 2.26)	2148	1.41**

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
St. Peter's Hosp								
Edwards N	128	1	0.78	0.99	1.19	(0.02, 6.62)	266	0.86
##Karavas A N	67	0	0.00	1.15	0.00	(0.00, 7.22)	96	1.09
Polomsky M	141	2	1.42	1.59	1.34	(0.15, 4.85)	203	1.52
Saifi J	257	2	0.78	1.36	0.86	(0.10, 3.12)	482	0.76**
##Sarabu M	35	0	0.00	1.34	0.00	(0.00, 11.83)	40	5.98
Terrien C M	145	0	0.00	1.41	0.00	(0.00, 2.72)	267	0.69
All Others	94	1	1.06	1.50	1.07	(0.01, 5.97)	130	1.99
Total	867	6	0.69	1.35	0.77	(0.28, 1.69)	1484	1.13**
Staten Island Univ Hosp								
Imam M N	135	0	0.00	1.06	0.00	(0.00, 3.85)	255	0.00
Rosell F M	205	1	0.49	1.59	0.46	(0.01, 2.58)	207	0.60
##Shahani R B	18	0	0.00	2.31	0.00	(0.00, 13.30)	18	0.00
All Others	130	1	0.77	1.38	0.84	(0.01, 4.67)	150	0.85
Total	488	2	0.41	1.41	0.44	(0.05, 1.58)	630	0.41**
Strong Memorial Hosp								
Alfieris G	1	0	0.00	0.75	0.00	(0.00, 100.0)	8	0.00
Barrus B B	207	6	2.90	1.04	4.21*	(1.54, 9.17)	231	5.93*
Gosev I	141	2	1.42	1.01	2.13	(0.24, 7.67)	183	2.66
##Hisamoto K	33	1	3.03	1.25	3.66	(0.05, 20.36)	41	3.03
Knight P	81	1	1.23	1.87	1.00	(0.01, 5.54)	569	3.41*
Prasad S M	89	4	4.49	1.75	3.89	(1.05, 9.95)	119	6.39*
All Others	3	0	0.00	0.72	0.00	(0.00, 100.0)	3	0.00
Total	555	14	2.52	1.28	2.98*	(1.63, 5.01)	1154	4.09*
UHS Wilson Med Ctr								
Khan A M	101	1	0.99	1.93	0.77	(0.01, 4.30)	129	2.18
##Shahani R B	10	0	0.00	1.02	0.00	(0.00, 54.15)	14	0.00
Wong K	107	2	1.87	1.24	2.28	(0.26, 8.22)	141	1.91
All Others	72	2	2.78	1.55	2.71	(0.30, 9.78)	95	4.32
Total	290	5	1.72	1.55	1.68	(0.54, 3.92)	379	2.50
Univ Hosp at Downstate								
##Joyce F	9	1	11.11	0.89	18.92	(0.25, 100.0)	10	30.73*
All Others	136	6	4.41	1.87	3.57	(1.30, 7.77)	176	5.78*
Total	145	7	4.83	1.81	4.04*	(1.62, 8.32)	186	6.69*

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Statewide Total	21,321	322	1.51				35,090	1.97
Univ Hosp – Stony Brook								
Bilfinger T	16	0	0.00	0.88	0.00	(0.00, 39.53)	21	0.00
Chikwe J Y	152	0	0.00	1.36	0.00	(0.00, 2.67)	252	0.40
McLarty A	30	1	3.33	1.71	2.95	(0.04, 16.40)	45	4.59
Tannous H J	137	0	0.00	1.03	0.00	(0.00, 3.91)	169	1.58
All Others	101	1	0.99	1.45	1.03	(0.01, 5.72)	123	0.74
Total	436	2	0.46	1.29	0.54	(0.06, 1.94)	610	1.18
Univ Hosp – Upstate								
Green G R	220	2	0.91	1.79	0.77	(0.09, 2.76)	329	1.11
#Marvasti M	29	0	0.00	1.37	0.00	(0.00, 13.90)	51	0.00
All Others	151	7	4.64	2.71	2.58	(1.03, 5.32)	194	3.72
Total	400	9	2.25	2.11	1.61	(0.74, 3.06)	574	2.08
Vassar Bros Med Ctr								
Aharon A S	127	1	0.79	1.08	1.10	(0.01, 6.11)	146	1.18
##Sarabu M	2	0	0.00	0.44	0.00	(0.00, 100.0)	9	0.00
##Shahani R B	56	0	0.00	1.06	0.00	(0.00, 9.34)	93	0.00
Sperling J S	207	4	1.93	1.81	1.61	(0.43, 4.13)	366	2.49
All Others	47	2	4.26	1.16	5.52	(0.62, 19.93)	55	6.22
Total	439	7	1.59	1.43	1.69	(0.68, 3.47)	669	2.32
Westchester Med Ctr								
Goldberg J B	30	0	0.00	1.32	0.00	(0.00, 14.01)	67	2.34
Kai M	97	2	2.06	1.66	1.87	(0.21, 6.76)	118	2.32
Malekan R	186	2	1.08	1.39	1.17	(0.13, 4.23)	255	2.13
Spielvogel D	258	1	0.39	1.52	0.39	(0.01, 2.14)	378	1.29
All Others	15	0	0.00	2.34	0.00	(0.00, 15.78)	20	0.00
Total	586	5	0.85	1.51	0.85	(0.27, 1.99)	838	1.76
White Plains Hosp								
#Michler R E	5	0	0.00	0.90	0.00	(0.00, 100.0)	5	0.00
Total	5	0	0.00	0.90	0.00	(0.00, 100.0)	5	0.00

*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, 2018-2019 and June – November 2021**

