



REPORT ON ADULT CARDIAC SURGERY IN ONTARIO

**ISOLATED CORONARY ARTERY BYPASS GRAFT (CABG) SURGERY
ISOLATED AORTIC VALVE REPLACEMENT (AVR) SURGERY
COMBINED CABG AND AVR SURGERY
OCTOBER 2008 – SEPTEMBER 2011**

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Please send feedback/correspondence to:

Kori Kingsbury
Chief Executive Officer
Cardiac Care Network
Email: kkingsbury@ccn.on.ca
Tel: (416) 512-7472



Authors

Garth H Oakes, PhD (CCN)
Chris Feindel, MD, CM, FRCSC (UHN)
Dan M Purdham, PhD (CCN)
Jack V Tu, MD, MSc, PhD, FRCPC (ICES)
Julie Wang, MSc (ICES)
Kori Kingsbury, MSc, MPA (CCN)

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Table of Contents

Authors.....	1
Acknowledgments	3
Executive Summary	4
Background	5
Time Frame 2008 - 2011	6
Ontario Cardiac Surgery Centres	6
Methods	7
General Comments	7
Model Development and Analysis	7
Data Sources	8
Data Linkage	9
Results	11
Provincial Results	11
Comparison of Cardiac Centre Results	14
Discussion.....	17
Results in Context.....	18
Limitations	19
Conclusion.....	20
References.....	21
Appendix A	22
Appendix B	70



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CCN serves as system support to the Ontario Ministry of Health and Long-Term Care (MOHLTC), Local Health Integration Networks and care providers and is dedicated to improving quality, efficiency, access and equity in the delivery of adult cardiac services in Ontario. CCN is funded by the MOHLTC.

The results and conclusions presented in this report are those of the authors and should not be attributed to the funding agencies.



Executive Summary

The Cardiac Care Network of Ontario (CCN) serves as system support to the Ontario Ministry of Health and Long-Term Care (MOHLTC), Local Health Integration Networks, and care providers and is dedicated to improving quality, efficiency, access and equity in the delivery of adult cardiac services in Ontario. CCN maintains the cardiac registry for the province of Ontario, and has a mandate to monitor adult cardiac services in the province and develop strategies to enhance the quality of cardiac care. In this role, CCN develops and implements strategies based on evidence and best practices to better manage cardiovascular disease across the continuum of care. In collaboration with the Institute for Clinical Evaluative Sciences (ICES), CCN has been monitoring and reporting on trends in the case-mix and outcomes of patients receiving coronary artery bypass graft (CABG) surgery since 1994. These reports, which assist Ontario institutions to monitor their case-mix and patient outcomes, have been released publicly since 1999 to allow for greater transparency in the reporting of quality of care received by patients undergoing CABG surgery in the province.

For this report, CCN worked with ICES to monitor trends in the case-mix and outcomes of patients in an expanded cohort to include patients receiving CABG surgery and aortic valve replacement (AVR) surgery in Ontario. In this current study, the outcomes of patients receiving isolated CABG surgery, isolated AVR surgery, or combined CABG and AVR surgery at 11 cardiac centres in Ontario were examined for 2008/2009, 2009/2010, and 2010/2011 and compared to the provincial average. The intention of this report is to provide a provincial summary of outcomes and hospital results and help stimulate quality improvement activity both at the provincial level and within individual cardiac centres in the province of Ontario.



Background

Over the past 10-15 years, there has been a significant change in the cardiac surgery environment in Ontario manifested by a decline in the volume of CABG surgeries being performed. While the rate of CABG surgeries being performed has decreased, the rate of Percutaneous Coronary Intervention (PCI) procedures over the same time frame has greatly increased due to advances in technology and procedural skills. The shift in revascularization practices from surgery to PCI has resulted in a reduction in the overall number of CABG surgeries. In addition, patients referred for CABG now tend to be older and have more co-morbidities than they did 10-15 years ago, resulting in increased case complexity. In contemporary clinical practice, the majority of patients who are referred for CABG are typically referred because they have extensive, multivessel coronary artery disease, and may or may not have co-existing valve disease; these types of patients are beyond the scope of PCI. In light of this shifting clinical profile, it is important to remain diligent in measuring and reporting of outcomes following all cardiac procedures to ensure a common standard of high quality care in the province of Ontario.

This report is based on data that includes all isolated CABG surgeries performed, isolated AVR surgeries performed and all instances of combined CABG and AVR surgeries performed for the years of 2008/2009, 2009/2010, and 2010/2011.


The primary outcomes include crude and risk-adjusted rates for:

- in-hospital mortality
- 30-day mortality
- post-operative length of stay (LOS)
- transfusion of red blood cells and plasma or platelets
- post-operative complications: renal failure; stroke

For isolated CABG surgeries the following crude and risk-adjusted outcomes are also reported:

- cardiac catheterization (CATH) rate, 1-year post discharge
- acute myocardial infarction (AMI) readmission rate, 1-year post discharge
- revascularization rates, 1-year post discharge
- major adverse cardiac events (MACE) rates, 1-year post discharge
- use of arterial grafts (note: only crude observed rates are reported)
- off-pump use (note: only crude observed rates are reported)

By linking CCN cardiac surgery registry data to hospital discharge data from the Canadian Institute for Health Information (CIHI) discharge abstract database (DAD), outcomes were analyzed at the hospital level with adjustment for case mix.



Patients who had a valid health card number in the linked CCN/CIHI data set were also linked to the Ontario Registered Persons Database (RPDB) and the Ontario Health Insurance Plan (OHIP) database.

Time Frame 2008 - 2011

To evaluate hospital performance for the 2008/2009-2010/2011 time period, this report includes all patients who had isolated CABG surgery, isolated AVR surgery, or combined CABG and AVR surgery between October 1, 2008 and September 30, 2011, inclusive. The time period of October 1 to September 30 was specifically chosen (versus the fiscal year of April 1 to March 31) because CCN launched a new cardiac registry system on October 1st, 2008; hence October 1, 2008 to September 30, 2009 was the first complete 12 month period in which CCN was able to collect data from the new registry.

Ontario Cardiac Surgery Centres

The following 11 cardiac surgery centres were active during the study period (2008/09, 2009/10, and 2010/11):

- Hamilton Health Sciences Centre (HHSC)
- Health Sciences North (HSN)
- Kingston General Hospital (KGH)
- London Health Sciences Centre (LHSC)
- Sunnybrook Health Sciences Centre (SHSC)
- St. Mary's General Hospital (SMGH)
- St. Michael's Hospital (SMH)
- Southlake Regional Health Centre (SRHC)
- Trillium Health Centre (THC)
- University Health Network (UHN)
- University of Ottawa Health Institute (UOHI)



Methods

General Comments

This report details the crude and risk-adjusted outcomes of in-hospital and 30-day mortality rates after isolated CABG surgery, isolated AVR surgery, and combined CABG and AVR surgery. Two new outcomes from linkage of CCN data to the CIHI discharge database were also provided: the post-operative complications of renal failure and stroke. Several new outcomes specific to isolated CABG surgeries were also provided including the crude and risk-adjusted rates for the following:

- repeat cardiac catheterization (CATH) rate, 1-year post discharge
- acute myocardial infarction (AMI) readmission rate, 1-year post discharge
- repeat revascularization rate, 1-year post discharge
- major adverse cardiac events (MACE) rates, 1-year post discharge

Statistical models to predict post-operative LOS were modeled using a Poisson regression model, while all other outcomes were modeled using logistic regression. As in previous CABG reports prepared jointly by CCN and ICES, the risk models were derived using the most recent data available. This report has been developed by CCN, with data analysis completed by ICES.


The exclusion criteria utilized for post-operative LOS were consistent with those previously used; patients who died in hospital and patients with a post-operative LOS greater than the 99th percentile were excluded.

When reporting data, with all outcomes, if the sample size was less than 5, the values were suppressed and reported in the table as " ≤ 5 " according to standards in place to comply with privacy legislation.

Model Development and Analysis

The model development techniques used were similar to those in previous reports¹. These models were created to permit statistical adjustment for patient case-mix at each centre prior to the comparison of outcomes. Risk factors with p-values less than 0.25 at the univariate level were included in the full multivariate model. Class parameter was used in the logistic regression with backward selection at level 0.05 for the model selection. Risk adjustment models are provided in Appendix B.

For the in-hospital mortality model, the model's predictive power was measured with the c statistic, which is equal to the area under the receiver operating characteristic (ROC) curve. The Hosmer-Lemeshow goodness-of fit statistic was used to assess model fit.



Yearly risk-adjusted outcomes by cardiac centre were calculated as the observed outcome divided by the expected outcome for an institution multiplied by the observed outcome for the province in that year. The overall expected outcome by institution was calculated as the sum (in-hospital mortality, 30-day mortality, 1-year mortality) or the mean (post-operative LOS) of the individual expected outcomes for each individual centre. Risk-adjusted outcomes can be interpreted as the outcome that would be expected if each centre's case mix were identical to the provincial average.

For the longitudinal trend analysis of in-hospital mortality from 2008/2009 to 2010/2011, a risk model was derived based on the entire cohort. Yearly risk-adjusted mortality rates were calculated as the observed rate divided by the expected rate based on the statistical model multiplied by the overall provincial observed rate. This analysis allowed for trends in mortality rates across years to be identified.

Data Sources

The following variables were taken from the CCN database:

- urgency category
- previous CABG
- left ventricular ejection fraction (LVEF)
- CCS class
- creatinine level

As in previous work, age, sex, in-hospital mortality status, procedure date and discharge date were obtained from the CIHI discharge database. Post-operative LOS was calculated using the procedure date and discharge date.

Overall indicators for the following were constructed by combining the CIHI and CCN indicators and assuming a co-morbid condition was present when it was indicated by either source:

- peripheral vascular disease (PVD)
- cerebrovascular disease (CVD)
- chronic obstructive pulmonary disease (COPD)
- diabetes
- dialysis
- congestive heart failure (CHF)



Data Linkage

The data linkage processes were similar to those used in previous report cards. As such, patients who were classified by CCN as isolated CABG, isolated AVR or combined CABG/AVR, but who had other cardiac procedures listed on their linked CIHI record were excluded. Table 8 outlines the data linkage steps and the processes used to generate the final data sets. Starting with the CCN 2008/2009 to 2010/2011 files, only those records for isolated CABG, isolated AVR or combined CABG/AVR were retained for data linkage. In the case where a patient had more than one procedure in the same year, only the record for the first procedure was retained.

Data linkage between CCN records and CIHI discharge abstracts was performed on health card number, institution and procedure date. Provincial health card numbers were converted to a unique ICES encrypted Health Card Number (IKN) and used for data linkage.


To create the final analysis data set, records found in the CIHI database but not the CCN database, were excluded. The analysis data set was further restricted to those cases with isolated CABG, isolated AVR or combined CABG/AVR surgery. For this definition a case had to (a) be identified as either isolated CABG, isolated AVR, or combined surgery in CCN data (b) have a procedure code for CABG or AVR or combined CABG/AVR in its linked CIHI record; and (c) have no other valve or cardiac procedures performed during the same admission. For isolated AVR surgery, the following aortic relevant procedures or conditions were identified by OHIP billing and excluded:

- aortic valvotomy
- modified Bentall
- valve sparing aortic valve root replacement
- replacement of ascending aorta
- replacement of aortic arch
- subaortic myectomy
- aortic dissection
- aortic valve repair

The final number of surgeries performed was as follows:

	Isolated CABG	Isolated AVR	Combined CABG/AVR
2008/09	6809	840	761
2009/10	6665	849	782
2010/11	6303	920	791

*Note: AVR and CABG/AVR data were analyzed over the three year study period and not individual years due to the small sample size.



To capture 30-day and 1-year mortality, the records were linked by encrypted health card number/IKN to the RPDB to obtain out-of-hospital dates of death (Table 8). Therefore, the 30-day mortality analysis was restricted to records that had a valid health card number and could be linked to the RPDB. Accordingly, non-Ontario residents who had isolated CABG, isolated AVR or combined CABG/AVR surgery in Ontario were not included in the 30-day mortality analysis. One-year mortality rates for the 2010/2011 cohort were not reported as the 1 year follow up data was not yet available at the time this report was created.



Results

Provincial Results

Table 1 illustrates a summary of the risk-adjusted outcomes following isolated CABG surgery, isolated AVR surgery and combined CABG/AVR surgery performed in Ontario. In some cases, provincial risk-adjusted rates were not available, so only the crude observed rate was reported (denoted by *). For a more detailed presentation of the data see Tables 9-20, 22-37 & Figures 1-3.

Table 1 - Summary of risk-adjusted outcomes for the province of Ontario following isolated CABG, isolated AVR, and combined CABG/AVR surgery

	Isolated CABG			Isolated AVR	Combined CABG/AVR
	2008/09	2009/10	2010/11	2008-2011	2008-2011
Number of Surgeries Performed	6809	6665	6303	2609	2334
In-Hospital Mortality	1.84 (1.54 - 2.14)	1.6 (1.31 - 1.89)	1.74 (1.43 - 2.04)	2.34*	4.8*
30-Day Mortality	1.9 (1.61 - 2.2)	1.52 (1.23 - 1.8)	1.61 (1.31 - 1.92)	2.03*	3.98*
1-Year Mortality	4 (3.57 - 4.44)	3.71 (3.28 - 4.15)	ND	ND	ND
Post-Operative LOS	7.43 (7.39 - 7.47)	7.36 (7.32 - 7.41)	7.29 (7.24 - 7.33)	8.89*	11.23*
Blood Transfusion - Red Blood Cells	40.98*	36.97*	36.17*	45*	64.7*
Blood Transfusion - Plasma or Platelets	18.96*	16.55*	18.02*	22.35*	40.75*

	Isolated CABG			Isolated AVR	Combined CABG/AVR
	2008/09	2009/10	2010/11	2008-2011	2008-2011
Post-Operative Complications - Renal Failure	5.87*	5.63*	5.25*	6.86*	12.68*
Post-Operative Complications - Stroke	1.2*	1.38*	0.92*	1.92*	3.43*
CATH Rate†	4.65*	4.53*	ND	ND	ND
AMI Readmission Rate†	1.65*	1.63*	ND	ND	ND
Revascularization Rate†	2.08*	2.15*	ND	ND	ND
MACE Rate†	5.18*	5.06*	ND	ND	ND
CHF Readmission Rate†	ND	ND	ND	4.74*	6*

ND - No data available; *Crude observed rate reported; †Volume of surgeries is different than the value shown in table; see Tables 18-20, 29 & 37.

The province of Ontario overall saw a decrease from 6809 surgeries performed in 2008/09 to 6665 in 2009/10 to 6303 in 2010/11 (Table 1).

Risk-adjusted in-hospital mortality rates (Tables 1 & 9 and Figure 1), 30-day mortality rates (Tables 1 & 10 and Figure 2), and 1-year mortality rates (Tables 1 & 11 and Figure 3) following isolated CABG surgeries were low overall, and relatively consistent between cardiac centres, in the province during the reporting period.

The number of isolated AVR surgeries and combined CABG/AVR surgeries performed in Ontario during the study period were much lower than the number of isolated CABG surgeries performed (Table 1). The average mortality rates following isolated AVR surgery for the three years of this study remained low, only slightly higher than those reported for isolated CABG



surgery (Tables 1, 22 & 23). The mortality rates reported for combined CABG/AVR surgeries were higher than for either isolated CABG or AVR (Tables 1, 30 & 31).

Table 38 (in Appendix A) demonstrates the overall provincial distribution of risk factors by mortality for all three surgeries studied (isolated CABG, isolated AVR, and combined CABG/AVR). Patients with the following risk factors all have lower rates of survival following CABG surgery:

- Elderly (≥ 75 years)
- Female
- High urgency risk scores
- Previous CABG surgery
- Poor left ventricular function
- Presence of other co-morbid illnesses

Comparing data presented in previous CABG reports, trends in changes in the prevalence of select high-risk risk factors can be identified (Table 39). Since the fiscal year of 2002, the percentage of patients in Ontario undergoing isolated CABG who are elderly (≥ 75 years), and who present with either left main disease or an “emergency” Urgency Risk Score (URS) has increased (Table 2).

Table 2 - Changes in the Prevalence of Select Risk Factors in Patients Undergoing Isolated CABG from 2002 to 2011

Risk Factor		Year							
		2002/ 03*	2003/ 04*	2004/ 05*	2005/ 06*	2006/ 07*	2008/ 09**	2009/ 10**	2010/ 11**
Age	≥ 75	16	16	18	19	19	21.1	20.3	20.9
Sex	Female	22	21	21	22	22	21.8	20.6	20.1
URS	Emergency	6	8	7	7	8	10.2	10.2	9.3
LVEF	3	15	15	14	14	12	10.9	10.9	10.7
	4	2	3	2	2	2	2.6	2.2	2.1
Coronary Anatomy	Left Main Disease	26	27	29	30	29	32	31.4	30.9
Creatinine	>180	3	2	3	3	3	2.7	2.9	3.2

*Data are from the fiscal year (April 1 - March 31; grey shading); Data from the fiscal years of 2002 to 2006 was obtained from previous public CABG reports^{1,4}; **Data are from October 1 - September 30.

Comparison of Cardiac Centre Results

Centre-specific risk-adjusted mortality rates were relatively consistent between all cardiac centres in the province of Ontario. Table 3 illustrates the provincial range of in-hospital, 30-day, and 1-year risk-adjusted mortality rates reported following isolated CABG, isolated AVR, and combined CABG/AVR surgeries. A more detailed presentation of the data including observed and risk-adjusted outcome rates reported at each individual cardiac centre can be found in Appendix A.

Table 3 - Range of Risk-Adjusted Mortality Rates across Individual Cardiac Centres in Ontario

	Isolated CABG 2008/09	Isolated CABG 2009/10	Isolated CABG 2010/11	Isolated AVR	Combined CABG/AVR
In-Hospital	0.91 - 2.81	0.25 - 3.07	0.86 - 3.28	0.91 - 4.17	3.26 - 9.26
30-Day	1.03 - 3.5	0.73 - 2.6	0.66 - 2.87	0.48 - 3.77	2.24 - 9.12
1-Year	2.78 - 5.63	2.06 - 5.84	ND	ND	ND

ND - No Data; For a more detailed presentation of the data see Tables 9-11, 22, 23, 30, 31 & Figures 1-3 (Appendix A).

There was wide variation in centre-specific risk-adjusted post-operative LOS and blood product transfusion rates (red blood cells and plasma or platelets) across the province. Table 4 illustrates the range of these outcomes for each of the surgeries studied.

Table 4 - Range of Risk-Adjusted Post-Operative LOS and Blood Product Transfusion Rates across Individual Cardiac Centres in Ontario

	Isolated CABG 2008/09	Isolated CABG 2009/10	Isolated CABG 2010/11	Isolated AVR	Combined CABG/AVR
Post-Operative LOS	6.12 - 8.99	5.86 - 8.32	5.72 - 8.27	7.51 - 10.07	9.7 - 12.64
Red Blood Cell Transfusion Rate	22.64 - 56.61	19.87 - 52.83	20.79 - 45.09	17.86 - 59.17	38.12 - 75.83
Plasma or Platelet Transfusion Rate	8.99 - 26.74	8.89 - 24.82	8.59 - 34.3	11.66 - 35.78	38.12 - 75.83

For a more detailed presentation of the data see Tables 12-14, 24-26, 32-34.




Table 5 summarizes the reported ranges of risk-adjusted rates of post-operative complications at individual cardiac centres. NOTE: Please see section on limitations, relative to the renal failure outcome.

This report presents, for the first time, rates for CATH, revascularization, AMI, and MACE at 1-year post-discharge following isolated CABG surgery. These risk-adjusted 1-year post-discharge rates were relatively consistent between cardiac centres. Table 5 summarizes the range of these risk-adjusted rates across the province. The risk-adjusted CHF readmission rate 1-year post-discharge was reported following isolated AVR and combined CABG/AVR surgeries and the provincial range of centre-specific rates is presented in Table 5. NOTE: Please see section on limitations, relative to the CHF readmissions rate.

Table 5 - Range of Post-Operative Complications and 1-Year Post-Discharge Rates across Individual Cardiac Centres across Ontario

	Isolated CABG 2008/09	Isolated CABG 2009/10	Isolated CABG 2010/11	Isolated AVR	Combined CABG/AVR
Renal Failure	4.41 - 10.88	3.51 - 8.66	3.9 - 7.78	2.58 - 9.83	3.24 - 20.85
Stroke	0 - 2.25	0.84 - 2.2	0 - 1.3	0 - 4.54	0.58 - 5.86
CATH Rate	3.21 - 6.65	2.56 - 7.1	ND	ND	ND
AMI Rate	1.21 - 2.89	0.92 - 2.59	ND	ND	ND
Revascularization Rate	0.95 - 2.82	1.24 - 3.91	ND	ND	ND
MACE Rate	4.39 - 6.8	3.86 - 7.43	ND	ND	ND
CHF Rate	ND	ND	ND	1.29 - 7	1.85 - 10.9

ND - No Data; For a more detailed presentation of the data see tables 15-20, 27-29, and 35-37.



This report also measured centre-specific use of arterial grafts and off-pump procedures for isolated CABG surgery (Table 21). Arterial graft use was generally high with most cardiac centres reporting rates of 90% or greater with the exception of HSN which reported rates of 68.8%, 74.6% and 85.9% in 2008/09, 2009/10, and 2010/11 respectively. Off-pump use was generally low across the province with most cardiac centres reporting rates of less than 20%. HSN and SMH reported off-pump use in no more than 5 patients in each of the three years studied. Comparatively, THC reported extremely high off-pump use rates of 89.7%, 87.4% and 91.3% in 2008/09, 2009/10 and 2010/11 respectively.

Tables 39-41 (in Appendix A) illustrate differences in the patient case-mix at each cardiac centre for isolated CABG surgery, isolated AVR surgery, and combined CABG/AVR surgery by reporting the prevalence of a number of risk factors. Differences of more than 25% as compared to the provincial average are highlighted in the tables.



Discussion

The growing emphasis for accountability has increased the demand for public reporting on the performance of healthcare providers and hospitals. Hospital report cards are being used increasingly to ensure that the highest quality of care is delivered to ensure the best possible outcomes. This CCN cardiac surgery report represents an effort to track the case-mix and outcomes of patients undergoing isolated CABG surgery, isolated AVR surgery, or combined CABG/AVR surgery each cardiac centre providing services, with provincial benchmark comparisons.

One of the findings of this report is that risk-adjusted, in-hospital mortality rates in the province of Ontario overall following isolated CABG surgery, while still remaining relatively low, have increased slightly over the past few years. In the fiscal years of 2005/06 and 2006/07 risk-adjusted in-hospital mortality rates were reported to be 1.08% and 1.2% respectively¹. In this study we report that the risk-adjusted in-hospital mortality rates following isolated CABG surgery were 1.84%, 1.60%, and 1.74% for the 2008/09, 2009/10, and 2010/11 study periods (Tables 1 & 9). The cause and significance of this increase is unknown, and it may be the result of the quality of the data (two different cardiac registry systems were used between the two cohorts, with improved data quality in 2008-2011) or other unknown factors. Future work is required to directly compare the patient populations presented in both studies to determine the significance of this slight increase in mortality. NOTE: Not all of the risk factors presented in this study had comparable data available in the previous report (2005-2007), making a direct comparison between the overall prevalence of risk factors in the two cohorts difficult.

Patients with the following characteristics present with lower rates of survival following CABG surgery (Table 38):

- Elderly (≥ 75 years)
- Female
- High urgency risk scores
- Previous CABG surgery
- Poor left ventricular function
- Patients with other co-morbid illnesses

The mortality rates of these higher-risk patients have greatly improved over the last 10 years however we must remain vigilant in providing attention to these unique patient groups to determine optimal perioperative practices to continue to improve their outcomes^{1,2,3}.

Significant variation in the blood product transfusion rates, including red blood cells and plasma or platelets, was identified among the cardiac centres in Ontario. The optimal benchmarks and best practices for transfusion rates are not yet fully defined. Future quality improvement initiatives should focus on identifying optimal benchmarks for transfusion rates peri- and post-

operatively which would provide the opportunity to adopt a province-wide blood conservation strategy.

Results in Context

Table 6 compares the risk-adjusted 30-day mortality rates for the various cardiac surgeries reported in the province of Ontario to those reported by the Society of Thoracic Surgeons (STS) over a similar time frame. The STS is an international organization of thoracic surgeons that maintains one of the largest adult cardiac surgery databases in the world. Observed 30-day mortality rates reported in Ontario are less than or equal to the observed operative mortality rates reported by STS for each of the surgeries compared. When making a direct comparison between the two data sets, consideration should be given to the fact that these are crude observed rates being reported, and these data have not been risk-adjusted. Also the time periods reported for Ontario and the STS differ. The rates from Ontario are measured over a period from October to September while STS reports for the calendar year, January to December. Despite these differences between the two data sets, using STS data as a comparison bench mark is a valuable method to put Ontario's cardiac surgery mortality rates into a broader context.

Table 6 - Comparison of Observed 30-Day Mortality Rates Following Cardiac Surgery Reported in Ontario and by the Society of Thoracic Surgeons

Source of Outcomes Report	2008/09	2009/10	2010/11†
Isolated CABG			
Province of Ontario (Risk-Adjusted 30-Day Mortality)	1.9	1.52	1.61
Society of Thoracic Surgeons ⁵ (Observed Operative Mortality)	1.9**	1.9**	1.9**
Isolated AVR			
Province of Ontario (Observed 30-Day Mortality)	2.03		
Society of Thoracic Surgeons ⁵ (Observed Operative Mortality)	3**	3**	2.6**
Combined CABG/AVR			
Province of Ontario (Observed 30-Day Mortality)	3.98		
Society of Thoracic Surgeons ⁵ (Observed Operative Mortality)	4.7**	4.5**	4.2**

The Society of Thoracic Surgeons defines Operative Mortality as all deaths that occur during the hospitalization in which the cardiac surgery was performed (regardless of length of stay) and any deaths within 30 days after the surgery, no matter where they occur; **Rates are approximate as they were extrapolated from a graphical representation of the data; †STS data for 2008/09 includes only from January 1 2009 to December 31, 2009, STS data for 2009/10 includes only from January 1 2010 to December 31 2010, and STS data for 2010/2011 includes only from January 1, 2011 - September 30, 2011.



Limitations

Cardiac surgery report cards have proven to be very powerful tools to aid in quality improvement. They offer the opportunity to provide essential cardiac surgery outcomes data to members of the cardiac care sector as well as the general public. However, there are limitations to the current study that should be addressed.


The post-operative complication renal failure was an outcome presented for the first time in Ontario in this report. The definition used for post-operative renal failure in this study is very broad. Renal failure, for the purpose of this outcomes report, was defined based on the use of ICD-10 complication codes recorded in the CIHI-DAD. This definition makes it difficult to differentiate between patients with acute post-operative renal failure and patients who present for cardiac surgery with preexisting chronic renal failure. In addition, as this definition is not a clinically objective definition it also introduces subjectivity in the assigning of outcomes to a patient and is influenced by the way medical staff code renal failure across institutions, which may not always be consistent. In the future the use of more specific and quantitative indicators of renal failure will be considered such as pre-and post-operative creatinine concentrations.

Blood product transfusion rates (both red blood cells and plasma or platelets) were used as quality indicators. The method of risk-adjustment of these outcomes must be considered when interpreting these data. Blood product transfusion rates were not risk-adjusted according to preoperative hemoglobin levels as these values were not available. In addition, some of the risk factors considered in this study, risk factors that affect mortality, may not necessarily be the same as those that increase the need for a blood product transfusion.

The repeat cardiac CATH rate and the revascularization rate 1-year post-discharge were both also used as quality indicators following isolated CABG surgery. When interpreting these results it is important to note that these indicators are affected by factors beyond the control of the cardiac surgery programs and individual cardiac surgeons. The aggressiveness of the physicians who are referring patients for these repeat procedures is a factor that is going to affect these rates considerably.

Similarly, the CHF readmission rate was used as a quality indicator following isolated AVR surgery and combined CABG/AVR surgery. The limitation of using the CHF readmission rate as an endpoint is that there isn't a qualitative way to measure the appropriateness of readmission. The readmission rate will be affected by the subjectivity of the physician responsible for the decision to readmit the patient.

Finally, due to relatively low mortality rates measured following cardiac surgery, it now takes potentially only a few extra deaths for a hospital to become a "statistical outlier". Distinguishing between true outlier hospitals versus statistical outlier hospitals is becoming an increasing challenge.



Despite these limitations, cardiac surgery outcomes reports are still necessary and important. This province wide cardiac surgery outcomes report provides both cardiac care providers and the general public with important information regarding the positive outcomes of cardiac surgery in this province and aids in the identification of areas of improvement.

Conclusion

CABG surgery report cards have been in use in the province of Ontario for more than a decade¹⁻⁴. A number of hospitals have launched quality improvement initiatives in response to the information contained in these reports. The results of this 2012 report are consistent with previous reports on mortality rates following CABG surgery in Ontario, demonstrating that mortality rates continue to be much lower than they were over ten years ago^{2,3}. We must continue to pursue excellence in clinical care and quality improvement initiatives to maintain these lower mortality rates post isolated CABG surgery and ensure the best possible outcomes for patients.

For the first time, CCN is reporting on mortality rates following isolated AVR surgery and combined CABG/AVR surgery. We identified that mortality rates and post-operative LOS for isolated AVR surgery were slightly higher than those for isolated CABG surgery; combined CABG/AVR surgery had an even higher rate of mortality and longer post-operative LOS. These data indicate that current and future quality improvement initiatives for cardiac surgery should also be focused on improving practices for these surgeries.

For the past 20 years, CCN has worked with its member hospitals and care providers to improve the quality, efficiency, access and equity in the delivery of adult cardiac services in Ontario. Reports on health system and procedural outcomes are a resource to support continuous quality improvement efforts. We look forward to continuing to work together with all stakeholders to ensure that all Ontarians have access to the highest possible quality of cardiac care.



References

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2. Naylor C David, Deanna M Rothwell, Jack V Tu, Peter Austin, and the Steering Committee of the Cardiac Care Network of Ontario (1999). Outcomes of Coronary Artery Bypass Surgery in Ontario. In C David Naylor and Pamela M Slaughter (eds.), *Cardiovascular Health and Services in Ontario* (Institute for Clinical Evaluative Sciences): 189-98.
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Appendix A

Table 7 - Data Definitions

Field Name	Data Definition
Age	Calculated from patient's date of birth
Sex	<ul style="list-style-type: none"> •Male •Female •Undifferentiated
AMI	Previous Acute Myocardial Infarction (AMI)
Atrial Fib	Sustained or paroxysmal atrial fibrillation or flutter.
BMI	Calculated from height and weight <ul style="list-style-type: none"> •<25% - Normal Weight •25-30% - Overweight •>30% - Obese
CCS	Select – Class 0, 1, 2, 3, 4, ACS low risk, ACS intermediate risk, ACS high risk, emergent 0,1,2,3,4 to be used for stable angina. 0: Class 0, Asymptomatic. 1: Class I: Ordinary physical activity such as walking or climbing stairs does not cause angina. Angina with strenuous, rapid, or prolonged exertion at work or recreation. 2: Class II: Slight limitation of ordinary activity like walking, climbing stairs, rapidly walking uphill, walking or stair climbing after meals, in cold, in wind, under emotional stress, or during the few hours after awakening. Walking more than 2 blocks on the level and climbing more than one flight of stairs at a normal pace and in normal conditions. 3: Class III: Marked limitation of ordinary physical activity. Walking one or two blocks on the level or climbing one flight of stairs in normal conditions and at a normal pace. 4: Class IV: Inability to carry out any physical activity without discomfort – 24 angina syndrome may be present at rest. Low risk, intermediate risk, high risk and emergent to be used with acute coronary symptoms (ACS), STEMI not treated with primary PCI and Emergent Patient Categories. Low risk (includes ACS and STEMI not treated by primary PCI low risk) <i>ACS low risk:</i> a: TIMI Risk Score for unstable angina and non- ST segment elevation myocardial infarction = 0-2 – OR any of the following b: Age < 65 years (note: age is not to be used alone to determine risk category)



c: No or minimum troponin rise (<1.0 ng/ml) (note: Troponin T levels are universal due to a single system of standards)
d: No further Chest Pain
e: Inducible ischemia <= 7 MET's workload
STEMI not treated by primary PCI low risk:
a: TIMI risk score after STEMI = 0-3 – OR
b: ACC/AHA guidelines after STEMI (Gibbons, 2002) : i) LVEF >= 40%; ii) low risk on non-invasive assessment such as: Duke treadmill score >=5.
Intermediate risk (includes ACS and STEMI not treated by primary PCI intermediate risk)
ACS intermediate risk:
a: TIMI Risk Score for unstable angina non-ST segment elevation myocardial infarction = 3-4 – OR any of the following
b: NSTEMI with small troponin rise (>= 1 < 5 ng/ml)
c: Worst ECG T wave inversion or flattening.
d: Significant LV dysfunction (EF < 40%)
e: Previous documented CAD, MI or CABG, PCI
STEMI not treated by primary PC intermediate risk:
a: TIMI risk score after STEMI = 4-5 OR
b: ACC/AHA guidelines after STEMI (Gibbons, 2002): 3. absence of high risk predictors; ii) LVEF < 40%; iii) high or intermediate risk on noninvasive assessment such as: Duke treadmill score < 5, stress-induced large anterior or multiple perfusion defects.
High risk (includes ACS and STEMI not treated by primary PCI high risk):
ACS high risk:
a: TIMI Risk Score for unstable angina and non-ST segment elevation myocardial infarction = 5-7 OR any of the following:
b: Persistent or recurrent chest pain
c: Dynamic ECG changes with chest pain (e.g. transient ischemic ST segment changes with chest pain.)
d: CHF, hypotension, arrhythmias with C/P
e: Moderate or high (>5 ng/ml) Troponin Rise
f: Age > 75 years (note: age is not to be used alone to determine risk category)
STEMI not treated by primary PCI high risk (clinical predictors):
a: TIMI risk score after STEMI > 5 OR-
b: ACC/AHA guidelines after STEMI ((high risk predictors) Gibbons, 2002): i) failed reperfusion (recurrent chest pain, persistent ECG findings of infarction), ii) mechanical complications (sudden heart failure, new murmur), iii) change in clinical status (shock)
Emergent (URS = 1)= shock, and primary PCI, salvage/rescue PCI, facilitated PCI for STEMI

	Note: if clinical parameters result in patient falling into two classifications (e.g. High Risk and Emergent for shock) the higher classification takes precedence.
CHF	Patient has a history of Congestive Heart Failure (CHF) diagnosed and/or treated by a physician. There must be a history of one or more of the following: exertional dyspnea, orthopnea, paroxysmal nocturnal dyspnea (PND), and other cardiac rales, or pulmonary congestion on x-ray. Neither pedal edema nor dyspnea alone are diagnostic.
COPD	Chronic lung disease: The patient must have a documented history of obstructive or restrictive lung disease (e.g. COPD, asthma, bronchitis, emphysema, pulmonary fibrosis) and be on pharmacology therapy.
CVD	History of Cerebral Vascular Disease (CVD) as any history of stroke TIA previous carotid endarterectomy/stent or any known carotid stenosis $\geq 70\%$.
Diabetes	Patient has history of diabetes mellitus diagnosed and/or treated by a physician as documented in chart and/or referral/triage form.
Dialysis	History of dialysis. On any form of dialysis at time of referral (peritoneal, hemodialysis, CRT).
Hypertension	Documented history of hypertension diagnosed and treated with medication, diet and/or exercise.
Left Main Disease	Stenosis of Left Main CAD based on most recent Cath. Applies to native circulation only. Yes $\geq 50\%$.
LV Ejection Fraction (LVEF)	Left Ventricular Ejection Fraction percentage <ul style="list-style-type: none"> •$\geq 50\%$ •35-49% •20-34% •$< 20\%$ <ul style="list-style-type: none"> •Unknown: If LV assessment is completed but the results are not yet available, user should enter LVEF of "unknown"
Previous CABG	Patient has had a previous CABG procedure
PVD	History of Peripheral Vascular Disease (PVD). This can include: <ul style="list-style-type: none"> •Claudication either with exertion or rest •Amputation for arterial vascular insufficiency •Prior vascular surgery or angioplasty (to extremities or intra-abdominal viscera) •Positive non-invasive/invasive vascular test [Footnote - a) AAA > 4 cm; b) ABI $< 70\%$; and/or c) PVD (excluding CVD) with a luminal diameter $> 50\%$]. This does not include procedures such as vein stripping or carotid disease. [Footnote - examples may include a) aorto-iliac occlusive disease reconstruction, b) peripheral vascular (excluding carotids) bypass surgery, angioplasty or stent; c) percutaneous intervention to the extremities or intra-abdominal viscera, or d) AAA repair or stent.]
Shock	Shock resulting from the failure of the heart to maintain adequate output
Creatinine	The value of the most recent serum creatinine prior to procedure, entered at the time of offlisting.