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Bacha E						(. , .)	7	0.00
NYP – Columbia Presby	.	.	.	.	.	(. , .)	6	0.00
NYP – NY Weill Cornell	.	.	.	.	.	(. , .)	1	0.00
Brinster D R	28	1	3.57	1.18	4.59	(0.06, 25.53)	103	1.05
Lenox Hill Hosp	25	1	4.00	1.25	4.85	(0.06, 26.99)	97	1.08
North Shore Univ Hosp	3	0	0.00	0.59	0.00	(0.00, 100.0)	6	0.00
Chau M L	40	5	12.50	1.18	15.93*	(5.13, 37.18)	60	11.95*
Montefiore – Moses	10	0	0.00	0.78	0.00	(0.00, 70.72)	12	0.00
Montefiore – Weiler	30	5	16.67	1.32	19.09*	(6.15, 44.54)	48	13.45*
Derosé J J	299	6	2.01	1.07	2.83	(1.03, 6.17)	484	3.81*
Montefiore – Moses	53	0	0.00	1.02	0.00	(0.00, 10.26)	76	3.51
Montefiore – Weiler	246	6	2.44	1.08	3.41	(1.24, 7.42)	408	3.86*
Fernandez H A	170	3	1.76	1.49	1.79	(0.36, 5.23)	274	1.50
North Shore Univ Hosp	46	0	0.00	1.53	0.00	(0.00, 7.88)	61	2.04
South Shore Univ Hosp	124	3	2.42	1.47	2.48	(0.50, 7.24)	213	1.27
Forest S J	139	2	1.44	1.65	1.32	(0.15, 4.77)	175	1.74
Montefiore – Moses	136	2	1.47	1.64	1.35	(0.15, 4.88)	172	1.77
Montefiore – Weiler	3	0	0.00	1.69	0.00	(0.00, 100.0)	3	0.00
Goldstein D J	162	3	1.85	1.46	1.92	(0.39, 5.60)	232	2.46
Montefiore – Moses	158	3	1.90	1.44	1.99	(0.40, 5.81)	227	2.52
Montefiore – Weiler	4	0	0.00	2.13	0.00	(0.00, 64.94)	5	0.00
Hisamoto K	109	2	1.83	1.04	2.67	(0.30, 9.64)	189	1.76
Bellevue Hosp Ctr	68	0	0.00	0.97	0.00	(0.00, 8.36)	132	0.00
NYU Langone Health	8	1	12.50	0.70	27.10	(0.35, 100.0)	16	10.08
Strong Memorial Hosp	33	1	3.03	1.25	3.66	(0.05, 20.36)	41	3.03
Jakobleff W A	139	4	2.88	1.34	3.24	(0.87, 8.31)	182	2.58
Montefiore – Moses	133	4	3.01	1.37	3.31	(0.89, 8.46)	175	2.63
Montefiore – Weiler	6	0	0.00	0.58	0.00	(0.00, 100.0)	7	0.00
Joyce F	78	3	3.85	1.08	5.35	(1.08, 15.64)	106	6.10*
Mercy Hosp – Buffalo	1	0	0.00	1.25	0.00	(0.00, 100.0)	1	0.00
St. Elizabeth Med Ctr	68	2	2.94	1.11	4.01	(0.45, 14.46)	95	4.01
Univ Hosp at Downstate	9	1	11.11	0.89	18.92	(0.25, 100.0)	10	30.73*
Karavas A N	164	0	0.00	1.29	0.00	(0.00, 2.61)	211	0.52
Mercy Hosp – Buffalo	70	0	0.00	1.24	0.00	(0.00, 6.38)	74	0.00
St. Elizabeth Med Ctr	27	0	0.00	1.81	0.00	(0.00, 11.36)	41	0.00
St. Peter's Hospital	67	0	0.00	1.15	0.00	(0.00, 7.22)	96	1.09

	Isolated CABG						Isolated CABG, or Valve or Valve/CABG	
	Cases	Deaths	OMR	EMR	RAMR	95% CI for RAMR	Cases	RAMR
Kon Z N	3	0	0.00	0.99	0.00	(0.00,100.0)	9	0.00
Bellevue Hosp Ctr	2	0	0.00	0.80	0.00	(0.00,100.0)	8	0.00
NYU Langone Health	1	0	0.00	1.36	0.00	(0.00,100.0)	1	0.00
Lang S	202	0	0.00	1.41	0.00	(0.00, 1.95)	240	0.00**
NYP – NY Weill Cornell	2	0	0.00	1.24	0.00	(0.00,100.0)	4	0.00
NYP – Queens	200	0	0.00	1.41	0.00	(0.00, 1.97)	236	0.00**
Loulmet D F	33	0	0.00	1.07	0.00	(0.00,15.74)	436	3.01
Bellevue Hosp Ctr	.	.	.	.	.	(. , .)	1	44.59
NYU Langone Health	33	0	0.00	1.07	0.00	(0.00,15.74)	435	2.66
Manetta F	178	1	0.56	1.50	0.56	(0.01, 3.14)	229	1.00
Lenox Hill Hosp	1	0	0.00	0.52	0.00	(0.00,100.0)	1	0.00
North Shore Univ Hosp	152	1	0.66	1.53	0.65	(0.01, 3.61)	195	0.56
South Shore Univ Hosp	25	0	0.00	1.37	0.00	(0.00,16.15)	33	4.35
Marvasti M	178	4	2.25	1.81	1.87	(0.50, 4.79)	286	1.26
St. Joseph's Hospital	149	4	2.68	1.90	2.14	(0.57, 5.47)	235	1.46
Univ Hosp – Upstate	29	0	0.00	1.37	0.00	(0.00,13.90)	51	0.00
Michler R E	80	2	2.50	1.10	3.43	(0.38,12.37)	189	3.05
Montefiore – Moses	75	2	2.67	1.12	3.61	(0.41,13.04)	184	3.10
White Plains Hosp	5	0	0.00	0.90	0.00	(0.00,100.0)	5	0.00
Naka Y	150	1	0.67	1.26	0.80	(0.01, 4.44)	232	1.70
NYP – Columbia Presby	140	1	0.71	1.27	0.85	(0.01, 4.71)	209	0.98
NYP – NY Weill Cornell	10	0	0.00	1.09	0.00	(0.00,50.75)	23	6.20
Sarabu M	42	1	2.38	1.29	2.79	(0.04,15.54)	54	6.79
Ellis Hosp	5	1	20.00	1.27	23.75	(0.31,100.0)	5	30.93
St. Peter's Hosp	35	0	0.00	1.34	0.00	(0.00,11.83)	40	5.98
Vassar Bros Med Ctr	2	0	0.00	0.44	0.00	(0.00,100.0)	9	0.00
Shahani R B	84	0	0.00	1.32	0.00	(0.00, 4.98)	125	0.00
Staten Island Univ Hosp	18	0	0.00	2.31	0.00	(0.00,13.30)	18	0.00
UHS Wilson Med Ctr	10	0	0.00	1.02	0.00	(0.00,54.15)	14	0.00
Vassar Bros Med Ctr	56	0	0.00	1.06	0.00	(0.00, 9.34)	93	0.00
Smith D E	101	0	0.00	1.35	0.00	(0.00, 4.05)	157	0.58
Bellevue Hospital Ctr	51	0	0.00	1.12	0.00	(0.00, 9.66)	83	0.00
NYU Langone Health	50	0	0.00	1.59	0.00	(0.00, 6.98)	74	1.09
Swistel D	104	2	1.92	1.26	2.30	(0.26, 8.30)	253	3.59
Bellevue Hosp Ctr	8	0	0.00	2.40	0.00	(0.00,28.88)	14	0.00
NYU Langone Health	96	2	2.08	1.17	2.69	(0.30, 9.72)	239	3.87
Tranbaugh R	133	6	4.51	1.52	4.49*	(1.64, 9.76)	181	6.11*
NYP – Brooklyn Methodist	132	6	4.55	1.29	5.34*	(1.95,11.62)	179	6.84*
NYP – NY Weill Cornell	1	0	0.00	32.30	0.00	(0.00,17.15)	2	0.00