	<ul style="list-style-type: none"> •0-120 µmol/L •120-180 µmol/L •>180 µmol/L
URS	<p>Urgency Rating Score calculate by application</p> <ul style="list-style-type: none"> •Elective •Urgent •Emergency
NYHA Class	<p>The New York Heart Association (NYHA) Functional Classification</p> <ul style="list-style-type: none"> • 1. No symptoms with ordinary physical activity. • 2. Symptoms with ordinary activity. Slight limitations of activity • 3. Symptoms with less than ordinary activity. Marked limitation of activity. • 4. Symptoms with any physical activity or even at rest. <p>Uncontrollable heart failure not responsive to medical therapy (X) was removed in Oct 2011</p> <ul style="list-style-type: none"> • N: Not applicable • U: Unknown <p>The New York Heart Association (NYHA) Functional Classification provides a simple way of classifying the extent of heart failure. It places patients in one of four categories based on how much they are limited during physical activity. Not applicable applies to patients without known HF</p>

Table 8a - Summary of data linkage and cohort creation for isolated CABG surgery

CCN data from Oct. 2008 - Sept. 2011	
-Include patients with valid Health Card Number, age >=18, and offlist for Procedure Started	N=274876
-Only keep patients who had CABG surgery, exclude all who had Valve surgery	N=20203
-For each patient only keep one procedure per year	N=20164
Link to CIHI DAD data to get the hospitalization data for each procedure	N=19782
Link to RPDB data to get the death date for each patient and clean data (remove those with admission date after death date)	N=19777
The final cohort for analysis	N=19777

Table 8b - Summary of data linkage and cohort creation for isolated AVR surgery and combined CABG/AVR surgery

CCN data from Oct. 2008 - Sept. 2011	AVR	CABG/AVR
-Include patients with valid Health Card Number, age >=18, and offlist for Procedure Started	N=274876	N=274876
-For Isolated AVR surgery only keep patients who had Aortic Valve Replacement surgery, exclude all who had Mitrial Valve /Other Valve /CABG		
-For combined CABG/AVR surgeries only keep patients who had Aortic Valve Replacement surgery and CABG, exclude all who had Mitrial Valve/Other Valve.	N=4071	N=2961
-For each patient only keep one procedure per year	N=4054	N=2961
-Exclude all patients who had TAVI	N=3880	N=2957
Link to OHIP to get OHIP billing for the procedure	N=3789	N=2915
-Keep patients who had Aortic Valve Replacement and exclude those who had Aortic valvotomy / Modified Bentall / Valve sparing aortic valve root replacement / Replacement of ascending aorta/ Replacement of aortic arch / Subaortic myectomy / Aortic dissection / Aortic valve repair	N=2639	N=2346
Link to CIHI DAD data to get the hospitalization data for each procedure	N=2610	N=2334
Link to RPDB to get the death date for each patient and clean data (remove those with admission date after death date)	N=2609	N=2334
The final cohort for analysis	N=2609	N=2334

NB Values suppressed where number of reports are ≤ 5.

**Table 9a - In-Hospital Mortality Rate Following Isolated CABG Surgery in 2008/09**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	992	2.52	2.32	1.98 (1.3 - 2.66)
HSN	250	2.4	1.72	2.54 (0.86 - 4.22)
KGH	451	1.55	1.53	1.85 (0.53 - 3.17)
LHSC	870	1.38	1.62	1.55 (0.64 - 2.46)
SHSC	464	2.59	1.68	2.81 (1.6 - 4.01)
SMGH	436	≤5	≤5	0.91 (0 - 2.12)
SMH	681	1.47	1.17	2.3 (1.05 - 3.54)
SRHC	670	1.04	1.33	1.43 (0.26 - 2.6)
THC	770	1.69	1.29	2.38 (1.28 - 3.48)
UHN	632	2.22	1.87	2.15 (1.16 - 3.15)
UOHI	593	2.36	2.29	1.88 (0.99 - 2.77)
Overall	6809	1.82	1.71	1.84 (1.54 - 2.14)

*In-hospital mortality: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 9b - In-Hospital Mortality Rate Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	986	2.13	2.46	1.42 (0.83 - 2)
HSN	307	1.95	1.32	2.42 (0.85 - 3.99)
KGH†	444	≤5	≤5	0.25 (0 - 1.45)
LHSC	767	2.09	1.84	1.85 (1.09 - 2.61)
SHSC†	412	2.43	1.29	3.07 (1.74 - 4.39)
SMGH	426	1.88	1.91	1.61 (0.54 - 2.68)
SMH	684	0.88	1.29	1.12 (0.07 - 2.17)
SRHC	734	0.95	1.48	1.06 (0.11 - 2)
THC	747	1.34	1.63	1.34 (0.51 - 2.18)
UHN	599	2.17	1.67	2.12 (1.16 - 3.08)
UOHI	559	1.97	2.34	1.37 (0.6 - 2.15)
Overall	6665	1.64	1.76	1.6 (1.31 - 1.89)

*In-hospital mortality: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 9c - In-Hospital Mortality Rate Following Isolated CABG Surgery in 2010/11

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	981	2.75	2.46	1.92 (1.31 - 2.53)
HSN	249	≤5	≤5	2.77 (0.89 - 4.65)
KGH	434	≤5	≤5	1.01 (0 - 2.25)
LHSC	736	2.58	1.83	2.42 (1.58 - 3.25)
SHSC†	377	2.39	1.25	3.28 (1.77 - 4.78)
SMGH	413	≤5	≤5	1.21 (0 - 2.43)
SMH	661	1.36	1.13	2.07 (0.86 - 3.27)
SRHC	681	1.32	1.37	1.65 (0.58 - 2.71)
THC	744	1.48	1.7	1.49 (0.62 - 2.36)
UHN	537	≤5	≤5	0.99 (0 - 2.06)
UOHI	490	≤5	≤5	0.86 (0 - 1.83)
Overall	6303	1.71	1.7	1.74 (1.43 - 2.04)

*In-hospital mortality: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average



Figure 1 - Risk-Adjusted In-Hospital Mortality Rate Following Isolated CABG Surgery

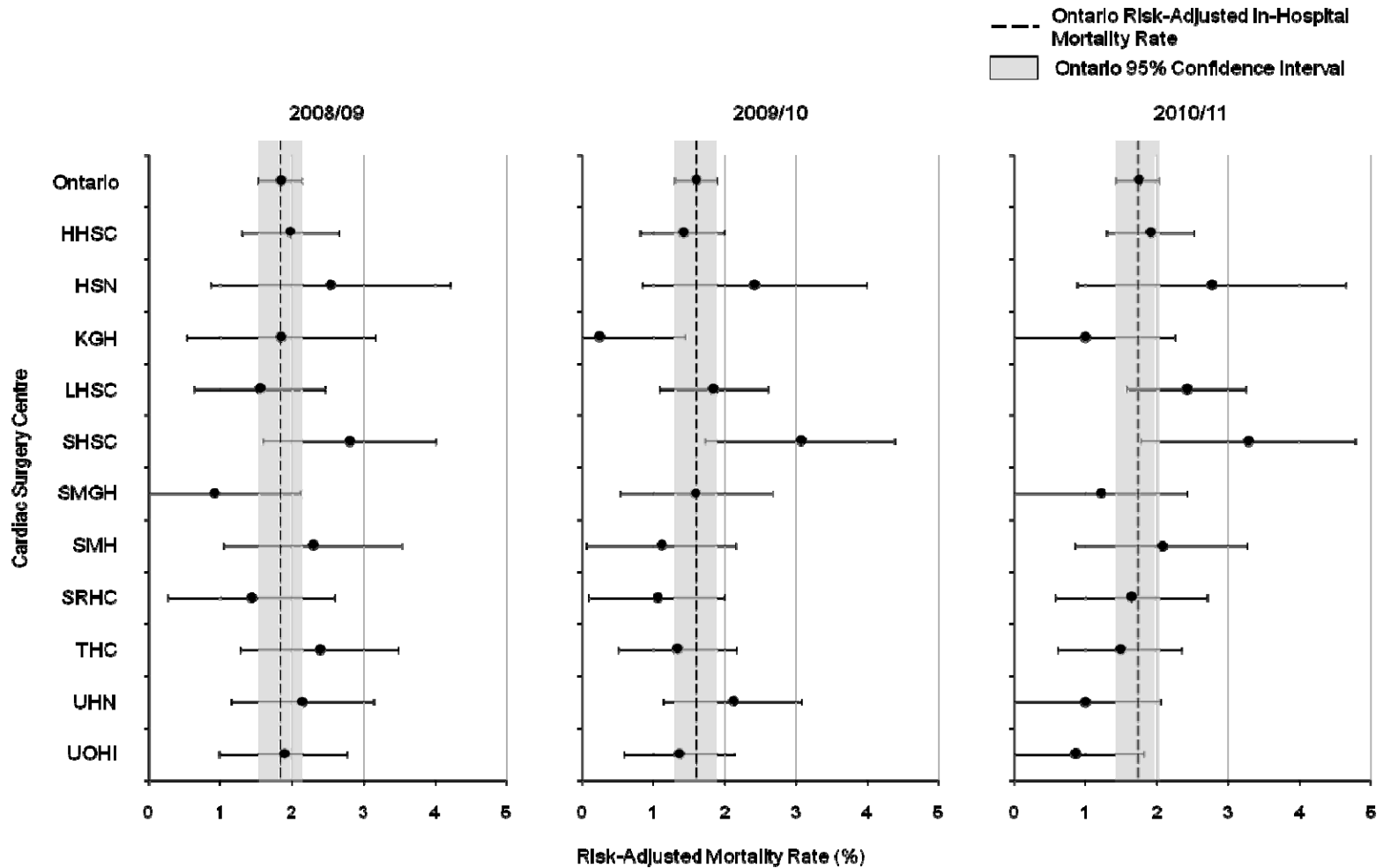


Table 10a - 30-Day Mortality Rate Following Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	992	2.72	2.19	2.36 (1.62 - 3.1)
HSN	250	3.2	1.73	3.5 (1.76 - 5.24)
KGH	451	2	1.53	2.47 (1.1 - 3.85)
LHSC	870	1.84	1.64	2.12 (1.17 - 3.07)
SHSC	464	2.37	1.67	2.69 (1.42 - 3.96)
SMGH	436	≤5	≤5	1.03 (0 - 2.36)
SMH	681	0.88	1.17	1.42 (0.13 - 2.72)
SRHC	670	1.19	1.35	1.67 (0.46 - 2.88)
THC	770	1.82	1.33	2.58 (1.45 - 3.72)
UHN	632	2.22	1.8	2.33 (1.27 - 3.39)
UOHI	593	2.02	2.16	1.77 (0.81 - 2.74)
Overall	6809	1.89	1.67	1.9 (1.61 - 2.2)

*30-day mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

Table 10b - 30-Day Mortality Rate Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	986	1.93	2.31	1.29 (0.71 - 1.87)
HSN	307	1.95	1.33	2.26 (0.79 - 3.74)
KGH	444	≤5	≤5	0.73 (0 - 1.88)
LHSC	767	1.96	1.81	1.67 (0.93 - 2.41)
SHSC	412	2.18	1.3	2.6 (1.35 - 3.86)
SMGH	426	1.88	1.76	1.65 (0.59 - 2.7)
SMH	684	0.88	1.29	1.05 (0.06 - 2.05)
SRHC	734	1.09	1.51	1.12 (0.23 - 2)
THC	747	1.2	1.62	1.15 (0.35 - 1.95)
UHN	599	2	1.64	1.89 (0.97 - 2.82)
UOHI	559	1.43	2.2	1.01 (0.23 - 1.78)
Overall	6665	1.55	1.71	1.52 (1.23 - 1.8)

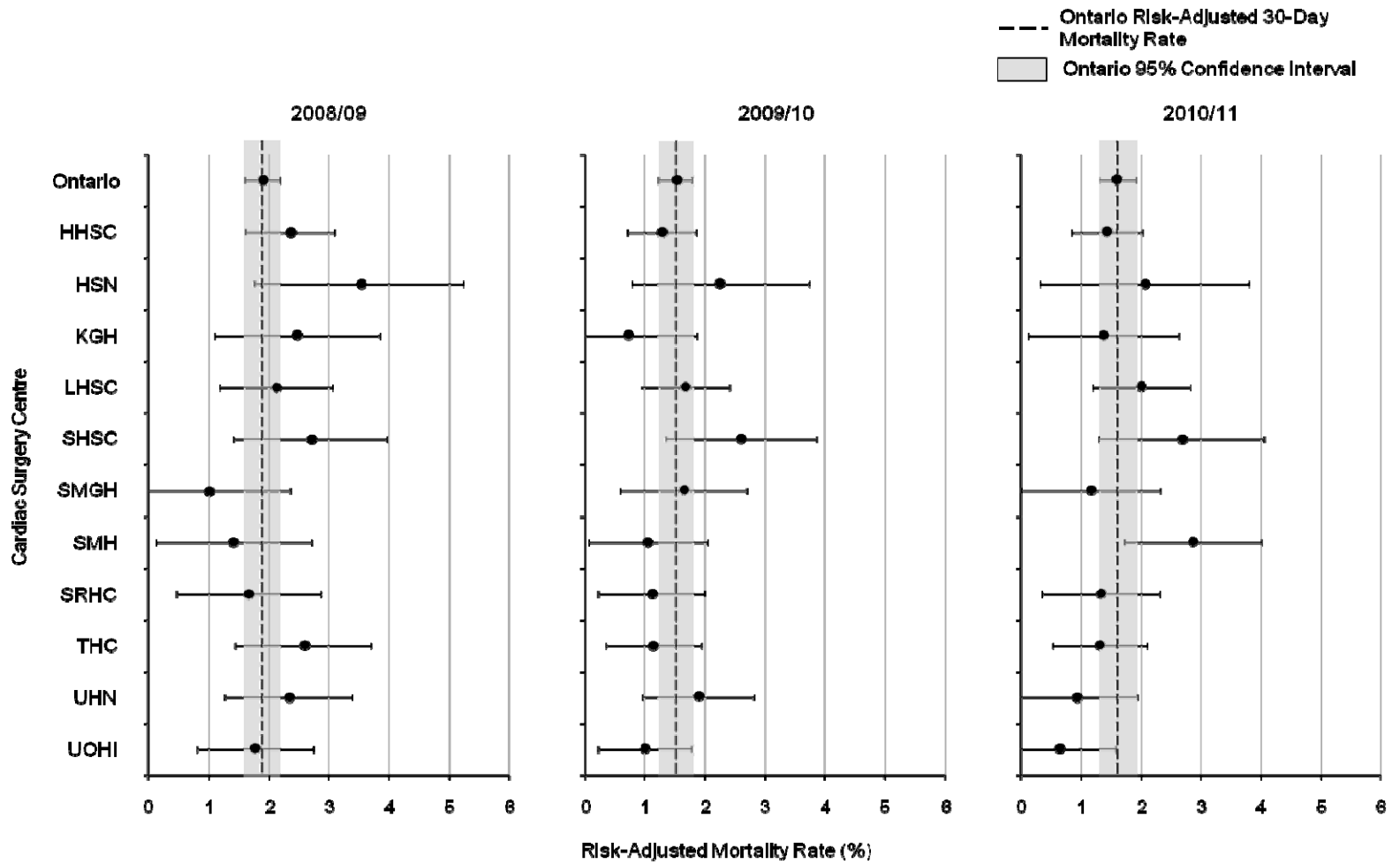
*30-day mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

**Table 10c - 30-Day Mortality Rate Following Isolated CABG Surgery in 2010/11**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	981	2.14	2.36	1.44 (0.85 - 2.02)
HSN	249	≤5	≤5	2.07 (0.32 - 3.81)
KGH	434	≤5	≤5	1.38 (0.13 - 2.64)
LHSC	736	2.17	1.71	2.01 (1.2 - 2.83)
SHSC	377	2.12	1.26	2.68 (1.29 - 4.06)
SMGH	413	≤5	≤5	1.17 (0.01 - 2.33)
SMH†	661	1.97	1.09	2.87 (1.73 - 4.01)
SRHC	681	1.17	1.39	1.34 (0.35 - 2.32)
THC	744	1.48	1.78	1.32 (0.53 - 2.11)
UHN	537	≤5	≤5	0.94 (0 - 1.95)
UOHI	490	≤5	≤5	0.66 (0 - 1.59)
Overall	6303	1.59	1.65	1.61 (1.31 - 1.92)

*30-day mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

Figure 2 - Risk-Adjusted 30-Day Mortality Rate Following Isolated CABG Surgery



**Table 11a - 1-Year Mortality Rate Following Isolated CABG Surgery in 2008/09**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	992	4.94	4.63	4.3 (3.23 - 5.36)
HSN	250	4.4	3.59	4.94 (2.42 - 7.45)
KGH	451	4.21	3.67	4.61 (2.79 - 6.44)
LHSC	870	4.25	3.89	4.4 (3.13 - 5.67)
SHSC	464	5.17	3.7	5.63 (3.87 - 7.39)
SMGH	436	2.98	4.31	2.78 (1.08 - 4.49)
SMH	681	2.5	2.97	3.38 (1.69 - 5.06)
SRHC	670	2.54	3.17	3.22 (1.58 - 4.86)
THC	770	3.51	3.35	4.21 (2.74 - 5.69)
UHN	632	4.91	4.35	4.53 (3.13 - 5.94)
UOHI	593	4.89	4.77	4.13 (2.78 - 5.48)
Overall	6809	4.02	3.88	4 (3.57 - 4.44)

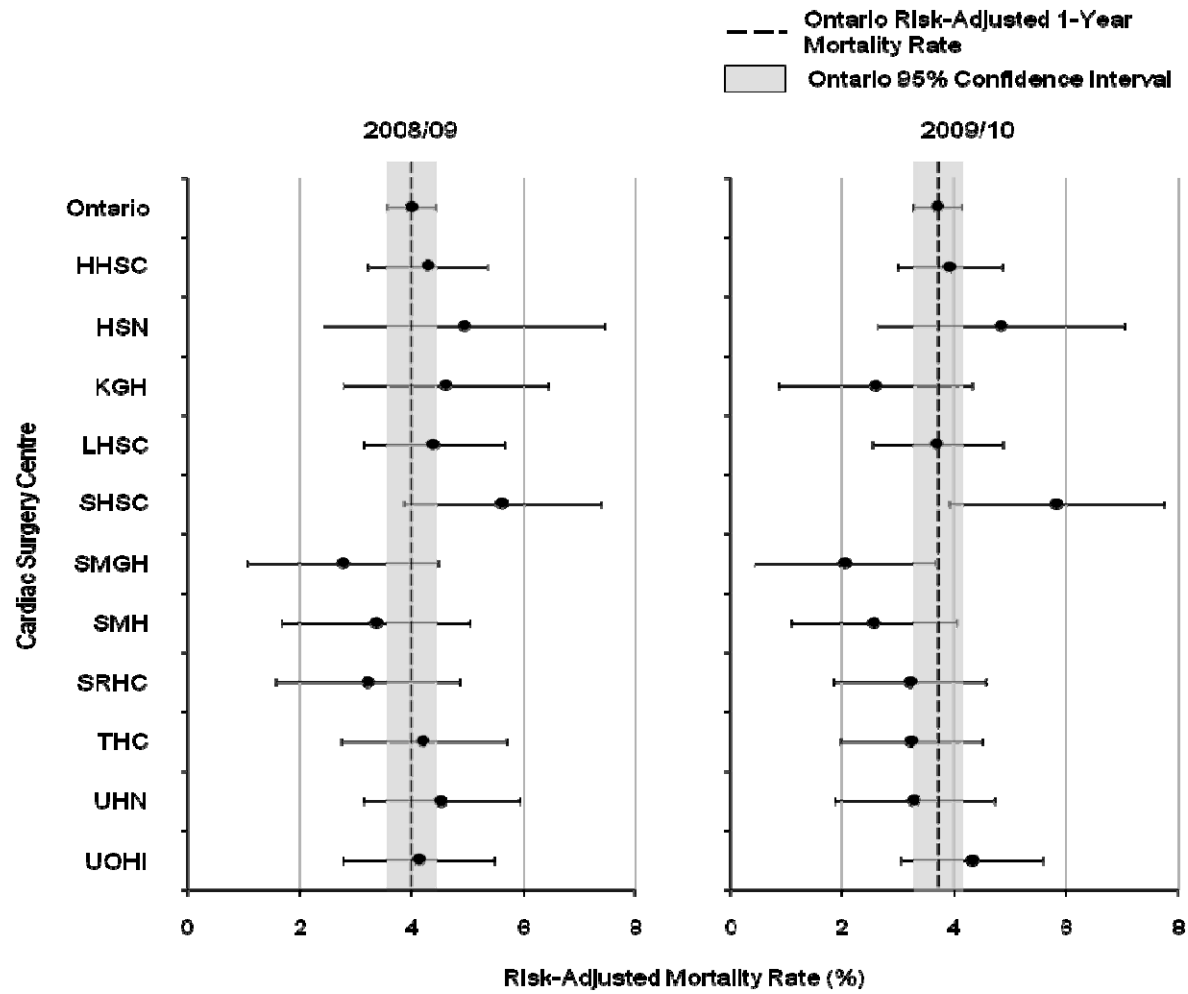
*1-year mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