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

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

Section 11: Surgeon and Hospital Volumes for Total Adult Cardiac Surgery

Table 8 presents, for each hospital and for each surgeon performing at least 200 cardiac operations in any hospital in the reporting period and/or performing one or more cardiac operations in each of the years 2018, 2019, 2021 (June – November), 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 twelve Valve and Valve/CABG groups that were identified in **Tables 4a** and **4b**. 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: TAVR, repairs of congenital conditions, heart transplants, aneurysm repairs, ventricular reconstruction and ventricular assist device (VAD) insertions and some rare multiple valve surgeries that were not accounted for by one of the 12 valve groups. 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, 2018-2019 and June – November 2021

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Albany Med Ctr				
Akujoo A C	151	78	193	422
Britton L	84	81	20	185
Samy S A	141	95	116	352
Singh C	142	62	595	799
All Others	116	52	183	351
Total	634	368	1107	2109
Arnot Ogden Med Ctr				
All Others	91	43	16	150
Total	91	43	16	150
Bassett Med Center				
Daniel S R	64	14	9	87
Kelley J	109	44	78	231
All Others	5	2	0	7
Total	178	60	87	325
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Bellevue Hosp Ctr				
Hisamoto K	68	64	34	166
Kon Z N	2	6	5	13
Loulmet D F	0	1	0	1
Smith D E	51	32	20	103
Swistel D	8	6	3	17
All Others	148	96	52	296
Total	277	205	114	596
Buffalo General Med Ctr				
Aldridge J	108	34	583	725
Ashraf M	454	87	389	930
Grosner G	555	435	138	1128
All Others	55	11	58	124
Total	1172	567	1168	2907
Ellis Hosp				
Choumarov K	206	87	85	378
Reich H	192	75	80	347
Sarabu M	5	0	7	12
All Others	18	0	24	42
Total	421	162	196	779
Good Sam – Suffern				
Badami C D	124	31	32	187
Passik C S	116	22	4	142
Total	240	53	36	329
Good Sam Univ Hosp				
Carter T I	164	104	92	360
Lamendola C	41	100	161	302
Rovensky M	288	80	16	384
Total	493	284	269	1046
Lenox Hill Hosp				
Brinster D R	25	72	278	375
Manetta F	1	0	0	1
Patel N C	649	195	31	875
Pirelli L	29	21	322	372
Scheinerman S J	200	43	27	270
All Others	13	5	30	48
Total	917	336	688	1941
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Long Island Jewish MC				
All Others	0	0	30	30
Total	0	0	30	30
Maimonides Med Ctr				
Crooke G	57	36	189	282
Jacobowitz I	245	96	87	428
Ribakove G	65	40	8	113
Saunders P	58	11	111	180
Stephens G A	93	41	10	144
Youdelman B A	59	21	85	165
Total	577	245	490	1312
Mercy Hosp – Buffalo				
Downing S W	216	121	166	503
Jain H B	333	69	127	529
Joyce F	1	0	2	3
Karavas A N	70	4	5	79
All Others	174	11	5	190
Total	794	205	305	1304
Montefiore – Moses				
Chau M L	10	2	24	36
Derosé J J	53	23	29	105
Forest S J	136	36	34	206
Goldstein D J	158	69	62	289
Jakobleff W A	133	42	16	191
Michler R E	75	109	14	198
Sugiura T	2	0	4	6
All Others	81	25	91	197
Total	648	306	274	1228
Montefiore – Weiler				
Chau M L	30	18	305	353
Derosé J J	246	162	83	491
Forest S J	3	0	2	5
Goldstein D J	4	1	1	6
Jakobleff W A	6	1	0	7
All Others	2	0	30	32
Total	291	182	421	894
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Mount Sinai Hosp				
Adams D H	0	773	60	833
Anyanwu A	47	67	160	274
Boateng P	43	92	45	180
El-Eshmawi A M	21	93	25	139
Filsoufi F	237	86	96	419
Reddy R C	154	56	66	276
Stelzer P	7	113	200	320
Varghese R	152	87	30	269
All Others	76	99	948	1123
Total	737	1466	1630	3833
Mount Sinai Morningside				
Balaram S K	111	94	60	265
DiLuzzo G	28	27	121	176
Puskas J D	555	124	51	730
All Others	46	20	22	88
Total	740	265	254	1259
NYP – Brooklyn Methodist				
Gambardella I	6	2	8	16
Tranbaugh R	132	47	18	197
Worku B M	86	47	124	257
Total	224	96	150	470
NYP – Columbia Presby				
Argenziano M	223	147	35	405
Bacha E	0	6	102	108
Bapat V N	26	148	349	523
George I	108	219	933	1260
Naka Y	140	69	126	335
Smith C	174	256	53	483
Takayama H	255	203	325	783
Takeda K	126	58	145	329
All Others	6	4	308	318
Total	1058	1110	2376	4544
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
NYP – NY Weill Cornell				
Bacha E	0	1	27	28
Girardi L	158	399	582	1139
Iannacone E M	38	30	105	173
Lang S	2	2	0	4
Lau C	155	90	92	337
Naka Y	10	13	4	27
Salemi A	15	54	386	455
Tranbaugh R	1	1	0	2
All Others	55	208	191	454
Total	434	798	1387	2619
NYP – Queens				
Lang S	200	36	8	244
All Others	61	28	30	119
Total	261	64	38	363
NYU Langone Health				
Galloway A	29	189	62	280
Hisamoto K	8	8	29	45
Kon Z N	1	0	71	72
Loulmet D F	33	402	54	489
Mosca R S	0	2	31	33
Smith D E	50	24	35	109
Swistel D	96	143	16	255
Vaynblat M	85	60	25	170
Williams M R	4	156	1125	1285
Zias E	309	87	39	435
All Others	0	12	115	127
Total	615	1083	1602	3300
NYU Langone-Long Island				
Abrol S	239	110	60	409
Kokotos W J	96	62	46	204
Salhab K F	98	59	653	810
Schubach S	141	45	23	209
All Others	22	3	2	27
Total	596	279	784	1659
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
North Shore Univ Hosp				
Brinster D R	3	3	46	52
Esposito R	105	44	342	491
Fernandez H A	46	15	33	94
Hartman A	159	214	77	450
Manetta F	152	43	88	283
Palazzo R	178	42	161	381
Taylor J	328	201	77	606
Vatsia S	157	84	95	336
Yu P J	79	34	125	238
All Others	113	90	73	276
Total	1320	770	1117	3207
Rochester General Hosp				
Cheeran D	346	194	305	845
Kirshner R	470	241	91	802
Park S J	101	45	59	205
Prastein D J	119	32	341	492
All Others	15	6	85	106
Total	1051	518	881	2450
South Shore Univ Hosp				
Fernandez H A	124	89	76	289
Hussain S T	72	12	40	124
Kalimi R	187	187	218	592
Manetta F	25	8	29	62
All Others	47	19	43	109
Total	455	315	406	1176
St. Elizabeth Med Ctr				
Joyce F	68	27	73	168
Karavas A N	27	14	20	61
All Others	237	64	94	395
Total	332	105	187	624
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
St. Francis Hosp				
Bercow N	255	149	120	524
Colangelo R	357	168	21	546
Dimeo A C	391	116	64	571
Henry M J	44	14	448	506
Lundy E F	208	50	49	307
Robinson N	12	208	762	982
All Others	0	0	1	1
Total	1267	705	1465	3437
St. Joseph's Hosp				
Lutz C J	308	303	156	767
Marvasti M	149	86	180	415
Nazem A	305	126	190	621
Zhou Z	458	334	188	980
All Others	67	12	86	165
Total	1287	861	800	2948
St. Peter's Hosp				
Edwards N	128	138	40	306
Karavas A N	67	29	10	106
Polomsky M	141	62	43	246
Saifi J	257	225	151	633
Sarabu M	35	5	3	43
Terrien C M	145	122	87	354
All Others	94	36	96	226
Total	867	617	430	1914
Staten Island Univ Hosp				
Imam M N	135	120	114	369
Rosell F M	205	2	30	237
Shahani R B	18	0	21	39
All Others	130	20	49	199
Total	488	142	214	844
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Strong Memorial Hosp				
Alfieris G	1	7	28	36
Barrus B B	207	24	71	302
Gosev I	141	42	144	327
Hisamoto K	33	8	61	102
Knight P	81	488	310	879
Prasad S M	89	30	279	398
All Others	3	0	18	21
Total	555	599	911	2065
UHS Wilson Med Ctr				
Khan A M	101	28	39	168
Shahani R B	10	4	51	65
Wong K	107	34	120	261
All Others	72	23	102	197
Total	290	89	312	691
Univ Hosp at Downstate				
Joyce F	9	1	1	11
All Others	136	40	9	185
Total	145	41	10	196
Univ Hosp – Stony Brook				
Bilfinger T	16	5	183	204
Chikwe J Y	152	100	29	281
McLarty A	30	15	68	113
Tannous H J	137	32	246	415
All Others	101	22	59	182
Total	436	174	585	1195
Univ Hosp – Upstate				
Green G R	220	109	125	454
Marvasti M	29	22	29	80
All Others	151	43	31	225
Total	400	174	185	759
Vassar Bros Med Ctr				
Aharon A S	127	19	162	308
Sarabu M	2	7	2	11
Shahani R B	56	37	135	228
Sperling J S	207	159	131	497
All Others	47	8	37	92
Total	439	230	467	1136
Statewide Total	21,321	13,769	22,147	57,237