Table 11b - 1-Year Mortality Rate Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	986	5.07	4.76	3.93 (2.98 - 4.88)
HSN	307	4.23	3.22	4.85 (2.64 - 7.06)
KGH	444	2.48	3.51	2.61 (0.89 - 4.33)
LHSC	767	4.04	4.02	3.71 (2.54 - 4.89)
SHSC†	412	4.85	3.07	5.84 (3.93 - 7.76)
SMGH†	426	2.35	4.2	2.06 (0.45 - 3.67)
SMH	684	2.19	3.15	2.57 (1.09 - 4.05)
SRHC	734	3	3.44	3.22 (1.85 - 4.58)
THC	747	3.21	3.65	3.25 (1.98 - 4.51)
UHN	599	3.34	3.74	3.29 (1.87 - 4.72)
UOHI	559	5.37	4.57	4.34 (3.06 - 5.61)
Overall	6665	3.69	3.84	3.71 (3.28 - 4.15)

*1-year mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

Figure 3 - Risk-Adjusted 1-Year Mortality Rate Following Isolated CABG Surgery



**Table 12a - Post-Operative LOS Following Isolated CABG Surgery in 2008/09**

Cardiac Centre	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	7.42	7.64	7.25 (7.12 - 7.37)
HSN†	8.32	7.32	8.48 (8.29 - 8.68)
KGH†	6.04	7.36	6.12 (5.96 - 6.28)
LHSC	7.36	7.4	7.43 (7.31 - 7.55)
SHSC†	7.62	7.18	7.91 (7.75 - 8.07)
SMGH	7.47	7.47	7.46 (7.29 - 7.63)
SMH†	6.63	7.11	6.96 (6.84 - 7.07)
SRHC†	6.84	7.18	7.1 (6.99 - 7.22)
THC†	7.45	7.3	7.62 (7.5 - 7.74)
UHN†	8.16	7.54	8.07 (7.92 - 8.23)
UOHI†	9.23	7.66	8.99 (8.83 - 9.16)
Overall	7.46	7.39	7.43 (7.39 - 7.47)

*LOS: CIHI DAD; Patients who died in hospital and whose post-operative LOS exceeded the 99th percentile were excluded; †Risk-adjusted rate is significantly different than provincial average

Table 12b - Post-Operative LOS Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	7.68	7.71	7.35 (7.21 - 7.48)
HSN†	7.76	7.31	7.83 (7.65 - 8.01)
KGH†	5.81	7.32	5.86 (5.71 - 6.01)
LHSC	7.28	7.37	7.29 (7.15 - 7.42)
SHSC†	8	7.09	8.32 (8.17 - 8.48)
SMGH†	7.11	7.47	7.02 (6.85 - 7.2)
SMH†	6.79	7.25	6.9 (6.78 - 7.03)
SRHC†	6.8	7.2	6.97 (6.85 - 7.09)
THC†	7.5	7.27	7.61 (7.48 - 7.74)
UHN†	8.17	7.32	8.24 (8.11 - 8.37)
UOHI†	8.28	7.61	8.03 (7.87 - 8.2)
Overall	7.38	7.38	7.36 (7.32 - 7.41)

*LOS: CIHI DAD; Patients who died in hospital and whose post-operative LOS exceeded the 99th percentile were excluded; †Risk-adjusted rate is significantly different than provincial average

Table 12c - Post-Operative LOS Following Isolated CABG Surgery in 2010/11

Cardiac Centre	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	7.34	7.72	6.89 (6.76 - 7.02)
HSN†	8.13	7.18	8.19 (8 - 8.38)
KGH†	5.65	7.15	5.72 (5.58 - 5.86)
LHSC†	7.05	7.3	6.99 (6.85 - 7.13)
SHSC†	7.97	6.97	8.27 (8.12 - 8.42)
SMGH†	7.92	7.56	7.58 (7.4 - 7.76)
SMH†	6.89	7.04	7.08 (6.96 - 7.2)
SRHC†	6.93	7.09	7.07 (6.95 - 7.19)
THC	7.32	7.26	7.3 (7.17 - 7.43)
UHN	7.33	7.34	7.22 (7.08 - 7.36)
UOHI†	7.82	7.53	7.51 (7.34 - 7.68)
Overall	7.24	7.31	7.29 (7.24 - 7.33)

*LOS: CIHI DAD; Patients who died in hospital and whose post-operative LOS exceeded the 99th percentile were excluded; †Risk-adjusted rate is significantly different than provincial average

**Table 13a - Red Blood Cell Transfusion Rate for Isolated CABG Surgery in 2008/09**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	992	50.5	41.55	49.8 (47.11 - 52.49)
HSN†	250	30.8	36.89	34.21 (28.2 - 40.23)
KGH†	451	47.23	37.34	51.83 (47.35 - 56.3)
LHSC†	870	29.77	37.63	32.41 (29.27 - 35.56)
SHSC†	464	49.35	36.98	54.68 (50.26 - 59.1)
SMGH†	436	23.39	42.34	22.64 (18.56 - 26.72)
SMH†	681	49.05	36.85	54.54 (50.89 - 58.2)
SRHC	670	36.12	37.24	39.74 (36.06 - 43.42)
THC	770	36.49	37.48	39.9 (36.5 - 43.3)
UHN†	632	54.43	39.4	56.61 (53.02 - 60.2)
UOHI†	593	35.08	40.04	35.9 (32.31 - 39.49)
Overall	6809	40.98		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 13b - Red Blood Cell Transfusion Rate for Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	986	44.22	41.16	39.72 (37.25 - 42.18)
HSN†	307	25.41	35.6	26.39 (21.33 - 31.45)
KGH†	444	45.95	36.77	46.2 (42.07 - 50.32)
LHSC†	767	25.42	37.02	25.39 (22.31 - 28.47)
SHSC	412	36.89	33.73	40.44 (35.84 - 45.04)
SMGH†	426	23.24	43.24	19.87 (16.19 - 23.55)
SMH	684	40.5	37.32	40.12 (36.85 - 43.39)
SRHC	734	36.38	37.49	35.87 (32.72 - 39.03)
THC†	747	33.2	37.54	32.7 (29.58 - 35.81)
UHN†	599	53.59	37.5	52.83 (49.36 - 56.31)
UOHI†	559	33.45	39.09	31.64 (28.24 - 35.03)
Overall	6665	36.97		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 13c - Red Blood Cell Transfusion Rate for Isolated CABG Surgery in 2010/11

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	981	46.79	40.82	41.46 (39.04 - 43.88)
HSN	249	32.93	34.99	34.05 (28.46 - 39.64)
KGH	434	34.1	36.01	34.26 (30.1 - 38.41)
LHSC†	736	25	35.74	25.3 (22.12 - 28.48)
SHSC	377	34.48	33.18	37.59 (32.88 - 42.31)
SMGH†	413	24.46	42.54	20.79 (17.11 - 24.48)
SMH	661	36.61	34.62	38.25 (34.79 - 41.71)
SRHC	681	38.47	35.8	38.87 (35.55 - 42.19)
THC†	744	31.72	38.98	29.43 (26.49 - 32.37)
UHN†	537	47.49	38.1	45.09 (41.55 - 48.63)
UOHI	490	36.94	38.29	34.9 (31.23 - 38.56)
Overall	6303	36.17		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

**Table 14a - Plasma or Platelet Transfusion Rate for Isolated CABG Surgery in 2008/09**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	992	28.13	20.15	26.46 (24.23 - 28.69)
HSN	250	13.6	16.03	16.09 (10.82 - 21.35)
KGHT†	451	25.28	17.92	26.74 (23.11 - 30.37)
LHSC†	870	12.3	17.68	13.19 (10.55 - 15.83)
SHSC†	464	23.49	17.14	25.99 (22.3 - 29.67)
SMGHT†	436	9.17	19.34	8.99 (5.45 - 12.54)
SMH	681	16.3	16.55	18.67 (15.53 - 21.8)
SRHC†	670	12.99	18	13.67 (10.7 - 16.65)
THC†	770	21.69	16.63	24.72 (21.79 - 27.65)
UHN	632	20.57	18.34	21.26 (18.25 - 24.28)
UOHI	593	19.06	19.04	18.97 (15.95 - 21.99)
Overall	6809	18.96		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 14b - Plasma or Platelet Transfusion Rate for Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	986	30.53	20.36	24.82 (22.89 - 26.75)
HSN	307	15.64	15.1	17.14 (12.82 - 21.46)
KGHT†	444	22.75	16.9	22.27 (18.94 - 25.6)
LHSC†	767	9.78	17.47	9.26 (6.81 - 11.71)
SHSC†	412	11.17	15.59	11.85 (8.22 - 15.49)
SMGHT†	426	10.33	19.23	8.89 (5.76 - 12.03)
SMHT†	684	7.75	17.16	7.47 (4.82 - 10.12)
SRHC†	734	12.94	17.97	11.92 (9.43 - 14.41)
THC	747	16.2	17.07	15.7 (13.17 - 18.24)
UHN†	599	22.2	18.11	20.29 (17.56 - 23.02)
UOHI	559	15.38	18.41	13.83 (11.07 - 16.58)
Overall	6665	16.55		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 14c - Plasma or Platelet Transfusion Rate for Isolated CABG Surgery in 2010/11

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	981	38.33	20.14	34.3 (32.18 - 36.42)
HSN	249	11.65	15.68	13.39 (8.27 - 18.51)
KGH	434	19.82	16.45	21.71 (17.98 - 25.44)
LHSC†	736	10.33	17.21	10.82 (8.06 - 13.57)
SHSC†	377	20.42	15.1	24.37 (20.15 - 28.6)
SMGH†	413	9.2	18.52	8.95 (5.38 - 12.53)
SMH†	661	7.56	15.88	8.59 (5.5 - 11.67)
SRHC†	681	11.75	17.39	12.18 (9.3 - 15.05)
THC†	744	11.56	17.52	11.89 (9.18 - 14.61)
UHN†	537	25.33	17.55	26 (22.79 - 29.21)
UOHI	490	20.82	19.34	19.4 (16.3 - 22.51)
Overall	6303	18.02		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average



Table 15a - Post-Operative Complications: Renal Failure Rate for Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	992	5.65	5.81	5.71 (4.32 - 7.1)
HSN	250	5.2	5.5	5.56 (2.68 - 8.43)
KGH	451	5.54	5.28	6.16 (4.02 - 8.31)
LHSC	870	4.37	5.73	4.47 (3 - 5.95)
SHSC	464	3.88	5.17	4.41 (2.27 - 6.55)
SMGH	436	7.11	5.84	7.15 (5.06 - 9.24)
SMH†	681	9.4	5.07	10.88 (9.08 - 12.69)
SRHC	670	5.22	4.52	6.79 (4.82 - 8.77)
THC	770	4.55	5.47	4.88 (3.25 - 6.51)
UHN	632	6.49	5.43	7.02 (5.19 - 8.84)
UOHI	593	7.42	7.07	6.16 (4.58 - 7.75)
Overall	6809	5.87		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 15b - Post-Operative Complications: Renal Failure Rate for Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	986	5.58	6.46	4.86 (3.62 - 6.1)
HSN	307	3.58	5.74	3.51 (1.09 - 5.93)
KGH	444	3.15	4.98	3.56 (1.39 - 5.73)
LHSC†	767	3.65	5.43	3.78 (2.23 - 5.33)
SHSC	412	4.61	4.84	5.36 (3.06 - 7.66)
SMGH†	426	8.92	6.06	8.28 (6.29 - 10.27)
SMH†	684	7.46	4.85	8.66 (6.87 - 10.44)
SRHC	734	5.04	4.99	5.69 (3.99 - 7.39)
THC	747	6.29	5.76	6.15 (4.62 - 7.68)
UHN	599	6.84	5.16	7.46 (5.62 - 9.31)
UOHI	559	6.08	8.09	4.23 (2.79 - 5.67)
Overall	6665	5.63		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 15c - Post-Operative Complications: Renal Failure Rate for Isolated CABG Surgery in 2010/11

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	981	5.2	6.69	4.08 (2.94 - 5.22)
HSN	249	3.61	4.81	3.95 (1.17 - 6.72)
KGH	434	5.76	4.73	6.39 (4.26 - 8.53)
LHSC	736	4.89	5.76	4.46 (3.04 - 5.88)
SHSC	377	4.51	4.91	4.82 (2.62 - 7.02)
SMGH	413	6.54	6.4	5.37 (3.55 - 7.18)
SMH†	661	6.96	4.69	7.78 (6.06 - 9.51)
SRHC	681	4.11	4.53	4.77 (3.03 - 6.51)
THC	744	6.45	5.9	5.75 (4.34 - 7.15)
UHN	537	3.91	4.91	4.19 (2.31 - 6.06)
UOHI	490	4.69	6.32	3.9 (2.23 - 5.57)
Overall	6303	5.25		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average



Table 16a - Post-Operative Complications: Stroke Rate for Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	992	2.42	1.66	1.75 (1.21 - 2.29)
HSN	250	0	0.9	0 (0 - 1.5)
KGH	451	≤5	≤5	1.08 (0.01 - 2.14)
LHSC	870	1.26	0.9	1.7 (0.89 - 2.5)
SHSC	464	1.72	1.44	1.44 (0.61 - 2.28)
SMGH	436	≤5	≤5	1.08 (0.13 - 2.02)
SMH†	681	1.62	0.87	2.25 (1.32 - 3.17)
SRHC†	670	≤5	≤5	0.32 (0 - 1.13)
THC	770	≤5	≤5	0.85 (0 - 1.69)
UHN	632	1.27	1.78	0.86 (0.2 - 1.51)
UOHI	593	≤5	≤5	0.71 (0 - 1.57)
Overall	6809	1.2		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 16b - Post-Operative Complications: Stroke Rate for Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	986	1.83	1.62	1.55 (0.93 - 2.18)
HSN	307	≤5	≤5	2.07 (0.66 - 3.49)
KGH	444	1.35	1.36	1.37 (0.33 - 2.42)
LHSC	767	1.43	1.1	1.79 (0.91 - 2.68)
SHSC	412	≤5	≤5	1.7 (0.45 - 2.95)
SMGH	426	≤5	≤5	1.1 (0 - 2.22)
SMH	684	1.61	1.01	2.2 (1.22 - 3.17)
SRHC	734	1.36	1.07	1.76 (0.84 - 2.68)
THC	747	1.07	0.97	1.52 (0.57 - 2.47)
UHN	599	≤5	≤5	0.84 (0 - 1.73)
UOHI	559	1.61	1.04	2.14 (1.1 - 3.18)
Overall	6665	1.38		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 16c - Post-Operative Complications: Stroke Rate for Isolated CABG Surgery in 2010/11

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	981	0.92	1.49	0.57 (0.13 - 1)
HSN	249	≤5	≤5	0.31 (0 - 1.31)
KGH	434	≤5	≤5	0.21 (0 - 1.02)
LHSC	736	1.63	1.15	1.3 (0.72 - 1.89)
SHSC	377	≤5	≤5	1.05 (0 - 2.11)
SMGH	413	1.45	1.36	0.98 (0.26 - 1.71)
SMH	661	≤5	≤5	0.85 (0.11 - 1.59)
SRHC†	681	0	0.95	0 (0 - 0.67)
THC	744	1.21	1.04	1.07 (0.46 - 1.68)
UHN	537	1.68	1.55	0.99 (0.4 - 1.59)
UOHI	490	≤5	≤5	0.62 (0 - 1.42)
Overall	6303	0.92		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average



Table 17a - CATH Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	967	3.41	4.65	3.42 (2.09 - 4.74)
HSN	244	5.74	4.71	5.67 (3.05 - 8.29)
KGH†	444	6.53	4.57	6.65 (4.68 - 8.62)
LHSC	858	3.85	4.59	3.9 (2.48 - 5.31)
SHSC	452	5.09	4.61	5.13 (3.19 - 7.08)
SMGH	432	3.01	4.36	3.21 (1.16 - 5.27)
SMH	671	5.22	4.69	5.18 (3.59 - 6.76)
SRHC	663	5.58	4.46	5.82 (4.18 - 7.45)
THC	757	3.96	4.56	4.04 (2.53 - 5.56)
UHN	618	5.83	4.66	5.81 (4.16 - 7.47)
UOHI	579	4.84	4.84	4.65 (2.97 - 6.32)
Overall	6685	4.65		

*Post discharge CATH: CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 17b - CATH Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	965	3.52	4.55	3.51 (2.2 - 4.81)
HSN	301	3.99	4.57	3.95 (1.62 - 6.28)
KGH	443	4.51	4.55	4.49 (2.57 - 6.42)
LHSC	751	5.99	4.58	5.93 (4.45 - 7.4)
SHSC	402	5.47	4.52	5.48 (3.45 - 7.51)
SMGH	418	3.59	4.47	3.63 (1.63 - 5.63)
SMH	678	4.57	4.59	4.51 (2.96 - 6.06)
SRHC	727	4.13	4.49	4.16 (2.65 - 5.68)
THC†	737	2.58	4.57	2.56 (1.07 - 4.05)
UHN†	586	7.17	4.57	7.1 (5.43 - 8.77)
UOHI	548	4.93	4.82	4.63 (2.95 - 6.31)
Overall	6556	4.53		

*Post discharge CATH: CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 18a - AMI Readmission Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	967	1.55	1.88	1.36 (0.61 - 2.1)
HSN	244	2.87	1.63	2.89 (1.29 - 4.49)
KGH	444	2.7	1.6	2.78 (1.59 - 3.98)
LHSC	858	1.28	1.53	1.38 (0.5 - 2.25)
SHSC	452	1.99	1.49	2.2 (0.97 - 3.43)
SMGH	432	1.62	1.79	1.49 (0.35 - 2.63)
SMH	671	1.79	1.54	1.91 (0.92 - 2.9)
SRHC	663	1.36	1.35	1.66 (0.59 - 2.72)
THC	757	1.19	1.57	1.25 (0.32 - 2.17)
UHN	618	1.78	1.71	1.72 (0.74 - 2.69)
UOHI	579	1.38	1.88	1.21 (0.25 - 2.17)
Overall	6685	1.65		

*Post discharge AMI: CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 18b - AMI Readmission Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	965	1.76	1.88	1.53 (0.79 - 2.26)
HSN	301	2.66	1.67	2.59 (1.19 - 3.99)
KGH	443	≤5	≤5	0.92 (0 - 2.1)
LHSC	751	1.46	1.65	1.45 (0.55 - 2.34)
SHSC	402	≤5	≤5	1.25 (0 - 2.63)
SMGH	418	2.39	1.96	2 (0.9 - 3.09)
SMH	678	2.51	1.64	2.49 (1.55 - 3.44)
SRHC	727	0.83	1.4	0.96 (0 - 1.95)
THC	737	1.9	1.58	1.97 (1.04 - 2.9)
UHN	586	1.19	1.47	1.33 (0.25 - 2.41)
UOHI	548	1.64	1.79	1.49 (0.49 - 2.5)
Overall	6556	1.63		