	Isolated CABG	Valve or Valve/CABG	Other Cardiac Surgery	Total Cardiac Surgery
Statewide Total	21,321	13,769	22,147	57,237
Westchester Med Ctr				
Goldberg J B	30	37	359	426
Kai M	97	21	56	174
Malekan R	186	69	110	365
Spielvogel D	258	120	192	570
All Others	15	5	38	58
Total	586	252	755	1593
White Plains Hosp				
Michler R E	5	0	0	5
Total	5	0	0	5
Statewide Total	21,321	13,769	22,147	57,237

Section 12: Criteria Used in Reporting Significant Risk Factors (2021)

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: $BSA (m^2) = 0.0003207 \times H^{0.3} \times W^{(0.7285 - (0.0188 \times \text{LOG}))}$ 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. The formula for BMI is: $BMI = \text{Weight}/\text{Height}^2$ 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 less than 90 mmHg and/or cardiac index less than 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., intra-aortic balloon pump, extracorporeal circulation, VAD) to maintain blood pressure and cardiac index above those specified levels.
Refractory Cardiogenic Shock	Refractory Cardiogenic Shock is defined as an episode of systolic blood pressure less than 80 mmHg and/or cardiac index less than 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., intra-aortic balloon pump, extracorporeal circulation, VAD). Records with this risk factor were excluded from all analyses in this report.
Comorbidities	
Active 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.

Patient Risk Factor	Definitions
Cerebrovascular Disease	The patient has cerebrovascular disease, documented by any one of the following: • Stroke – an acute episode of focal or global neurological dysfunction caused by brain, spinal cord, or retinal vascular injury as a result of hemorrhage or infarction, where the neurological dysfunction lasts for greater than 24 hours. • Transient Ischemic Attack (TIA) – a transient episode of focal neurological dysfunction caused by brain, spinal cord, or retinal ischemia, without acute infarction, where the neurological dysfunction resolves within 24 hours. • Non-invasive or invasive arterial imaging test demonstrating greater than or equal to 80% stenosis of any of the major extracranial or intracranial vessels to the brain. • Previous cervical or cerebral artery surgery or percutaneous intervention.
Chronic Lung Disease	The patient has chronic lung disease with pre-operative findings of one of the following: • Mild – FEV₁ 60% to 75% of predicted, and/or on chronic inhaled or oral bronchodilator therapy. • Moderate – FEV₁ 50% to 59% of predicted, and/or on chronic steroid therapy aimed at lung disease. • Severe – FEV₁ less than 50% predicted, and/or Room Air partial pressure of oxygen less than 60 or Room Air partial pressure of carbon dioxide greater than 50.
Diabetes	The patient has a history of diabetes diagnosed and/or treated by a physician. • Insulin Treatment – Diabetes control method as presented on admission was Insulin. • Other Subcutaneous Medication – the patient's diabetes control method (long-term management) as presented on admission was other subcutaneous medication (e.g. GLP-1 agonists) - not insulin.
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 greater than 2 mg/dL and a serum albumin less than 3.5 g/dL.
Malignant Ventricular Arrhythmia	Recent (within the past 14 days) sustained ventricular tachycardia requiring electrical defibrillation or conversion with intravenous anti-arrhythmic agents or ventricular fibrillation requiring electrical defibrillation. Excludes V-Tach or V-Fib occurring within 6 hours of the diagnosis of a myocardial infarction and responding well to treatment.

Patient Risk Factor	Definitions
Comorbidities (continued)	
Peripheral Arterial 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 less than 0.9 is also acceptable documentation.
Renal Function, eGFR	Renal function is measured in this report using the estimated Glomerular Filtration Rate (eGFR). The equation used to calculate the eGFR, as recommended by the National Kidney Foundation is: $\text{eGFR} = 142 \times \min(\text{standardized Scr/K}, 1)^{\alpha} \times \max(\text{standardized Scr/K}, 1)^{\alpha} \times 0.9938^{\text{Age}} \times 1.012 [\text{if female}]$ Where: eGFR (estimated glomerular filtration rate) = mL/min/ 1.73 m² Scr (serum creatinine) = mg/dL K = 0.7 (females) or 0.9 (males) α = -0.241 (females) or -0.302 (males) min = indicates the minimum of Scr/K or 1 max = indicates the maximum of Scr/K or 1 Age = age in years 1.012 [if female] = a correction factor if the patient is female
Renal Failure Requiring Dialysis	The patient is currently (prior to surgery) undergoing dialysis on a routine basis.
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	Most recent myocardial infarction (MI, aka Heart Attack) occurred in the specified time period prior to surgery.
ST Elevation	EKG evidence of ST-segment Elevation Myocardial Infarction (STEMI) and cardiac biomarkers exceeding the upper limit of normal.

Patient Risk Factor	Definitions
Previous Procedures	
Immediate Surgery after Catheter-Based Procedure	The patient required immediate surgery after a catheter-based procedure. This includes immediate surgery required due to diagnostic catheterization findings or a complication of a diagnostic catheterization, PCI, electrophysiology procedure, catheter-based valve intervention, left atrial appendage occlusion device procedure, or other catheter-based procedure.
Previous CABG Surgery	Prior to this cardiac surgery, the patient has undergone CABG surgery.
Previous Cardiac Surgery or Valvular Intervention	Prior to this cardiac surgery, the patient has undergone CABG, valve surgery or intervention, or other cardiac surgery.
Previous PCI	Prior to this cardiac surgery, the patient has undergone PCI.
Previous Valve Surgery or Intervention	Prior to this cardiac surgery, the patient has undergone surgery or catheter based intervention for valve repair or replacement.
Valve Disease	
Mitral Valve Stenosis	The patient has mitral valve stenosis as demonstrated by appropriate imaging technique, echocardiography, or hemodynamic measurement during cardiac catheterization or operation.
Tricuspid Valve Incompetence	The patient has tricuspid valve incompetence (also called regurgitation) as demonstrated by physical examination or by pre-op or intraoperative echocardiography.
Tricuspid Valve Stenosis	The patient has tricuspid valve stenosis as demonstrated by appropriate imaging technique, echocardiography, or hemodynamic measurement during cardiac catheterization or operation.
Vessels Diseased	
Left Main Disease	The patient has at least a 50 percent blockage in the Left Main Coronary Artery.

Section 13: Medical Terminology

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

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

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

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

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

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 Mortality in NYS in 2021 (June – November Discharges)

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 2021 (June – November Discharges) are presented in **Appendix Table 1**.

The odds ratio is a way to understand the relationship between specific risk factors and in-hospital/30-day death. It tells us how many times higher the odds of in-hospital/30-day death is for a patient with that risk factor than for one that does not have that risk factor but otherwise has the same risk factors in the model. For example, the odds of in-hospital/30-day death for a patient with non-refractory shock is nearly 6 times higher than for a patient without non-refractory shock, if all of their other significant risks are the same (odds ratio = 5.951).

In this model, Renal Function is defined as Dialysis or eGFR less than 15 mL/min/1.73m² and is also interpreted in this way. The patient either has the risk factor or does not have the risk factor.

In this model, age is represented by both a linear and a quadratic (squared) term. This represents the fact that as patients age, their risk of in-hospital/30-day mortality increases at an increasing rate. 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. Therefore these odds ratios are not contained in the table.

Ejection Fraction, which is the percentage of blood in the heart's left ventricle that is expelled when it contracts, is subdivided into three ranges (40% or greater, 30 to 39% and less than 30%). The first 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 40 percent or more. Thus, the odds of in-hospital/30-day death for a patient with an ejection fraction less than 30 percent is 3.203 times higher than for a patient whose ejection fraction is greater than 40 percent, if all of their other risks are the same.

Previous MI is subdivided into three ranges based on the timing and characteristics of the most recent MI the patient has experienced: No MI within 24 hours of surgery, MI without ST Elevation less than 24 hours before the surgery, and MI with ST Elevation less than 24 hours before surgery. The first group is referred to as the reference category. The odds ratio for the other Previous MI groups are relative to patients who have not had an MI within 24 hours prior to surgery.

Chronic Lung Disease is divided into two categories: None or Mild and Moderate or Severe. The odds ratio of 2.735 for patients with Moderate or Severe Chronic Lung Disease is relative to patients with no Chronic Lung Disease or only mild Chronic Lung Disease.