*Post discharge AMI: CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average



Table 19a - Revascularization Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	967	1.86	2.1	1.84 (0.95 - 2.74)
HSN	244	2.46	2.13	2.41 (0.64 - 4.17)
KGH	444	2.93	2.16	2.82 (1.52 - 4.12)
LHSC	858	1.86	2.11	1.84 (0.89 - 2.79)
SHSC	452	1.99	2.15	1.93 (0.63 - 3.22)
SMGH	432	≤5	≤5	0.95 (0 - 2.31)
SMH	671	2.53	2.18	2.42 (1.37 - 3.47)
SRHC	663	2.71	2.16	2.62 (1.55 - 3.68)
THC	757	1.45	2.14	1.41 (0.41 - 2.41)
UHN	618	2.1	2.15	2.03 (0.93 - 3.14)
UOHI	579	2.42	2.09	2.41 (1.25 - 3.57)
Overall	6685	2.08		

*Post discharge revascularization (PCI/CABG): CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 19b - Revascularization Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	965	1.24	2.04	1.31 (0.37 - 2.25)
HSN	301	2.33	2.14	2.33 (0.69 - 3.97)
KGH†	443	3.84	2.11	3.91 (2.54 - 5.27)
LHSC†	751	3.46	2.14	3.47 (2.44 - 4.51)
SHSC	402	2.99	2.1	3.06 (1.62 - 4.49)
SMGH	418	≤5	≤5	1.25 (0 - 2.67)
SMH	678	2.06	2.17	2.05 (0.96 - 3.13)
SRHC	727	1.65	2.13	1.66 (0.61 - 2.72)
THC	737	1.22	2.12	1.24 (0.18 - 2.29)
UHN	586	2.22	2.09	2.28 (1.09 - 3.47)
UOHI	548	2.55	2.02	2.71 (1.46 - 3.97)
Overall	6556	2.15		

*Post discharge revascularization (PCI/CABG): CIHI DAD/SDS; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 20a - MACE Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2008/09

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	967	5.38	5.62	4.95 (3.63 - 6.27)
HSN	244	6.15	4.75	6.71 (3.81 - 9.6)
KGH	444	6.98	5.32	6.8 (4.79 - 8.81)
LHSC	858	5.48	5.4	5.25 (3.82 - 6.68)
SHSC	452	5.53	4.81	5.96 (3.85 - 8.06)
SMGH	432	4.4	4.95	4.59 (2.48 - 6.71)
SMH	671	4.62	4.61	5.18 (3.42 - 6.95)
SRHC	663	4.68	4.86	4.98 (3.25 - 6.71)
THC	757	4.1	4.83	4.39 (2.77 - 6.02)
UHN	618	5.5	5.65	5.04 (3.39 - 6.68)
UOHI	579	5.18	5.62	4.77 (3.07 - 6.48)
Overall	6685	5.18		

*MACE: A combination of death/MI readmission/revascularization; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

Table 20b - MACE Rate 1-Year Post-Discharge Following Isolated CABG Surgery in 2009/10

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	965	5.28	5.46	4.9 (3.59 - 6.22)
HSN	301	6.98	4.75	7.43 (4.89 - 9.97)
KGH	443	6.32	5.13	6.24 (4.23 - 8.25)
LHSC	751	5.99	5.23	5.8 (4.28 - 7.33)
SHSC	402	5.72	4.45	6.51 (4.24 - 8.79)
SMGH	418	3.83	4.92	3.94 (1.83 - 6.05)
SMH	678	4.87	4.76	5.18 (3.49 - 6.87)
SRHC	727	3.85	5.05	3.86 (2.28 - 5.44)
THC	737	4.21	4.85	4.39 (2.79 - 5.99)
UHN	586	4.1	5.19	3.99 (2.26 - 5.73)
UOHI	548	5.84	5.34	5.54 (3.78 - 7.3)
Overall	6556	5.06		

*MACE: A combination of death/MI readmission/revascularization; Only applies to patients discharged alive; †Risk-adjusted rate is significantly different than provincial average

**Table 21 - Arterial Graft Use and Off-Pump Use for Isolated CABG Surgery**

Cardiac Centre	Arterial Graft Use			Off-Pump Use		
	2008/09	2009/10	2010/11	2008/09	2009/10	2010/11
HHSC	95.8%	95.4%	95.2%	12.6%	15.8%	12.7%
HSN	68.8%	74.6%	85.9%	≤5	0.0%	≤5
KGH	90.2%	93.9%	96.1%	6.7%	2.5%	4.4%
LHSC	97.2%	98.3%	96.7%	8.6%	12.1%	9.8%
SHSC	98.1%	96.1%	94.7%	19.0%	17.2%	16.7%
SMGH	98.9%	98.1%	97.6%	3.2%	4.7%	7.5%
SMH	92.5%	94.9%	95.0%	0.0%	≤5	0.0%
SRHC	95.8%	95.4%	96.2%	2.1%	11.4%	3.7%
THC	97.1%	96.0%	96.4%	89.7%	87.4%	91.3%
UHN	89.4%	90.5%	91.2%	11.1%	6.5%	10.1%
UOHI	91.2%	93.7%	96.3%	19.4%	11.8%	8.2%

*Arterial graft use: OHIP billing; Off-Pump use: CCN.

Table 22 - In-Hospital Mortality Rate Following Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	1.98	3.17	1.46 (0.08 - 2.84)
HSN	230	≤5	≤5	1.12 (0 - 3.26)
KGH	92	≤5	≤5	3.45 (0 - 7.31)
LHSC†	381	4.2	2.35	4.17 (2.71 - 5.63)
SHSC	186	4.84	3.03	3.74 (1.98 - 5.5)
SMGH	103	≤5	≤5	0.92 (0 - 3.71)
SMH	351	3.13	2.25	3.26 (1.71 - 4.8)
SRHC	181	≤5	≤5	2.86 (0.4 - 5.31)
THC	145	≤5	≤5	1.32 (0 - 3.67)
UHN	250	≤5	≤5	0.91 (0 - 2.8)
UOHI	387	1.55	2.3	1.58 (0.11 - 3.04)
Overall	2609	2.34		

*In-hospital mortality: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 23 - 30-Day Mortality Rate Following Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	1.98	2.63	1.53 (0.2 - 2.85)
HSN	230	≤5	≤5	0.48 (0 - 2.32)
KGH	92	≤5	≤5	1.53 (0 - 4.93)
LHSC†	381	3.41	1.98	3.49 (2.12 - 4.87)
SHSC†	186	4.84	2.61	3.77 (2.09 - 5.45)
SMGH	103	≤5	≤5	1.29 (0 - 4.41)
SMH	351	2.56	2.21	2.35 (0.98 - 3.73)
SRHC	181	≤5	≤5	2.44 (0.33 - 4.56)
THC	145	≤5	≤5	1.72 (0 - 3.76)
UHN	250	≤5	≤5	0.92 (0 - 2.73)
UOHI	387	≤5	≤5	1.27 (0 - 2.8)
Overall	2609	2.03		

*30-day mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

**Table 24 - Post-Operative LOS Following Isolated AVR Surgery**

Cardiac Centre	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	8.2	9.19	7.93 (7.66 - 8.21)
HSN†	8.87	8.56	9.2 (8.94 - 9.46)
KGHT†	7.16	8.47	7.51 (7.17 - 7.85)
LHSC	8.71	8.82	8.77 (8.56 - 8.98)
SHSC†	10.18	8.98	10.07 (9.72 - 10.43)
SMGH	8.81	8.83	8.87 (8.46 - 9.28)
SMH†	8.51	8.88	8.52 (8.31 - 8.74)
SRHC	8.97	8.87	8.99 (8.66 - 9.31)
THC	9.71	9.46	9.12 (8.73 - 9.51)
UHN†	8.22	8.69	8.41 (8.17 - 8.65)
UOHI†	9.88	8.92	9.84 (9.63 - 10.06)
Overall	8.89		

*LOS: CIHI DAD; Patients who died in hospital and whose post-operative LOS exceeded the 99th percentile were excluded; †Risk-adjusted rate is significantly different than provincial average

Table 25 - Red Blood Cell Transfusion Rate for Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	49.83	47.69	47.02 (42.23 - 51.82)
HSN†	230	33.04	40.19	37 (30.51 - 43.49)
KGHT†	92	52.17	39.79	59 (48.53 - 69.48)
LHSC†	381	35.17	43.9	36.05 (31.36 - 40.74)
SHSC†	186	54.84	47.03	52.47 (46.18 - 58.76)
SMGH†	103	19.42	48.93	17.86 (9.68 - 26.03)
SMH	351	45.01	46.31	43.74 (39.06 - 48.41)
SRHC	181	41.99	43.89	43.05 (36.23 - 49.87)
THC†	145	57.24	49.25	52.3 (45.48 - 59.12)
UHN†	250	57.2	43.5	59.17 (53.31 - 65.02)
UOHI	387	47.29	44.74	47.56 (42.96 - 52.15)
Overall	2609	45		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 26 - Plasma or Platelet Transfusion Rate for Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	27.06	23.85	25.35 (20.98 - 29.73)
HSN†	230	14.78	20	16.52 (10.82 - 22.22)
KGH	92	25	20.68	27.02 (18.21 - 35.83)
LHSC	381	23.88	22.89	23.32 (19.3 - 27.34)
SHSC	186	28.49	23.82	26.74 (21.12 - 32.35)
SMGH†	103	13.59	26.06	11.66 (4.51 - 18.8)
SMH†	351	15.1	22.38	15.07 (10.81 - 19.34)
SRHC	181	20.99	20.96	22.39 (16.16 - 28.62)
THC	145	22.76	22.84	22.26 (15.72 - 28.8)
UHN†	250	33.2	20.74	35.78 (30.47 - 41.08)
UOHI	387	20.41	22.2	20.55 (16.45 - 24.64)
Overall	2609	22.35		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 27 - Post-Operative Complications: Renal Failure Rate Following Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	6.93	7.11	6.68 (4.1 - 9.27)
HSN†	230	3.48	6.94	3.44 (0.43 - 6.45)
KGH	92	≤5	≤5	5.41 (0 - 10.94)
LHSC	381	6.82	6.4	7.31 (4.82 - 9.81)
SHSC	186	9.14	7.53	8.33 (5.18 - 11.48)
SMGH	103	8.74	6.71	8.94 (4.35 - 13.53)
SMH†	351	9.97	6.96	9.83 (7.41 - 12.25)
SRHC	181	8.29	6.29	9.04 (5.45 - 12.62)
THC	145	10.34	8.82	8.04 (4.75 - 11.34)
UHN†	250	≤5	≤5	2.58 (0 - 6.02)
UOHI	387	6.2	7.54	5.64 (3.42 - 7.87)
Overall	2609	6.86		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

**Table 28 - Post-Operative Complications: Stroke Rate Following Isolated AVR Surgery**

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	303	2.31	2.35	1.89 (0.6 - 3.18)
HSN	230	≤5	≤5	1.18 (0 - 3.06)
KGH	92	≤5	≤5	2.36 (0.21 - 4.51)
LHSC	381	2.36	1.79	2.53 (1.25 - 3.81)
SHSC†	186	5.38	2.27	4.54 (2.93 - 6.16)
SMGH	103	0	1.57	0 (0 - 2.75)
SMH	351	1.71	1.57	2.09 (0.6 - 3.58)
SRHC	181	≤5	≤5	1.06 (0 - 2.89)
THC	145	≤5	≤5	0.67 (0 - 2.68)
UHN	250	≤5	≤5	0.93 (0 - 2.27)
UOHI	387	1.81	1.65	2.1 (0.74 - 3.47)
Overall	2609	1.92		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 29 - CHF Readmission Rate 1-Year Post-Discharge Following Isolated AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	184	8.15	5.51	7 (4.34 - 9.66)
HSN	161	4.35	4	5.15 (1.77 - 8.54)
KGH	56	≤5	≤5	2.47 (0 - 8.82)
LHSC	245	6.94	4.7	6.99 (4.46 - 9.51)
SHSC	114	7.02	4.95	6.72 (3.07 - 10.36)
SMGH	66	≤5	≤5	3.73 (0 - 9.28)
SMH	211	2.84	4.59	2.93 (0.13 - 5.74)
SRHC	107	6.54	4.7	6.59 (2.85 - 10.34)
THC	100	≤5	≤5	3.2 (0 - 6.73)
UHN†	163	≤5	≤5	1.29 (0 - 4.42)
UOHI	240	3.75	4.93	3.6 (1.07 - 6.14)
Overall	1647	4.74		

*Post-discharge readmissions: CIHI DAD; This applies to patients discharged alive with a procedure data before Sept. 30, 2010; †Risk-adjusted rate is significantly different than provincial average

Table 30 - In-Hospital Mortality Rate Following Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	452	5.53	5.35	4.96 (3.2 - 6.71)
HSN	135	5.19	4.01	6.21 (2.39 - 10.03)
KGH	121	≤5	≤5	4.45 (0.26 - 8.64)
LHSC	307	4.23	4.15	4.9 (2.44 - 7.35)
SHSC†	100	12	6.22	9.26 (5.83 - 12.69)
SMGH	90	≤5	≤5	4.94 (0 - 10.31)
SMH	151	4.64	4.75	4.68 (1.35 - 8.02)
SRHC	164	4.27	4.54	4.51 (1.34 - 7.67)
THC	198	5.56	5.34	4.99 (2.33 - 7.66)
UHN	316	3.16	4.65	3.26 (0.96 - 5.57)
UOHI	300	4.33	5.44	3.82 (1.67 - 5.98)
Overall	2334	4.8		

*In-hospital mortality: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 31 - 30-Day Mortality Rate Following Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	452	5.09	4.34	4.67 (3.02 - 6.33)
HSN	135	4.44	2.59	6.83 (2.78 - 10.88)
KGH	121	≤5	≤5	4.27 (0.41 - 8.13)
LHSC	307	3.26	3.77	3.45 (1.29 - 5.6)
SHSC†	100	11	4.81	9.12 (5.76 - 12.48)
SMGH	90	≤5	≤5	3.26 (0 - 8.15)
SMH	151	4.64	4.02	4.59 (1.56 - 7.63)
SRHC	164	≤5	≤5	3.63 (0.43 - 6.83)
THC	198	4.55	4.25	4.26 (1.73 - 6.79)
UHN	316	2.53	4.15	2.43 (0.38 - 4.48)
UOHI	300	2.67	4.75	2.24 (0.29 - 4.19)
Overall	2334	3.98		

*30-day mortality: RPDB; †Risk-adjusted rate is significantly different than provincial average

**Table 32 - Post-Operative LOS Following Combined CABG/AVR Surgery**

Cardiac Centre	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	9.95	11.53	9.7 (9.4 - 9.99)
HSN†	9.59	10.27	10.5 (10.13 - 10.87)
KGH	10.26	10.27	11.23 (10.78 - 11.67)
LHSC†	11.51	10.86	11.9 (11.58 - 12.22)
SHSC†	12.86	11.52	12.54 (11.92 - 13.15)
SMGH†	9.79	10.74	10.25 (9.79 - 10.71)
SMH†	10.87	11.49	10.63 (10.13 - 11.13)
SRHC†	12.6	11.2	12.64 (12.21 - 13.07)
THC†	12.75	11.71	12.23 (11.79 - 12.67)
UHN†	10.86	11.37	10.73 (10.41 - 11.05)
UOHI†	12.81	11.51	12.51 (12.17 - 12.85)
Overall	11.23		

*LOS: CIHI DAD; Patients who died in hospital and whose post-operative LOS exceeded the 99th percentile were excluded; †Risk-adjusted rate is significantly different than provincial average

Table 33 - Red Blood Cell Transfusion Rate for Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	452	69.47	67.67	66.41 (62.61 - 70.22)
HSN†	135	47.41	59.74	51.34 (43.05 - 59.62)
KGH†	121	70.25	59.93	75.83 (67 - 84.67)
LHSC†	307	51.47	60.61	54.93 (49.47 - 60.4)
SHSC	100	75	67.2	72.21 (64.03 - 80.38)
SMGH†	90	37.78	64.11	38.12 (28.57 - 47.67)
SMH	151	66.89	67.59	64.03 (57.41 - 70.64)
SRHC	164	63.41	61.93	66.25 (58.91 - 73.59)
THC	198	72.73	66.79	70.45 (64.53 - 76.36)
UHN†	316	74.37	64.32	74.8 (69.81 - 79.78)
UOHI	300	65.33	66.95	63.13 (58.37 - 67.9)
Overall	2334	64.7		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 34 - Plasma or Platelet Transfusion Rate for Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC†	452	52.21	43.1	49.35 (45.24 - 53.47)
HSN	135	31.85	37.1	34.98 (26.29 - 43.67)
KGH	121	39.67	36.99	43.7 (34.47 - 52.93)
LHSC†	307	28.99	37.96	31.12 (25.5 - 36.75)
SHSC	100	45	43.41	42.24 (33.55 - 50.93)
SMGH†	90	20	41.5	19.63 (9.79 - 29.48)
SMH†	151	33.11	42.99	31.39 (24.2 - 38.57)
SRHC	164	40.24	40.09	40.9 (33.5 - 48.31)
THC	198	44.44	41.87	43.25 (36.84 - 49.67)
UHN†	316	56.01	39.97	57.1 (51.78 - 62.41)
UOHI†	300	30.33	41.39	29.86 (24.6 - 35.12)
Overall	2334	40.75		

*Blood transfusions: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 35 - Post-Operative Complications: Renal Failure Rate Following Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	452	13.72	13.58	12.81 (9.99 - 15.64)
HSN†	135	≤5	≤5	3.24 (0 - 8.97)
KGH†	121	16.53	10.05	20.85 (14.27 - 27.44)
LHSC	307	11.4	11.87	12.18 (8.44 - 15.92)
SHSC	100	14	13.27	13.38 (7.25 - 19.51)
SMGH	90	14.44	10.39	17.63 (10.1 - 25.16)
SMH	151	18.54	13.45	17.48 (12.56 - 22.4)
SRHC†	164	19.51	12.1	20.45 (15.41 - 25.49)
THC	198	13.13	13.24	12.58 (8.2 - 16.96)
UHN	316	9.49	12.39	9.72 (6.12 - 13.32)
UOHI	300	10.67	14.09	9.6 (6.19 - 13.02)
Overall	2334	12.68		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average



Table 36 - Post-Operative Complications: Stroke Rate Following Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	452	3.76	3.8	3.39 (1.94 - 4.85)
HSN	135	≤5	≤5	2.55 (0 - 6.23)
KGH	121	≤5	≤5	1.38 (0 - 5.22)
LHSC†	307	5.21	3.05	5.86 (3.89 - 7.84)
SHSC	100	7	4.62	5.19 (2.39 - 8)
SMGH	90	≤5	≤5	1.84 (0 - 6.28)
SMH	151	≤5	≤5	2.93 (0.43 - 5.42)
SRHC	164	4.27	4.3	3.41 (1.13 - 5.68)
THC†	198	≤5	≤5	0.58 (0 - 3.07)
UHN	316	4.43	4.27	3.56 (1.92 - 5.2)
UOHI	300	3	3.18	3.23 (1.28 - 5.19)
Overall	2334	3.43		