Appendix Table 1

Multivariable Risk Factor Equation for CABG In-Hospital/30-Day Mortality in NYS in 2021 (June – November Discharges)

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Demographic				
Age in Years	—	-0.2591	0.0110	—
Age in Years, squared	—	0.0022	0.0052	—
Hemodynamic State				
Non-refractory Shock	0.41	1.7836	0.0164	5.951
Ventricular Function				
Ejection Fraction				
Ejection Fraction 40% or greater	85.31	—Reference—		1.000
Ejection Fraction 30-39%	9.40	0.7923	0.0376	2.208
Ejection Fraction less than 30%	5.28	1.1641	0.0046	3.203
Pre-Procedural MI				
No MI within 24 Hours	97.69	—Reference—		1.000
MI without ST Elevation within 24 Hours	0.73	1.6486	0.0426	5.200
MI with ST Elevation within 24 Hours	1.58	1.8650	0.0003	6.456
Comorbidities				
Chronic Lung Disease				
None or Mild	95.10	—Reference—		1.000
Moderate or Severe	4.90	1.0060	0.0278	2.735
Renal Function				
Dialysis or eGFR less than 15 mL/min/1.73m ²	4.07	1.6004	0.0001	4.955

Intercept = 2.4503

C-Statistic = 0.781

Appendix 2

Risk Factors for CABG 30-Day Readmissions in NYS in 2021 (June – November Discharges)

The significant pre-procedural risk factors for 30-day readmissions following CABG in 2021 (June – November Discharges) are presented in **Appendix Table 2**. The interpretation of Age in Years and Age in Years, squared is the same as presented in **Appendix 1**. Cerebrovascular Disease: Prior Stroke or Cerebrovascular Procedure, Diabetes with Insulin Treatment or Subcutaneous Medication and Previous PCI are interpreted in the same way as Non-refractory Shock in **Appendix 1**. The patient either has the risk factor or does not.

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. There are three categories of BMI in this model: less than 35 kg/m², 35 to less than 40 kg/m², and 40 kg/m² or greater. In this model, the reference category is less than 35 kg/m², with the odds ratios for the other categories reflecting an increased risk of in-hospital/30-day death relative to patients who are the same with respect to all other significant risk factors but have a BMI less than 35 kg/m².

The interpretation of Chronic Lung Disease is similar to **Appendix 1** except in this model there are four separate levels of Chronic Lung Disease.

In this model, Renal Function is divided into four categories, three for patients who are not on dialysis with various eGFR results and one for patients who are either on Dialysis or are not on Dialysis but have eGFR less than 30 mL/min/1.73m².

Appendix Table 2

Multivariable Risk Factor Equation for CABG In-Hospital/30-Day Readmissions in NYS in 2021 (June – November Discharges)

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Demographic				
Age in Years	—	-0.1090	0.0223	—
Age in Years, squared	—	0.0009	0.0162	—
Body Mass Index (BMI)				
BMI less than 35 kg/m ²	84.49	—Reference—		1.000
BMI 35 to less than 40 kg/m ²	10.43	0.3505	0.0327	1.420
BMI 40 kg/m ² or greater	5.08	0.9113	<.0001	2.488
Comorbidities				
Cerebrovascular Disease: Prior Stroke or Cerebrovascular Procedure	10.18	0.4715	0.0021	1.602
Chronic Lung Disease				
None	87.64	—Reference—		1.000
Mild	7.37	0.5466	0.0020	1.727
Moderate	2.23	0.7561	0.0090	2.130
Severe	2.76	1.3385	<.0001	3.813
Diabetes Treated with Insulin or Subcutaneous Medication	20.69	0.2761	0.0310	1.318
Renal Function				
No Dialysis				
eGFR 75 mL/min/1.73m ² or greater	58.18	—Reference—		1.000
eGFR 45 to less than 75 mL/min/1.73m ²	30.95	0.3975	0.0014	1.488
eGFR 30 to less than 45 mL/min/1.73m ²	5.21	0.5405	0.0145	1.717
Dialysis or eGFR less than 30 mL/min/1.73m ²	5.66	0.8627	<.0001	2.369
Previous Cardiac Procedures				
Previous PCI	26.54	0.4346	0.0002	1.544

Intercept = 0.4573

C-Statistic = 0.672

Appendix 3

Risk Factors For Valve Surgery In-Hospital/30-Day Mortality in NYS in Reporting Period

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve surgery in the reporting period are presented in **Appendix Table 3**.

The odds ratio for type of valve surgery roughly represents the odds of in-hospital/30-day mortality for a patient with a specific valve surgery compared to a patient with all of the same significant risk factors who has aortic valve replacement. For example, odds of in-hospital/30-day mortality for a patient who has multiple valve surgery that includes a mitral valve replacement are roughly 2.521 times higher than those of a patient with aortic valve replacement surgery, all other significant risk factors being the same.

For age, the odds ratio roughly represents the number of times more likely to die a patient who is older than 65 is compared to a patient who is one year younger but otherwise has the same significant risk factors. Thus, the odds of in-hospital/30-day death for a 66 year-old patient is approximately 1.091 times that of a 65 year-old, if all other risk factors are the same. All patients age 65 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.

In this model, there are three categories for Diabetes: No Diabetes, Diabetes not treated with Insulin, and Diabetes treated with Insulin. Patients without Diabetes are the reference group.

The interpretation of renal function in this model is similar to that provided in **Appendix 2** except in this case there are two categories for patients who are not on Dialysis and one category limited only to patients with dialysis. The reference category for this model is patients not on Dialysis with an eGFR of 45 mL/min/1.73m² or greater.

Non-refractory Shock, Previous MI within 20 days, Active Endocarditis, Chronic Lung Disease-Severe, Hepatic Failure, Previous CABG, and Previous Valve Surgery or Intervention are interpreted in the same manner as Non-refractory Shock in **Appendix 1**.

Appendix Table 3

Multivariable Risk Factor Equation for Valve Surgery In-Hospital/30-Day Mortality in NYS, 2018-2019 and June – November 2021

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Type of Valve Surgery				
Aortic Valve Replacement (AVR)	38.59	—Reference—		1.000
Mitral Valve Replacement (MVR)	13.77	0.2265	0.3053	1.254
Mitral Valve Repair	22.62	-0.2590	0.3371	0.772
Multiple Valve Surgery				
with MVR	12.03	0.9247	<.0001	2.521
with AVR but no MVR	4.37	0.4285	0.1857	1.535
Demographic				
Age: Number of Years greater than 65	—	0.0874	<.0001	1.091
Body Surface Area, 0.1m ²	—	-0.4325	0.0255	—
Body Surface Area, squared, 0.01m ⁴	—	0.0097	0.0371	—
Hemodynamic State				
Non-refractory Shock	0.68	1.3927	0.0003	4.026
Ventricular Function				
Previous MI within 20 Days	1.22	1.0273	0.0048	2.793
Comorbidities				
Active Endocarditis	7.53	0.5870	0.0036	1.799
Chronic Lung Disease, Severe	2.63	1.0570	<.0001	2.878
Diabetes				
No Diabetes	80.06	—Reference—		1.000
Diabetes Not Treated with Insulin	14.76	0.4160	0.0262	1.516
Diabetes Treated with Insulin	5.18	0.6562	0.0079	1.927
Hepatic Failure	0.15	2.4208	0.0001	11.254
Renal Function				
No Dialysis				
eGFR 45 mL/min/1.73m ² or greater	90.93	—Reference—		1.000
eGFR less than 45 mL/min/1.73m ²	6.69	0.7591	0.0001	2.136
Renal Dialysis	2.38	1.7591	<.0001	5.807
Previous Cardiac Procedures				
Previous CABG	3.07	0.5839	0.0307	1.793
Previous Valve Surgery or Intervention	14.12	0.3639	0.0397	1.439