*In-hospital complications: CIHI DAD; †Risk-adjusted rate is significantly different than provincial average

Table 37 - CHF Readmission Rate 1-Year Post-Discharge Following Combined CABG/AVR Surgery

Cardiac Centre	Volume	Observed rate	Expected Rate	Adjusted Rate (95% CI)
HHSC	287	5.23	6.2	5.05 (2.41 - 7.69)
HSN	81	8.64	6.94	7.47 (2.85 - 12.09)
KGH	72	≤5	≤5	1.85 (0 - 8.15)
LHSC	197	7.61	5.2	8.79 (5.26 - 12.31)
SHSC	58	≤5	≤5	3.11 (0 - 8.79)
SMGH	61	≤5	≤5	4.89 (0 - 10.71)
SMH	109	7.34	6.63	6.64 (2.5 - 10.78)
SRHC†	91	10.99	6.05	10.9 (6.12 - 15.68)
THC	112	6.25	6.64	5.64 (1.56 - 9.73)
UHN	208	6.73	5.63	7.17 (3.89 - 10.46)
UOHI	191	3.14	6.11	3.08 (0 - 6.36)
Overall	1467	6		

* Post-discharge readmissions: CIHI DAD; This applies to patients discharged alive with a procedure data before Sept. 30, 2010; †Risk-adjusted rate is significantly different than provincial average

Table 38 - Provincial distribution of risk factors by mortality for isolated CABG surgery, isolated AVR surgery and combined CABG/AVR surgery for 2008/09 to 2010/11

Risk Factor		Isolated CABG Surgery		Isolated AVR Surgery		Combined CABG/AVR Surgery	
		In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality
Age	<65	0.8	0.7	1.2	1.1	2.8	2.2
	65-74	1.7	1.7	2.2	1.9	3.9	3.4
	>75	3.8	3.7	3.5	3	6	4.9
Sex	Male	1.5	1.4	1.8	1.4	4.1	3.3
	Female	2.6	2.7	3.1	2.8	6.6	5.7
AMI	No	1.2	1.2			4.2	3.6
	Yes	3.1	3			10.8	7.8
BMI	<25%	2.1	1.9	3.4	2.5	5.6	4.9
	25% - 30%	1.4	1.4	1.2	1.3	4.7	3.7
	>30%	1.8	1.8	2.7	2.4	4.2	3.5
	Unknown	2.5	2.5	≤5	≤5	≤5	≤5
CCS	Stable Angina	1.1	1.1			4.3	3.7
	ACS - Low risk	1.6	1.6			3.8	2.8
	ACS - Intermediate risk	1.7	1.7			7.4	5.4
	ACS - High risk	3.6	3.7			22.9	≤5
	ACS - Emergent risk	11.2	10.1			≤5	≤5
CHF	No	1.2	1.2	1.2	1.2	2.6	2.2
	Yes	5.9	5.3	5.4	4.4	9.7	8
COPD	No	1.5	1.5	2.3	2.1	4.5	3.7
	Yes	3.3	2.9	2.9	1.7	6.6	5.7
CVD	No	1.4	1.4	2	1.9	3.8	3.2
	Yes	3.9	3.8	4.5	3.2	9.6	7.8
Diabetes	No	1.6	1.6	2.1	1.9	4	3.1



Risk Factor		Isolated CABG Surgery		Isolated AVR Surgery		Combined CABG/AVR Surgery	
		In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality
Dialysis	Yes	1.9	1.8	3	2.3	6.1	5.3
	No	1.7	1.6				
Hypertension	Yes	5.5	5.8				
	No	1.4	1.3	1.5	1.1	3.6	3.1
Left Main Disease	Yes	1.8	1.8	2.7	2.4	5	4.2
	No	1.4	1.4			4.5	3.8
LVEF	≥50%	1.1	1.1	1.9	1.5	3.3	2.9
	35-49%	1.7	1.8	3.6	3.9	7.4	5.2
	20-34%	3.6	3.4	6.5	5.7	9.9	8.9
	<20%	5.5	5.7	<5	<5	<5	<5
	Unknown	3.9	3.7	<5	<5	12.2	<5
Previous CABG	No	1.7	1.6			4.3	3.6
	Yes	6	5.7			13.4	10.9
PVD	No	1.3	1.3	2.1	1.8	4.3	3.5
	Yes	4.4	4.1	5.2	3.9	7.5	6.4
Shock	No	1.4	1.4				
	Yes	32	28.1				
Creatinine	0 - 120	1.4	1.3	1.7	1.5	3.4	2.9
	120 - 180	3.4	3.1	4.7	3.8	9.1	7.3
	>180	7.6	7.7	15.8	13.2	16.5	13.6
URS	Elective	1	0.9	3.5	3.2	4	3.1
	Urgent	1.6	1.6	0	0	5.9	5.5
	Emergency	5.5	5.3	2	1.7	5.1	4.3
NYHA Class	1	1.4	1.4	1.3	1.2	2.9	2.8
	2	1.8	1.8	1.1	1.1	4.6	3.7

Risk Factor		Isolated CABG Surgery		Isolated AVR Surgery		Combined CABG/AVR Surgery	
		In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality	In-Hospital Mortality	30-Day Mortality
	3	2.7	2.5	2.7	2.2	5.7	4.5
	4	6.1	5.6	11.6	10.4	8.8	7.6
	Unknown	1.7	1.6	≤5	≤5	5.1	4.1



Table 39a - Prevalence of Risk Factors by Hospital for Isolated CABG Surgery in 2008/09

Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
Age	Mean	65.37 ±10.24	66.88 ±10.42	66.20 ±9.65	65.22 ±9.84	65.99 ±10.01	65.20 ±10.09	65.81 ±10.20	64.18 ±10.60	64.61 ±10.35	64.13 ±10.60	65.39 ±10.02	65.30 ±9.84
	<65	45.3	38.8	41.6	46.6	42.6	47.4	42.7	51	47.9	50.5	44.8	45.5
	65-74	33.5	34.9	35.6	33.5	34.8	31.7	35.3	30.7	33.6	30.3	35.1	34.6
	≥75	21.1	26.3	22.8	20	22.5	20.9	22	18.4	18.5	19.2	20.1	19.9
Sex	Female	21.8	24.6	24.8	21.1	21.7	20.5	17.9	21	20.6	21.6	22.8	21.4
AMI		26.4	26.9	30	29.7	23.8	21.1†	39.2†	26.6	16.7†	29.1	20.6†	33.9†
Atrial Fib		15.5	16.1	8.4†	10.4†	16.6	15.3	22.9†	13.5	10.7†	10.9†	18	25.3†
BMI	<25%	27.6	23.3	18†	17.5†	17.1†	30.6	81.7†	30.7	20.6†	26.9	26.1	26.6
	25-30%	38.4	41.5	34.8	40.8	43.4	42.2	8.9†	38.5	39.1	39.5	41.5	39.1
	>30%	32.2	35	39.6	37	38.7	26.5	8†	28.9	34.6	32.9	31.8	33.7
	Unknown	1.8	≤5	7.6†	4.7†	0.7†	≤5	1.4†	1.9	5.7†	0.8†	≤5	≤5
CCS	Stable Angina	53.2	50.4	56.8	42.8	49.7	59.7	71.1†	59	39.9†	51.3	52.7	62.7
	ACS - Low Risk	20.7	37.7†	32.4†	11.1†	13.9†	18.3	16.7	28.8†	25.4	18.2	10.4†	8.6†
	ACS - Intermediate Risk	17.7	3.6†	8.4†	33.5†	25.9†	14.9	5.3†	8.4†	19.9	27.5†	25.9†	19.1
	ACS - High Risk	5.6	1.8†	≤5	9.1†	8.4†	5.8	5.5	3.4†	10.6†	1.6†	8.5†	6.1
	ACS - Emergent Risk	2.8	6.5†	≤5	3.5†	2.2†	1.3†	1.4†	≤5	4.3†	1.4†	2.4	3.5†
CHF		13.1	15.1	8.4†	8.9†	12.4	10.3†	16.1	12.8	7.9†	10.3†	14.9	23.6†
COPD		11.2	10.2	10.4	15.5†	13.7	7.3†	9.9	7.6†	9.4	8.8†	15.7†	15.3†
CVD		11.5	14.6†	9.6	10.4	9.1†	12.5	12.4	9†	10.4	9.7	16.6†	10.8
Diabetes		39.7	38.8	37.2	37.3	34.7	40.3	33.9	45.8	36.7	45.1	43.8	39.8
Dialysis		1.6	2.7†	3.2†	1.3	1†	1.3	≤5	1.8	1.9	1†	1.1†	1.2†
Hypertension		79.1	79.9	83.6	70.1	79	80.8	78.2	83.7	75.1	77.4	83.7	78.2

Risk Factor	Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI	
Left Main Disease	32	28.9	38	34.1	31.6	31.3	30.5	34.7	28.1	26.2	32.4	43.8†	
LV Function	≥50%	56.9	70.9	41.6†	53.4	58.6	55.6	45.9	55.1	45.8	50.9	63.9	64.4
	35-49%	26.7	21.1†	20†	31.7	30.9	25.6	31	28.9	31.9	29.2	23.6	18.4†
	20-34%	10.9	7.3†	8†	10	6.3†	11	16.7†	12.8	14.8†	14.9†	10.3	10.3
	<20%	2.6	0.8†	≤5	2.4	2†	3.4†	4.1†	1.3†	3.7†	4.8†	1.7†	3.2
	Unknown	2.9	0†	28.4†	2.4	2.2†	4.3†	2.3†	1.9†	3.7†	≤5	≤5	3.7†
Previous CABG	1.7	1.2†	≤5	1.3†	2	1.3†	2.1	0.9†	0.9†	2.3†	2.1	2.7†	
PVD	14.8	21.8†	12.4	15.3	15.9	10.6†	16.1	10.3†	7.2†	8.3†	23.4†	17.4	
Shock	0.7	1.6†	≤5	≤5	≤5	1.3†	≤5	0†	≤5	0.8	≤5	1.5†	
Creatinine	0-120	88.8	87.8	87.6	91.1	89.4	91.4	87.6	89.1	90	86.9	91.3	84.7
	120-180	8.5	8.6	8.8	6.9	7.5	6.9	10.1	8.4	7.8	10.4	6.8†	12†
	>180	2.7	3.6†	3.6†	2†	3.1	1.7†	2.3	2.5	2.2	2.7	1.9†	3.4†
URS	Elective	40.9	47.5	48.8	30.6†	39.4	41.2	47.7	43	36.4	39.6	40	36.4
	Urgent	48.9	43.4	48	55.2	50.1	49.6	42.9	52.3	46.4	53.6	46.7	51.4
	Emergency	10.2	9.1	3.2†	14.2†	10.5	9.3	9.4	4.7†	17.2†	6.8†	13.3†	12.1
NYHA Class	1	45.8	0.9†	58.8†	59†	46.9	52.8	59.4†	52.9	52.1	43.1	53.2	68.8†
	2	8.3	1.2†	20†	14.6†	9.1	4.7†	12.2†	7.8	12.8†	3.5†	5.9†	13†
	3	5.7	0.9†	6	5.5	6.7	3.2†	20.9†	5.4	6.4	2.3†	5.5	7.4†
	4	2.2	0.7†	≤5	≤5	1.5†	3.2†	6.4†	2.8†	≤5	1.4†	4.1†	3.5†
	Unknown	38	96.3†	13.6†	20†	35.9	36	≤5	31.1	27.9†	49.6†	31.3	7.3†

*Risk factors: CIHI DAD and CCN data; †Prevalence of risk factor is at least 25% different than the provincial average.



Table 39b - Prevalence of Risk Factors by Hospital for Isolated CABG Surgery in 2009/10

Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
Age	Mean	65.44 ±10.11	67.38 ±10.09	65.51 ±9.13	65.23 ±9.90	65.35 ±10.21	65.32 ±10.59	65.94 ±9.90	64.50 ±9.91	65.09 ±10.10	64.52 ±10.23	65.61 ±10.45	64.62 ±9.83
	<65	44.9	38.3	45.6	43.7	45.6	46.8	40.6	47.8	46.7	50.5	43.2	46.5
	65-74	34.8	34.7	36.5	38.5	34.2	30.3	38.5	35.7	33.5	31.9	35.2	36.7
	≥75	20.3	27†	17.9	17.8	20.2	22.8	20.9	16.5	19.8	17.7	21.5	16.8
Sex	Female	20.6	22.1	21.2	21.8	21.3	17.2	20.7	20.2	20	20.5	19.2	21.1
AMI		28.1	29.8	29.3	29.3	26.5	17.2†	43.9†	32.3	20.7†	32.3	19.4†	30.1
Atrial Fib		9	6.6†	3.9†	5.6†	18.1†	6.8†	8.9	6.4†	3.4†	8.6	6.5†	21.1†
BMI	<25%	26.6	21.9	10.4†	20.3†	18.5†	27.4	84.3†	30.1	18.4†	27.3	25.9	21.8
	25-30%	39.4	43.7	33.6	37.6	42.6	43	7.5†	39.5	42.6	42.8	43.4	40.6
	>30%	31.9	34.1	47.6†	33.8	38.9	29.4	6.8†	28.4	33	29.5	30.1	37.2
	Unknown	2.1	≤5	8.5†	8.3†	0†	≤5	1.4†	2	6†	≤5	≤5	≤5
CCS	Stable Angina	54.7	51.1	57.3	52.5	48.8	72.1†	73.7†	60.8	39.8†	47.1	56.1	63.3
	ACS - Low Risk	19.7	36.1†	33.6†	10.6†	16.7	14.8†	16.2	20	24.4	19.1	8.5†	6.8†
	ACS - Intermediate Risk	17.3	3.4†	7.2†	27.5†	26.3†	10†	5.2†	12.1†	17.4	29.7†	24.9†	22.4†
	ACS - High Risk	5.5	2.4†	2†	7.4†	6.5	2.4†	3.5†	4.5	15.5†	2.5†	7.3†	3.2†
	ACS - Emergent Risk	2.9	6.9†	0†	2†	1.7†	≤5	1.4†	2.5	2.9	1.5†	3.2	4.3†
CHF		11.7	14.5	9.8	7.7†	11.2	9.2†	12.9	12.3	8.3†	9.5	11.7	19†
COPD		10.9	12.1	9.8	18.7†	14.2†	10	10.8	7.5†	8.6†	7.9†	11	10.7
CVD		11.5	14.2	11.1	14.6†	11.2	9.5	11	10.1	10.9	9.6	13.9	9.3
Diabetes		40.9	40.1	48.9	36.7	38.5	42.5	35.2	46.6	37.5	44.7	40.9	40.3
Dialysis		1.6	1.9	4.6†	≤5	2†	≤5	1.9	2.3†	1.2†	≤5	1†	≤5
Hypertension		81.1	83.3	87.6	71.4	78.9	83.5	82.2	84.9	76.3	79.7	86.3	80

Risk Factor	Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI	
Left Main Disease	31.4	33.2	31.3	30.2	31.7	28.4	35.4	36.1	28.3	23.4†	32.1	36	
LV Function	1	58.5	68	48.9	62.4	57.1	59	48.4	56.7	48.5	53.9	67.9	64.9
	2	25.6	23.4	26.1	23.2	28.9	20.9	26.5	27.5	32.7†	28.1	19.5†	20.8
	3	10.9	8†	12.4	9.5	10.6	13.1	12.7	12.1	11.2	14.2†	9.8	8.9
	4	2.2	≤5	2.3	2.9†	2	3.2†	3.5†	1.8	2.6	3.7†	1†	2.7
	Unknown	2.7	≤5	10.4†	2†	1.4†	3.9†	8.9†	1.9†	5†	0†	1.7†	2.7
Previous CABG	1.4	1.9†	≤5	≤5	0.9†	≤5	1.4	0.9†	≤5	2.8†	2†	2.7†	
PVD	14.4	19.6†	9.8†	12.4†	15.5	10.9†	17.4	9.5†	10.1†	10†	20.9†	18.2†	
Shock	0.9	2†	0†	≤5	1.2†	≤5	≤5	≤5	0†	0.9	≤5	2.1†	
Creatinine	0-120	87.4	85.6	85	89.2	90.4	90.5	85.2	90.8	89.9	85.8	91.3	75.8
	120-180	9.7	11.3	9.1	8.6	7†	7.8	11.7	5.6†	7.6†	11.8	6.8†	19.9†
	>180	2.9	3.1	5.9†	2.3†	2.6	1.7†	3.1	3.7†	2.5	2.4	1.8†	4.3†
URS	Elective	41.9	47.5	46.9	37.8	39	48.3	46.5	43	37.6	40	39.9	37
	Urgent	47.9	42.1	50.8	50.5	51	47.1	44.8	48.5	43.3	53.4	46.6	52.8
	Emergency	10.2	10.4	2.3†	11.7	10	4.6†	8.7	8.5	19.1†	6.6†	13.5†	10.2
NYHA Class	1	44.4	1.3	32.2†	68†	47.1	39.3	59.2†	60.2†	35.1†	42.6	56.9†	79.4†
	2	8.4	1.7	18.6†	8.3	9.4	6.8	11.5†	7.5	12.9†	4.4†	9	11.8†
	3	5.9	1.6	4.9	3.4†	6.6	4.1†	22.5†	5.8	6.1	2.1†	6.8	7.2
	4	1.6	≤5	2.9†	≤5	2.2†	1.9	5.2†	2.5†	≤5	0.9†	2†	1.4
	Unknown	39.7	94.8†	41.4	20†	34.7	47.8	1.6†	24†	45.5	49.9†	25.2†	≤5

*Risk factors: CIHI DAD and CCN data; †Prevalence of risk factor is at least 25% different than the provincial average.



Table 39c - Prevalence of Risk Factors by Hospital for Isolated CABG Surgery in 2010/11

Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
Age	Mean	65.57 ±10.04	67.58 ±9.81	66.38 ±8.63	66.50 ±9.33	65.20 ±10.01	65.47 ±9.80	67.04 ±10.30	64.02 ±10.17	64.23 ±10.44	64.83 ±10.11	64.66 ±10.36	65.82 ± 9.70
	<65	46	38.3	43.8	40.3	46.3	45.6	41.6	53.4	52	49.3	48.2	44.9
	65-74	33.1	35.2	36.9	38.9	34.9	34.5	31.7	29.3	28.8	31.2	32.2	34.5
	≥75	20.9	26.5†	19.3	20.7	18.8	19.9	26.6†	17.2	19.2	19.5	19.6	20.6
Sex	Female	20.1	21.6	20.1	23.3	17.4	18.3	19.9	18.8	18.1	22	22.5	18.8
AMI		26.9	28.6	28.9	26.7	26.4	14.9†	43.1†	25.9	20.3†	28.2	21.4†	33.7†
Atrial Fib		9	8.4	6†	11.3†	14.9†	6.4†	9.2	7.3	5.7†	5.1†	6.7†	18†
BMI	<25%	25.1	19.6†	14.1†	14.5†	19.3†	28.4	75.5†	26.8	18.4†	25.7	24.8	22
	25-30%	39.4	40.4	41.8	32	40.1	40.3	10.9†	42.8	43.5	45.6	41.9	43.3
	>30%	31.9	40†	36.9	30.6	40.4†	30.5	12.6†	24.8†	32.5	27.3	32.4	34.1
	Unknown	3.5	≤5	7.2†	22.8†	≤5	≤5	≤5	5.6†	5.7†	1.5†	≤5	≤5
CCS	Stable Angina	56.8	50.8	57.8	59.7	54.1	79.6†	70.9	70.7	40.4†	50	55.3	56.1
	ACS - Low Risk	19.2	35.4†	34.5†	12.2†	13.5†	10.3†	18.4	14.4†	26†	20	12.1†	4.5†
	ACS - Intermediate Risk	16.5	4.8†	5.6†	24.4†	25.4†	7.7†	7.7†	9.1†	18.6	25.4†	23.6†	24.7†
	ACS - High Risk	4.7	1.9†	≤5	2.5†	4.9	2.4†	2.2†	4.4	13.7†	2.4†	6†	8†
	ACS - Emergent Risk	2.8	7.1†	≤5	≤5	2.2†	0†	≤5	1.5†	1.3†	2.2†	3	6.7†
CHF		11.2	16.5†	8†	6.9†	13.6	9.5	11.6	10	8.2†	7.5†	11.9	13.5
COPD		9.7	10.3	10.4	12.2†	11.8	6.1†	9.7	8.3	9.5	5.8†	10.6	12
CVD		10.9	12.3	12	9.7	11.4	7.2†	13.6	8.6†	9.7	10.3	16.2†	8.6†
Diabetes		40.8	41.9	41.8	35.3	39.1	41.1	33.7	47.5	33.8	47.3	41	42
Dialysis		1.5	2.2†	≤5	1.6	1.4	≤5	≤5	2†	0.9†	2.2†	1.5	≤5
Hypertension		81.4	84.8	83.5	77	78.5	84.4	82.6	85	75.6	79.8	85.1	80.2

Risk Factor	Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI	
Left Main Disease	30.9	32.1	34.5	27.9	31.1	29.7	32.7	31.5	27.9	24.1†	28.9	43.9†	
LV Function	1	59.4	67.2	58.2	68.4	58.3	57.6	46.5†	62	46.3†	53	66.1	66.9
	2	25.7	22.5	24.9	20.5†	29.8	23.9	31	23	33.3†	29	22.2	19.2†
	3	10.7	9.7	8.4†	6.5†	9.5	13.8†	15.5†	11.2	13.4†	14†	8.4†	6.5†
	4	2.1	0.6†	≤5	2.1	1.8	2.4	4.4†	1.4†	3.2†	3.8†	2.4	≤5
	Unknown	2.1	0†	6.8†	2.5	≤5	2.4	2.7†	2.4	3.8†	≤5	≤5	6.5†
Previous CABG	1.4	1.5	≤5	≤5	1.5	≤5	1.5	≤5	≤5	3.1†	≤5	3.1†	
PVD	13.5	18.1†	12.4	14.1	15.6	9†	15.5	8.3†	11.6	8.5†	17.7†	14.9	
Shock	1.1	1.9†	≤5	1.4†	1.4†	≤5	≤5	≤5	≤5	1.7†	1.1	≤5	
Creatinine	0-120	88.2	84.8	90	91	89.5	91	85	90.5	91.3	83.3	91.4	86.9
	120-180	8.6	11.1†	6.8†	6.5†	7.6	6.6†	13.1†	5.7†	6.8†	12†	5.6†	9.6
	>180	3.2	4.1†	3.2	2.5†	2.9	2.4†	1.9†	3.8	1.9†	4.7†	3	3.5
URS	Elective	42.9	45.8	48.2	45.6	39.1	53.1†	44.3	48.6	37.6	42.5	40.8	30.8†
	Urgent	47.9	43.7	49.4	48.6	52.4	43.2	48.7	44.8	46.4	51.1	46.7	53.5
	Emergency	9.3	10.5	2.4†	5.8†	8.4	3.7†	7†	6.7†	16†	6.5†	12.5†	15.7†
NYHA Class	1	39.3	5.6†	32.5	49.8†	39.8	27.1†	50.8†	66.4†	34.1	24.1†	52.1†	79.2†
	2	8.2	4.5†	19.7†	3.7†	7.7	3.7†	10.9†	6.7	16.6†	3.5†	8.4	12.9†
	3	5.9	6.8	5.2	≤5	7.9†	2.4†	22†	3.6†	5	1.3†	7.3	4.7†
	4	1.6	1.8	≤5	≤5	1.9	≤5	4.8†	2.6†	≤5	≤5	2†	1.4
	Unknown	45.1	81.2†	41.4	45.9	42.7	66.6†	11.4†	20.7†	43.8	70.8†	30.2†	1.8†

*Risk factors: CIHI DAD and CCN data; †Prevalence of risk factor is at least 25% different than the provincial average.



Table 40 - Prevalence of Risk Factors by Hospital for Isolated AVR Surgery

Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
Age	Mean	68.37 ± 12.27	68.96 ± 12.54	69.14 ± 10.13	66.62 ± 12.23	67.87 ± 12.78	69.13 ± 13.02	66.19 ± 13.34	68.22 ± 12.39	67.83 ± 12.45	72.88 ± 10.29	66.89 ± 13.29	68.21 ± 11.49
	<65	32.8	34.7	30	39.1	32.3	26.9	36.9	32.8	34.8	18.6†	37.6	35.4
	65-74	30.7	25.4	35.7	27.2	33.9	32.8	31.1	32.5	27.1	33.1	27.2	30
	≥75	36.5	39.9	34.3	33.7	33.9	40.3	32	34.8	38.1	48.3†	35.2	34.6
Sex	Female	43.2	43.9	39.1	34.8	39.4	43.5	43.7	48.4	45.3	50.3	47.2	39.8
BMI	<25%	26.1	22.8	16.1†	27.2	23.9	29	73.8†	27.6	18.8†	21.4	25.2	26.6
	25-30%	35.5	39.3	33.5	25†	37.3	38.7	8.7†	34.5	36.5	40	35.2	39.3
	>30%	35	38	39.1	35.9	38.8	31.2	10.7†	31.6	39.8	37.2	37.2	33.3
	Unknown	3.4	0†	11.3†	12†	0†	≤5	6.8†	6.3†	5†	≤5	2.4†	≤5
CHF		27	26.7	18.7†	16.3†	29.9	28	28.2	27.6	18.2†	34.5†	22.4	34.9†
COPD		13.3	14.9	11.3	17.4†	16.5	11.3	9.7†	10.8	12.2	12.4	12.8	14.7
CVD		11.9	15.5†	7.8†	15.2†	10.5	12.4	10.7	10.8	14.4	11.7	14.4	10.6
Diabetes		28.2	29.7	28.3	31.5	26.2	26.3	28.2	28.5	28.2	31	29.6	27.1
Hypertension		69.3	74.6	70.4	57.6	69.8	72	68.9	64.4	66.9	73.8	75.2	65.4
LV Function	1	81.1	83.5	75.7	80.4	81.9	74.7	84.5	77.2	77.3	71.7	86.4	89.4
	2	10.7	13.2	9.1	≤5	11.5	13.4†	10.7	11.7	12.2	16.6†	9.6	6.5†
	3	4.7	3.3†	4.3	6.5†	5	8.6†	≤5	6.3†	5.5	6.9†	2.4†	2.8†
	4	1.1	0†	≤5	0†	≤5	≤5	0†	1.7†	≤5	4.8†	≤5	≤5
	Unknown	2.4	0†	10.4†	9.8†	≤5	≤5	≤5	3.1†	3.3†	0†	≤5	≤5
PVD		8.8	12.9†	5.2†	7.6	7.3	7†	10.7	5.7†	7.2	7.6	11.6†	12.1†
Creatinine	0-120	88.1	86.5	87.4	90.2	90	87.6	86.4	89.2	88.4	87.6	92.8	84.2
	120-180	9	9.9	9.6	9.8	7.3	9.1	11.7†	7.7	10.5	7.6	5.6†	11.6†
	>180	2.9	3.6	3	0†	2.6	3.2	≤5	3.1	≤5	4.8†	≤5	4.1†
NYHA Class	1	29.4	16.8†	32.6	20.7†	21.3†	25.3	21.4†	35.9	20.4†	35.2	32.8	45.7†
	2	28.4	24.1	36.1†	37†	29.7	26.3	27.2	17.1†	26.5	35.9†	37.2†	27.9
	3	29.6	42.9†	14.3†	32.6	32.8	32.8	46.6†	29.9	37.6†	20†	22.8†	22.2†
	4	6.3	13.5†	≤5	≤5	7.6	10.2†	≤5	7.1	5†	6.2	4.8†	2.8†
	Unknown	6.3	2.6†	14.8†	7.6	8.7†	5.4	≤5	10†	10.5†	≤5	2.4†	≤5

*Risk factors: CIHI DAD and CCN data; †Prevalence of risk factor is at least 25% different than the provincial average

Table 41 - Prevalence of Risk Factors by Hospital for Combined CABG/AVR Surgery

Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
Age	Mean	73.78 ± 8.72	75.07 ± 9.36	73.03 ± 7.25	71.02 ± 8.19	72.51 ± 8.74	74.36 ± 8.30	73.80 ± 7.62	73.70 ± 9.19	73.37 ± 9.72	74.75 ± 8.40	73.49 ± 8.05	74.31 ± 8.69
	<65	15.4	13.9	13.3	19	17.3	15	12.2†	13.9	21.3†	12.1†	14.9	16.7
	65-74	33.1	30.1	40.7	44.6†	38.4	28	37.8	35.8	24.4†	32.3	34.8	26.7
	≥75	51.5	56	45.9	36.4†	44.3	57	50	50.3	54.3	55.6	50.3	56.7
Sex	Female	28.6	30.5	19.3†	27.3	24.8	31	32.2	29.1	27.4	35.9†	30.7	25.7
AMI		8.7	10.2	9.6	6.6†	4.2†	8	14.4†	9.9	3.7†	10.1	4.4†	16†
BMI	<25%	24.5	25.2	15.6†	12.4†	17.3†	28	78.9†	30.5	18.9†	20.2	19†	30.7†
	25-30%	37.2	41.6	36.3	40.5	40.4	39	7.8†	41.1	38.4	40.9	35.4	31.3
	>30%	35.5	33.2	32.6	37.2	42	33	8.9†	25.8†	32.9	38.4	43.4	37.7
	Unknown	2.9	0†	15.6†	9.9†	≤5	0†	≤5	≤5	9.8†	≤5	2.2†	≤5
CCS	Stable Angina	82.6	78.1	87.4	85.1	87.3	87	88.9	85.4	66.5	77.8	85.4	85.3
	ACS - Low Risk	9.1	19.2†	9.6	≤5	2.9†	6†	10	11.3	17.7†	8.1	4.4†	2.3†
	ACS - Intermediate Risk	6.3	≤5	≤5	9.1†	7.5	≤5	0†	≤5	11†	11.1†	8.2†	10†
	ACS - High Risk	1.5	≤5	0†	≤5	≤5	≤5	≤5	0†	4.9†	≤5	≤5	≤5
	ACS - Emergent Risk	0.5	≤5	≤5	0†	≤5	0†	0†	0†	0†	≤5	≤5	≤5
CHF		31	35.8	11.9†	20.7†	29	37	32.2	34.4	23.8†	31.3	29.4	39.7†
COPD		15	15.3	9.6†	20.7†	16.9	20†	8.9†	18.5	12.2	14.1	12.7	16
CVD		16.9	18.8	9.6†	9.9†	15	23†	10†	19.2	21.3†	14.6	21.2†	15.7
Diabetes		39.4	35.6	45.9	39.7	39.7	38	31.1†	40.4	34.1	46.5	39.9	41.7
Hypertension		83.2	81.4	87.4	72.7	82.1	83	85.6	84.8	82.3	86.9	90.5	78.7
Left Main Disease		14.8	15.7	13.3	20.7†	13.7	9†	11.1†	17.9	12.8	15.7	12.7	17.3



Risk Factor		Total	HHSC	HSN	KGH	LHSC	SHSC	SMGH	SMH	SRHC	THC	UHN	UOHI
LV Function	1	70.8	69	63	76	73	64	66.7	68.2	62.8	66.2	78.8	76.3
	2	17.4	20.8	13.3†	14.9	16.6	16	22.2†	18.5	23.2†	20.7	12.7†	14.3
	3	8.2	9.1	<5	<5	7.2	16†	<5	11.9†	9.8	10.6†	6.6	7.7
	4	1.5	<5	0†	<5	2.3†	<5	<5	<5	<5	<5	<5	<5
	Unknown	2.1	<5	20.7†	<5	<5	<5	<5	0†	<5	0†	<5	<5
Previous CABG		5.1	7.1†	<5	<5	2.3†	7†	0†	5.3	<5	5.6	6	7.3†
PVD		15.5	20.6†	10.4†	18.2	14.3	15	13.3	10.6†	14	7.6†	18.4	16.3
Creatinine	0-120	81.4	78.3	80	90.9	84.4	80	93.3	78.8	81.7	80.8	82	77.7
	120-180	14.2	15.7	11.9	6.6†	12.7	14	6.7†	13.9	17.1	15.2	13.3	18.7†
	>180	4.4	6†	8.1†	<5	2.9†	6†	0†	7.3†	<5	4	4.7	3.7
URS	Elective	36.4	25.2†	64.4†	32.2	28.7†	42	48.9†	43	84.1†	35.4	31.3	21.3†
	Urgent	10.9	6.2†	11.1	16.5†	9.4	8†	8.9	18.5†	6.7†	15.2†	11.1	14†
	Emergency	52.7	68.6†	24.4†	51.2	61.9	50	42.2	38.4†	9.1†	49.5	57.6	64.7
NYHA Class	1	29.4	20.4†	33.3	27.3	25.1	23†	31.1	33.8	26.2	30.3	32.3	44†
	2	24.1	19†	28.9	31.4†	23.8	29	16.7†	18.5†	22.6	33.3†	25.3	24
	3	30.8	42.3†	15.6†	31.4	35.8	31	47.8†	23.8†	31.1	21.7†	28.2	22†
	4	7.3	13.7†	<5	<5	4.2†	9	<5	9.9†	4.9†	6.1	7.6	6.3
	Unknown	8.4	4.6†	20†	9.1	11.1†	8	0†	13.9†	15.2†	8.6	6.6†	3.7†

*Risk factors: CIHI DAD and CCN data; †Prevalence of risk factor is at least 25% different than the provincial average

Appendix B

Table 1 - Logistic regression model for predicting in-hospital mortality following isolated CABG surgery

#	Risk Factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-5.7915	<.0001
2	age_grp	65-74	0.6459	<.0001
3	age_grp	≥75	1.2821	<.0001
4	female	1	0.3564	0.0054
5	bmi_grp	2	-0.2858	0.0498
6	bmi_grp	3	0.0435	0.7656
7	bmi_grp	U	0.5231	0.1072
8	ccs_grp	2	0.1206	0.4574
9	ccs_grp	3	0.0264	0.8766
10	ccs_grp	4	0.568	0.0057
11	ccs_grp	5	1.2989	<.0001
12	chf	1	0.8403	<.0001
13	copd	1	0.4485	0.0024
14	cvd	1	0.5865	<.0001
15	lv_grp	2	0.0655	0.6598
16	lv_grp	3	0.5357	0.0011
17	lv_grp	4	0.4402	0.1075
18	lv_grp	U	0.7174	0.0079
19	prevcabg	1	1.131	<.0001
20	pvd	1	0.6721	<.0001
21	shock	1	2.1709	<.0001
22	creatin_grp	2	0.2003	0.2191
23	creatin_grp	3	0.8716	<.0001
24	Hosmer-Lemeshow		.	0.029
25	C statistic		.	0.843



Table 2 - Logistic regression model for predicting 30-day mortality following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-6.0314	<.0001
2	age_grp	65-74	0.8232	<.0001
3	age_grp	≥75	1.4117	<.0001
4	female	1	0.4872	0.0001
5	ccs_grp	2	0.2073	0.2013
6	ccs_grp	3	0.1248	0.4593
7	ccs_grp	4	0.6818	0.0008
8	ccs_grp	5	1.291	<.0001
9	chf	1	0.6316	<.0001
10	copd	1	0.3294	0.0321
11	cvd	1	0.5551	<.0001
12	lv_grp	2	0.217	0.1423
13	lv_grp	3	0.6449	0.0001
14	lv_grp	4	0.7695	0.0038
15	lv_grp	U	0.7545	0.0055
16	prevcabg	1	1.0561	0.0001
17	pvd	1	0.5934	<.0001
18	shock	1	1.9522	<.0001
19	creatin_grp	2	0.1376	0.4132
20	creatin_grp	3	1.0098	<.0001
21	Hosmer-Lemeshow		.	0.0151
22	C statistic		.	0.834

Table 3 - Logistic regression model for predicting 1-year mortality following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.9232	<.0001
2	age_grp	65-74	0.6788	<.0001
3	age_grp	>75	1.3081	<.0001
4	female	1	0.232	0.0301
5	bmi_grp	2	-0.3443	0.0032
6	bmi_grp	3	-0.1227	0.3073
7	bmi_grp	U	-0.0974	0.7873
8	ccs_grp	2	0.2719	0.0331
9	ccs_grp	3	0.3033	0.0189
10	ccs_grp	4	0.6596	0.0001
11	ccs_grp	5	0.9852	<.0001
12	chf	1	0.7685	<.0001
13	copd	1	0.6212	<.0001
14	cvd	1	0.5549	<.0001
15	diabetes	1	0.2212	0.0255
16	lv_grp	2	0.1697	0.1489
17	lv_grp	3	0.5539	<.0001
18	lv_grp	4	0.5893	0.0102
19	lv_grp	U	0.4132	0.0998
20	prevcabg	1	1.1363	<.0001
21	pvd	1	0.5456	<.0001
22	shock	1	1.7652	<.0001
23	creatin_grp	2	0.2131	0.1119
24	creatin_grp	3	1.0259	<.0001
25	Hosmer-Lemeshow		.	0.4194
26	C statistic		.	0.81



Table 4 - Poisson model for predicting post-operative LOS following isolated CABG surgery

#	Parameter	Level 1	Estimate	Pr > Chi-Square
1	Intercept		1.6593	<.0001
2	age_grp	65-74	0.1269	<.0001
3	age_grp	>75	0.283	<.0001
4	female	1	0.1143	<.0001
5	ami	1	0.0482	<.0001
6	bmi_grp	2	-0.023	0.0006
7	bmi_grp	3	0.0425	<.0001
8	bmi_grp	U	-0.065	0.0005
9	ccs_grp	2	0.0171	0.0201
10	ccs_grp	3	0.0348	<.0001
11	ccs_grp	4	0.0757	<.0001
12	ccs_grp	5	0.2358	<.0001
13	chf	1	0.1901	<.0001
14	copd	1	0.1062	<.0001
15	cvd	1	0.1184	<.0001
16	diabetes	1	0.056	<.0001
17	hyperten	1	0.0403	<.0001
18	leftmain	1	0.0328	<.0001
19	lv_grp	2	0.0076	0.2389
20	lv_grp	3	0.0668	<.0001
21	lv_grp	4	0.1775	<.0001
22	lv_grp	U	0.022	0.1913
23	prevcabg	1	0.083	<.0001
24	pvd	1	0.0711	<.0001
25	shock	1	0.3259	<.0001
26	creatin_grp	2	0.1269	<.0001
27	creatin_grp	3	0.2374	<.0001