Intercept = -0.2527

C-Statistic = 0.804

Appendix 4

Risk Factors for Valve and CABG Surgery In-Hospital/30-Day Mortality in NYS in Reporting Period

The significant pre-procedural risk factors for in-hospital/30-day mortality following valve and CABG surgery in the reporting period are presented in **Appendix Table 4**.

The odds ratio for Type of Valve with CABG surgery are interpreted in the same way as Type of Valve Surgery in **Appendix 3**, except in this case all patients have a CABG surgery as well as a Valve surgery.

The interpretation of Left Main Disease is like that of Non-refractory Shock in **Appendix 1**, the patient either has the risk factor or does not have the risk factor.

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 Mortality in NYS, 2018-2019 and June – November 2021

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Type of Valve Surgery with CABG				
Aortic Valve Repair or Replacement (AVR)	59.60	—Reference—		1.000
Mitral Valve Replacement (MVR)	11.96	0.5519	0.0199	1.737
Mitral Valve Repair	16.53	-0.0620	0.8159	0.940
Multiple Valve Surgery				
with MVR	5.59	1.5072	<.0001	4.514
with AVR but no MVR	3.39	0.2448	0.5886	1.277
Mitral and Tricuspid Valve Repairs	2.93	-0.0771	0.8878	0.926
Demographic				
Age: Number of Years greater than 70	—	0.0464	0.0062	1.047
Ventricular Function				
Ejection Fraction				
Ejection Fraction 40% or greater	81.87	—Reference—		1.000
Ejection Fraction 20-39%	16.86	0.5979	0.0021	1.818
Ejection Fraction less than 20%	1.28	1.9270	<.0001	6.869
Previous MI within 14 Days	15.51	0.6855	0.0005	1.985
Comorbidities				
Cerebrovascular Procedure	4.36	0.7922	0.0081	2.208
Chronic Lung Disease, Severe	4.00	0.7690	0.0085	2.158
Renal Function				
No Dialysis				
eGFR 45 mL/min/1.73m ² or greater	85.26	—Reference—		1.000
eGFR less than 45 mL/min/1.73m ²	10.41	0.6659	0.0032	1.946
Renal Dialysis	4.34	1.4896	<.0001	4.435
Vessels Diseased				
Left Main Disease	20.84	0.4238	0.0280	1.528
Previous Cardiac Procedures				
Previous Cardiac Surgery or Valve Intervention	5.48	1.0427	<.0001	2.837

Intercept = -4.4727

C-Statistic = 0.777

Appendix 5

Risk Factors for TAVR In-Hospital/30-Day Mortality in NYS in Reporting Period

The significant pre-procedural risk factors for in-hospital/30-day mortality following TAVR in the reporting period are presented in **Appendix Table 5**. Most of the risk factors in this model are interpreted as described in **Appendices 1 – 4**. Female Sex at Birth, Ejection Fraction less than 30%, Cerebrovascular Disease: Stroke, Extensive Aortic Atherosclerosis, Peripheral Arterial Disease, Severe Mitral Valve Stenosis and Tricuspid Valve Stenosis are all interpreted like Non-refractory Shock in **Appendix 1**. The patient either has the risk factor or does not.

The interpretation of Age in this model is similar to that described in **Appendix 3** except in this case all ages 80 or less have roughly the same risk if their other significant risk factors are the same while each year older than 80 was associated with an increase in mortality risk.

There are three categories for Tricuspid Valve Incompetence: None or Mild, Moderate, and Severe. Patients with no Tricuspid Valve Incompetence or only Mild Tricuspid Valve Incompetence are the reference category.

Appendix Table 5

Multivariable Risk Factor Equation for TAVR In-Hospital/30-Day Mortality in NYS in 2018-2019 and June – November 2021

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Demographic				
Age: Number of Years greater than 80	—	0.0530	<.0001	1.054
Female Sex at Birth	46.39	0.4304	0.0006	1.538
Ventricular Function				
Ejection Fraction				
Ejection Fraction less than 30%	4.76	0.7128	0.0004	2.040
Hemodynamic State				
Non-refractory Shock	0.12	2.4564	<.0001	11.663
Comorbidities				
Cerebrovascular Disease: Prior Stroke	9.72	0.5784	0.0004	1.783
Chronic Lung Disease				
None or Mild	90.00	—Reference—		1.000
Moderate or Severe	10.00	0.5742	0.0005	1.776
Extensive Aortic Atherosclerosis	2.00	0.6687	0.0198	1.952
Peripheral Arterial Disease	18.35	0.3327	0.0172	1.395
Renal Function				
No Dialysis				
eGFR 90 mL/min/1.73m ² or greater	11.66	—Reference—		1.000
eGFR 60 - less than 90 mL/min/1.73m ²	44.89	0.7910	0.0254	2.206
eGFR 45 - less than 60 mL/min/1.73m ²	21.19	0.8082	0.0286	2.244
eGFR 30 - less than 45 mL/min/1.73m ²	13.55	1.3052	0.0004	3.689
eGFR less than 30 mL/min/1.73m ²	4.79	1.9509	<.0001	7.035
Renal Dialysis	3.92	1.9983	<.0001	7.377
Valve Disease				
Mitral Valve Stenosis, Severe	0.54	1.0468	0.0186	2.849
Tricuspid Valve Stenosis	0.40	1.2542	0.0186	3.505
Tricuspid Valve Incompetence				
None or Mild	80.45	—Reference—		1.000
Moderate	15.77	0.3162	0.0331	1.372
Severe	3.78	0.842	<.0001	2.323

Intercept = -5.7657

C-Statistic = 0.730

Appendix 6

Risk Factors for Isolated CABG In-Hospital/30-Day Mortality in NYS in Reporting Period

The significant pre-procedural risk factors for in-hospital/30-day mortality following isolated CABG in the reporting period are presented in **Appendix Table 6**. Malignant Ventricular Arrhythmia and Immediate Surgery after Catheter-based Procedure are interpreted like Non-refractory Shock in **Appendix 1**. The patient either has the risk factor or does not. The other 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 Mortality in NYS in 2018-2019 and June – November 2021

Patient Risk Factor	Prevalence (%)	Logistic Regression		
		Coefficient	P-value	Odds Ratio
Demographic				
Age: Number of Years greater than 65	—	0.0731	<.0001	1.076
Female Sex at Birth	23.17	0.3364	0.0069	1.400
Ventricular Function				
Ejection Fraction				
Ejection Fraction 40% or greater	84.27	—Reference—		1.000
Ejection Fraction 30-39%	9.46	0.6624	<.0001	1.939
Ejection Fraction 20-29%	5.20	1.1704	<.0001	3.223
Ejection Fraction less than 20%	1.08	1.6306	<.0001	5.107
Pre-Procedural MI				
No MI within 20 Days	69.11	—Reference—		1.000
MI with ST Elevation 8-20 days or MI without ST Elevation within 20 Days	26.78	0.2990	0.0178	1.349
MI with ST Elevation 1-7 Days	3.08	0.7595	0.0027	2.137
MI with ST Elevation within 24 Hours	1.03	1.2636	0.0003	3.538
Hemodynamic State				
Non-refractory Shock	0.41	0.8129	0.0330	2.254
Comorbidities				
Cerebrovascular Disease	13.59	0.5094	0.0002	1.664
Diabetes with Insulin Treatment	19.44	0.3819	0.0051	1.465
Extensive Aortic Atherosclerosis	2.19	0.6068	0.0136	1.834
Malignant Ventricular Arrhythmia	0.58	1.2256	0.0005	3.406
Renal Function				
No Dialysis				
eGFR 75 mL/min/1.73m ² or greater	88.79	—Reference—		1.000
eGFR 30 – less than 75 mL/min/1.73m ²	5.53	0.7494	<.0001	2.116
eGFR less than 30 mL/min/1.73m ²	2.00	1.0201	<.0001	2.773
Renal Dialysis	3.69	1.3334	<.0001	3.794
Previous Cardiac Procedures				
Immediate Surgery after Catheter-based Procedure	1.23	0.8830	0.0058	2.418
Previous CABG Surgery	1.20	1.1868	0.0001	3.276

Intercept = -5.6188

C Statistic = 0.784

New York State Cardiac Surgery Centers

Albany Medical Center

47 New Scotland Avenue
Albany, NY 12208

Arnot Ogden Medical Center*

600 Roe Avenue
Elmira, NY 14905

Bassett Medical Center

1 Atwell Road
Cooperstown, NY 13326

Bellevue Hospital Center

462 1st Avenue
New York, NY 10016

Buffalo General Medical Center

100 High Street
Buffalo, NY 14203

Ellis Hospital

1101 Nott Street
Schenectady, NY 12308

Garnet Health Medical Center**

707 East Main Street
Middletown, NY 10940

Good Samaritan Hospital of Suffern

255 Lafayette Avenue
Suffern, NY 10901

Good Samaritan University Hospital

1000 Montauk Highway
West Islip, NY 11795

Lenox Hill Hospital

100 East 77th Street
New York, NY 10021

Long Island Jewish Medical Center

270-05 76th Avenue
New Hyde Park, NY 11040

Maimonides Medical Center

4802 10th Avenue
Brooklyn, NY 11219

Mercy Hospital of Buffalo

565 Abbott Road
Buffalo, NY 14220

Montefiore Medical Center @ Henry and Lucy Moses Division

111 East 210th Street
Bronx, NY 10467

Montefiore Medical Center @ Jack D. Weiler Hospital of A. Einstein College

1825 Eastchester Road
Bronx, NY 10461

Mount Sinai Hospital

1 Gustave L. Levy Place
New York, NY 10029

Mount Sinai Morningside

1111 Amsterdam Avenue
New York, NY 10025

NY Presbyterian Queens

56-45 Main Street
Flushing, NY 11355

NY Presbyterian Brooklyn Methodist Hospital

506 6th Street
Brooklyn, NY 11215

NY Presbyterian Hospital @ Columbia Presbyterian Center

630 West 168th Street
New York, NY 10032

NY Presbyterian Hospital @ New York Weill – Cornell College

525 East 68th Street
New York, NY 10021

NYU Hospitals Center

550 First Avenue
New York, NY 10016

NYU Langone-Long Island Hospital

259 First Street
Mineola, NY 11501

North Shore University Hospital

300 Community Drive
Manhasset, NY 11030

Rochester General Hospital

1425 Portland Avenue
Rochester, NY 14621

St. Elizabeth Medical Center***

2209 Genesee Street
Utica, NY 13501

St. Francis Hospital

100 Port Washington Boulevard
Roslyn, NY 11576

St. Joseph's Hospital Health Center

301 Prospect Avenue
Syracuse, NY 13203

St. Peter's Hospital

315 South Manning Boulevard
Albany, NY 12208

South Shore University Hospital

301 East Main Street
Bayshore, NY 11706

Staten Island University Hospital – North

475 Seaview Avenue
Staten Island, NY 10305

Strong Memorial Hospital

601 Elmwood Avenue
Rochester, NY 14642

UHS Wilson Medical Center

33-57 Harrison Street
Johnson City, NY 13790

University Hospital at Stony Brook

101 County Road 97
Stony Brook, NY 11794

University Hospital at Downstate*

450 Clarkson Avenue
Brooklyn, NY 11203

Upstate University Hospital – State University of New York

750 East Adams Street
Syracuse, NY 13210

Vassar Brothers Medical Center

45 Reade Place
Poughkeepsie, NY 12601

Westchester Medical Center

100 Woods Road
Valhalla, NY 10595

White Plains Hospital

41 East Pond Road
White Plains, NY 10601

Wynn Hospital[†]

111 Hospital Drive
Utica, NY 13502

*Not currently performing cardiac surgery.

**Hospital began performing cardiac surgery after November 30, 2021.

***Hospital closed in November 2023.

[†]Hospital opened in November 2023.

Additional copies of this report may be obtained through the Department of Health website at:

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