Table 5 - Logistic regression model for predicting blood transfusion - Red blood cells following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-1.4547	<.0001
2	age_grp	65-74	0.399	<.0001
3	age_grp	>75	0.8035	<.0001
4	female	1	1.3217	<.0001
5	ami	1	0.127	0.0025
6	bmi_grp	2	-0.3786	<.0001
7	bmi_grp	3	-0.7148	<.0001
8	bmi_grp	U	-0.3641	0.0007
9	ccs_grp	2	0.4789	<.0001
10	ccs_grp	3	0.4359	<.0001
11	ccs_grp	4	0.7845	<.0001
12	ccs_grp	5	1.1798	<.0001
13	chf	1	0.5222	<.0001
14	cvd	1	0.2488	<.0001
15	diabetes	1	0.1413	<.0001
16	dialysis	1	0.5056	0.0022
17	hyperten	1	0.1021	0.0182
18	leftmain	1	0.1535	<.0001
19	lv_grp	2	0.0191	0.6249
20	lv_grp	3	0.0764	0.1716
21	lv_grp	4	0.4323	<.0001
22	lv_grp	U	-0.1879	0.0702
23	prevcabg	1	0.6646	<.0001
24	pvd	1	0.2299	<.0001
25	shock	1	1.1839	<.0001
26	creatin_grp	2	0.442	<.0001
27	creatin_grp	3	1.4938	<.0001
28	Hosmer-Lemeshow		.	0.0663
29	C statistic		.	0.747



Table 6 - Logistic regression model for predicting blood transfusion - Plasma or Platelets following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-1.8838	<.0001
2	age_grp	65-74	0.2364	<.0001
3	age_grp	≥75	0.4457	<.0001
4	bmi_grp	2	-0.2129	<.0001
5	bmi_grp	3	-0.5146	<.0001
6	bmi_grp	U	-0.2259	0.0806
7	ccs_grp	2	0.4613	<.0001
8	ccs_grp	3	0.3935	<.0001
9	ccs_grp	4	0.7915	<.0001
10	ccs_grp	5	1.7282	<.0001
11	chf	1	0.3904	<.0001
12	diabetes	1	-0.127	0.0018
13	dialysis	1	0.3727	0.018
14	leftmain	1	0.1873	<.0001
15	lv_grp	2	-0.1311	0.0051
16	lv_grp	3	-0.0104	0.8702
17	lv_grp	4	-0.0705	0.5707
18	lv_grp	U	-0.2329	0.0586
19	prevcabg	1	0.6767	<.0001
20	pvd	1	0.1871	0.0004
21	shock	1	1.0723	<.0001
22	creatin_grp	2	0.1097	0.0943
23	creatin_grp	3	0.5202	<.0001
24	Hosmer-Lemeshow		.	0.0481
25	C statistic		.	0.663

Table 7 - Logistic regression model for predicting post-operative complications - Renal failure following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.6772	<.0001
2	age_grp	65-74	0.4439	<.0001
3	age_grp	>75	0.9726	<.0001
4	ami	1	0.2331	0.0044
5	bmi_grp	2	-0.1169	0.1723
6	bmi_grp	3	0.2829	0.001
7	bmi_grp	U	0.1976	0.3604
8	ccs_grp	2	-0.1076	0.2587
9	ccs_grp	3	0.1086	0.2611
10	ccs_grp	4	0.3226	0.0186
11	ccs_grp	5	0.5314	0.0018
12	chf	1	0.646	<.0001
13	diabetes	1	0.3213	<.0001
14	dialysis	1	-1.5766	<.0001
15	hyperten	1	0.4681	<.0001
16	lv_grp	2	0.1125	0.1607
17	lv_grp	3	0.3441	0.0005
18	lv_grp	4	0.383	0.0288
19	lv_grp	U	0.3097	0.1
20	pvd	1	0.3065	0.0001
21	shock	1	0.7009	0.002
22	creatin_grp	2	1.5393	<.0001
23	creatin_grp	3	2.0198	<.0001
24	Hosmer-Lemeshow		.	<.0001
25	C statistic		.	0.804



Table 8 - Logistic regression model for predicting post-operative complications – Stroke following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-7.9721	<.0001
2	ccs_grp	2	0.0415	0.8236
3	ccs_grp	3	-0.1163	0.5612
4	ccs_grp	4	0.1972	0.4959
5	ccs_grp	5	1.2411	<.0001
6	chf	1	0.3385	0.0478
7	cvd	1	5.6364	<.0001
8	shock	1	0.8874	0.0448
9	Hosmer-Lemeshow		.	0.656
10	C statistic		.	0.94

Table 9 - Logistic regression model for predicting CATH rate 1yr post discharge following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-2.8024	<.0001
2	age_grp	65-74	-0.5465	<.0001
3	age_grp	>75	-0.6212	<.0001
4	female	1	0.3591	0.0002
5	chf	1	0.3585	0.0062
6	lv_grp	2	-0.13	0.1918
7	lv_grp	3	-0.5185	0.0017
8	lv_grp	4	-0.2297	0.4267
9	lv_grp	U	0.0925	0.6963
10	Hosmer-Lemeshow		.	0.98
11	C statistic		.	0.594

Table 10 - Logistic regression model for predicting AMI readmission rate 1yr post discharge following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.8332	<.0001
2	female	1	0.6154	<.0001
3	ami	1	0.8064	<.0001
4	chf	1	0.3703	0.0338
5	cvd	1	0.4337	0.018
6	dialysis	1	0.996	0.0024
7	pvd	1	0.553	0.001
8	shock	1	1.2113	0.0038
9	Hosmer-Lemeshow		.	0.4467
10	C statistic		.	0.684

Table 11 - Logistic regression model for predicting revascularization rate 1yr post discharge following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-3.6777	<.0001
2	age_grp	65-74	-0.3942	0.0046
3	age_grp	≥75	-0.5167	0.0037
4	female	1	0.4222	0.002
5	creatin_grp	2	-0.8455	0.0095
6	creatin_grp	3	0.1752	0.6106
7	Hosmer-Lemeshow		.	0.9725
8	C statistic		.	0.588



Table 12 - Logistic regression model for predicting MACE rate 1yr post discharge following isolated CABG surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-3.5544	<.0001
2	age_grp	65-74	0.0498	0.6019
3	age_grp	≥75	0.3563	0.0005
4	female	1	0.3247	0.0003
5	ccs_grp	2	0.1885	0.0729
6	ccs_grp	3	0.3379	0.0013
7	ccs_grp	4	0.4446	0.0047
8	ccs_grp	5	0.5632	0.0071
9	chf	1	0.5818	<.0001
10	copd	1	0.2801	0.0122
11	cvd	1	0.4624	<.0001
12	pvd	1	0.3476	0.0007
13	creatin_grp	2	0.00282	0.9831
14	creatin_grp	3	0.8015	<.0001
15	Hosmer-Lemeshow		.	0.3612
16	C statistic		.	0.646

Table 13 - Logistic regression model for predicting in-hospital mortality following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.9638	<.0001
2	age_grp	65-74	0.7685	0.0665
3	age_grp	≥75	1.1099	0.0044
4	bmi_grp	2	-1.19	0.002
5	bmi_grp	3	-0.2063	0.507
6	bmi_grp	U	-0.4724	0.5391
7	chf	1	0.8383	0.0077
8	pvd	1	0.6959	0.0458
9	creatin_grp	2	0.6704	0.0672
10	creatin_grp	3	1.8706	<.0001
11	nyha_grp	2	-0.408	0.4018
12	nyha_grp	3	0.1587	0.7012
13	nyha_grp	4	1.3814	0.0029
14	nyha_grp	U	0.0329	0.9614
15	Hosmer-Lemeshow		.	0.7775
16	C statistic		.	0.825



Table 14 - Logistic regression model for predicting 30-Day mortality following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-5.244	<.0001
2	female	1	1.0076	0.0009
3	lv_grp	2	0.8312	0.0303
4	lv_grp	3	1.2559	0.0071
5	lv_grp	4	0.8353	0.3284
6	lv_grp	U	1.0073	0.1905
7	creatin_grp	2	0.8998	0.0221
8	creatin_grp	3	1.9569	<.0001
9	nyha_grp	2	-0.2428	0.6236
10	nyha_grp	3	0.2947	0.4903
11	nyha_grp	4	1.5924	0.0006
12	nyha_grp	U	-0.2203	0.7831
13	Hosmer-Lemeshow		.	0.9309
14	C statistic		.	0.791

Table 15 - Poisson model for predicting post-operative LOS following isolated AVR surgery

#	Parameter	Level 1	Estimate	Pr > Chi Square
1	Intercept		1.8966	<.0001
2	age_grp	65-74	0.0503	0.0051
3	age_grp	>75	0.2473	<.0001
4	female	1	0.0757	<.0001
5	bmi_grp	2	-0.0472	0.007
6	bmi_grp	3	0.0046	0.7983
7	bmi_grp	U	-0.1141	0.004
8	chf	1	0.1989	<.0001
9	copd	1	0.07	0.0002
10	cvd	1	0.1229	<.0001
11	diabetes	1	0.0904	<.0001
12	lv_grp	2	-0.0098	0.6587
13	lv_grp	3	-0.0442	0.1853
14	lv_grp	4	0.2071	0.0002
15	lv_grp	U	-0.0066	0.8829
16	creatin_grp	2	0.2057	<.0001
17	creatin_grp	3	0.2874	<.0001
18	nyha_grp	2	0	0.998
19	nyha_grp	3	0.0293	0.1099
20	nyha_grp	4	0.1323	<.0001
21	nyha_grp	U	0.0877	0.0031



Table 16 - Logistic regression model for predicting blood transfusion - Red blood cells following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-1.1139	<.0001
2	age_grp	65-74	0.338	0.0021
3	age_grp	≥75	0.8057	<.0001
4	female	1	1.0033	<.0001
5	bmi_grp	2	-0.3137	0.0046
6	bmi_grp	3	-0.6484	<.0001
7	bmi_grp	U	-0.9492	0.0002
8	chf	1	0.3163	0.0024
9	cvd	1	0.3741	0.0056
10	diabetes	1	0.322	0.0012
11	creatin_grp	2	0.9241	<.0001
12	creatin_grp	3	1.7934	<.0001
13	nyha_grp	2	-0.0769	0.4985
14	nyha_grp	3	0.188	0.0995
15	nyha_grp	4	0.6931	0.0009
16	nyha_grp	U	0.059	0.7555
17	Hosmer-Lemeshow		.	0.0109
18	C statistic		.	0.735

Table 17 - Logistic regression model for predicting blood transfusion - Plasma or Platelets following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-1.3574	<.0001
2	age_grp	65-74	0.2703	0.0321
3	age_grp	≥75	0.4141	0.0007
4	female	1	-0.2464	0.0146
5	bmi_grp	2	-0.4128	0.0006
6	bmi_grp	3	-0.5489	<.0001
7	bmi_grp	U	-0.5726	0.047
8	chf	1	0.3687	0.001
9	creatin_grp	2	0.2835	0.0726
10	creatin_grp	3	0.6331	0.0116
11	nyha_grp	2	0.0231	0.8627
12	nyha_grp	3	0.2611	0.0456
13	nyha_grp	4	0.7747	0.0001
14	nyha_grp	U	0.1677	0.4314
15	Hosmer-Lemeshow		.	0.1315
16	C statistic		.	0.636



Table 18 - Logistic regression model for predicting post-operative complications - Renal failure following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.6809	<.0001
2	age_grp	65-74	1.1058	<.0001
3	age_grp	>75	1.2767	<.0001
4	bmi_grp	2	-0.0741	0.7565
5	bmi_grp	3	0.4504	0.0478
6	bmi_grp	U	0.5514	0.1807
7	chf	1	0.858	<.0001
8	diabetes	1	0.5781	0.0008
9	creatin_grp	2	1.3985	<.0001
10	creatin_grp	3	2.4369	<.0001
11	Hosmer-Lemeshow		.	0.5529
12	C statistic		.	0.803

Table 19 - Logistic regression model for predicting post-operative complications – Stroke following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-7.2071	<.0001
2	cvd	1	5.4399	<.0001
3	lv_grp	2	-0.6936	0.2676
4	lv_grp	3	1.6278	0.0045
5	lv_grp	4	0.8259	0.3307
6	lv_grp	U	0.5651	0.6207
7	Hosmer-Lemeshow		.	0.8089
8	C statistic		.	0.937

Table 20 - Logistic regression model for predicting CHF readmission rate 1yr post discharge following isolated AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-5.4131	<.0001
2	age_grp	65-74	0.8598	0.0798
3	age_grp	>75	1.8693	<.0001
4	chf	1	1.3625	<.0001
5	copd	1	0.6751	0.0167
6	diabetes	1	0.7843	0.0014
7	pvd	1	0.8782	0.0063
8	Hosmer-Lemeshow		.	0.6022
9	C statistic		.	0.81



Table 21 - Logistic regression model for predicting in-hospital mortality following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.9837	<.0001
2	age_grp	65-74	0.3147	0.4267
3	age_grp	≥75	0.802	0.0303
4	female	1	0.6496	0.0031
5	ccs_grp	2	-0.5596	0.1577
6	ccs_grp	3	0.2401	0.4986
7	ccs_grp	4	1.4378	0.0022
8	ccs_grp	5	1.7675	0.0136
9	chf	1	0.8742	0.0001
10	cvd	1	0.772	0.0005
11	lv_grp	2	0.4983	0.0502
12	lv_grp	3	0.7041	0.0246
13	lv_grp	4	0.4879	0.4806
14	lv_grp	U	1.3819	0.007
15	prevcabg	1	1.2128	0.0001
16	creatin_grp	2	0.6524	0.0088
17	creatin_grp	3	1.2111	0.0002
18	Hosmer-Lemeshow		.	0.3812
19	C statistic		.	0.795

Table 22 - Logistic regression model for predicting 30-day mortality following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.4187	<.0001
2	female	1	0.6887	0.0027
3	ccs_grp	2	-0.5414	0.2212
4	ccs_grp	3	0.1718	0.6657
5	ccs_grp	4	1.0888	0.0437
6	ccs_grp	5	1.8557	0.0092
7	chf	1	1.0402	<.0001
8	cvd	1	0.7191	0.0026
9	prevcabg	1	1.1649	0.0006
10	creatin_grp	2	0.6947	0.0095
11	creatin_grp	3	1.1035	0.0013
12	Hosmer-Lemeshow		.	0.6455
13	C statistic		.	0.769

**Table 23 - Poisson model for predicting post-operative LOS following combined CABG/AVR surgery**

#	Parameter	Level 1	Estimate	Pr > Chi Square
1	Intercept		1.9353	<.0001
2	age_grp	65-74	0.1341	<.0001
3	age_grp	>75	0.3579	<.0001
4	female	1	0.1261	<.0001
5	bmi_grp	2	-0.0407	0.015
6	bmi_grp	3	0.0261	0.1292
7	bmi_grp	U	0.0218	0.5958
8	ccs_grp	2	-0.0003	0.9908
9	ccs_grp	3	0.0661	0.0098
10	ccs_grp	4	0.1462	0.0048
11	ccs_grp	5	0.3991	<.0001
12	chf	1	0.1684	<.0001
13	copd	1	0.0917	<.0001
14	cvd	1	0.2246	<.0001
15	diabetes	1	0.1268	<.0001
16	leftmain	1	0.0508	0.005
17	lv_grp	2	0.025	0.1539
18	lv_grp	3	0.0682	0.0048
19	lv_grp	4	0.2886	<.0001
20	lv_grp	U	-0.0862	0.0798
21	creatin_grp	2	0.1095	<.0001
22	creatin_grp	3	0.2272	<.0001

Table 24 - Logistic regression model for predicting blood transfusion - Red blood cells following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-0.5282	0.0007
2	age_grp	65-74	0.3244	0.019
3	age_grp	≥75	0.7393	<.0001
4	female	1	1.0625	<.0001
5	ami	1	0.7254	0.0002
6	bmi_grp	2	0.0575	0.646
7	bmi_grp	3	-0.3814	0.0025
8	bmi_grp	U	-0.4445	0.1159
9	chf	1	0.3838	0.0005
10	copd	1	0.3993	0.004
11	cvd	1	0.344	0.0098
12	leftmain	1	0.4865	0.0005
13	prevcabg	1	1.0167	<.0001
14	creatin_grp	2	0.5572	0.0001
15	creatin_grp	3	2.666	<.0001
16	Hosmer-Lemeshow		.	0.3145
17	C statistic		.	0.723



Table 25 - Logistic regression model for predicting blood transfusion - Plasma or Platelets following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-1.0153	<.0001
2	age_grp	65-74	0.3983	0.005
3	age_grp	>75	0.4703	0.0006
4	female	1	0.2027	0.0411
5	bmi_grp	2	-0.1585	0.16
6	bmi_grp	3	-0.4593	<.0001
7	bmi_grp	U	-0.2345	0.3949
8	ccs_grp	2	0.2112	0.1697
9	ccs_grp	3	0.1947	0.2796
10	ccs_grp	4	0.5186	0.1586
11	ccs_grp	5	2.5357	0.0169
12	chf	1	0.2611	0.0114
13	cvd	1	0.4028	0.0005
14	leftmain	1	0.3553	0.0043
15	lv_grp	2	0.1108	0.3576
16	lv_grp	3	0.5353	0.0016
17	lv_grp	4	0.799	0.0374
18	lv_grp	U	0.0654	0.832
19	prevcabg	1	1.0395	<.0001
20	creatin_grp	2	0.0243	0.8503
21	creatin_grp	3	0.8565	0.0001
22	Hosmer-Lemeshow		.	0.4158
23	C statistic		.	0.655

Table 26 - Logistic regression model for predicting post-operative complications - Renal failure following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-2.9521	<.0001
2	age_grp	65-74	0.041	0.8518
3	age_grp	>75	0.4665	0.0221
4	chf	1	0.5489	<.0001
5	diabetes	1	0.5484	<.0001
6	creatin_grp	2	1.1275	<.0001
7	creatin_grp	3	1.0232	<.0001
8	Hosmer-Lemeshow		.	0.0187
9	C statistic		.	0.707

Table 27 - Logistic regression model for predicting post-operative complications – Stroke following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-6.8757	<.0001
2	cvd	1	5.4735	<.0001
3	Hosmer-Lemeshow		.	.
4	C statistic		.	0.917



Table 28 - Logistic regression model for predicting CHF readmission rate 1yr post discharge following combined CABG/AVR surgery

#	Risk factor	Class	Estimate	Pr > Chi-Square
1	Intercept		-4.4667	<.0001
2	age_grp	65-74	0.91	0.0712
3	age_grp	>75	1.4018	0.0032
4	chf	1	0.8657	0.0003
5	lv_grp	2	0.4531	0.1144
6	lv_grp	3	0.8855	0.0083
7	lv_grp	4	0.5763	0.4595
8	lv_grp	U	1.5783	0.0026
9	Hosmer-Lemeshow		.	0.4593
10	C statistic		.	0.72