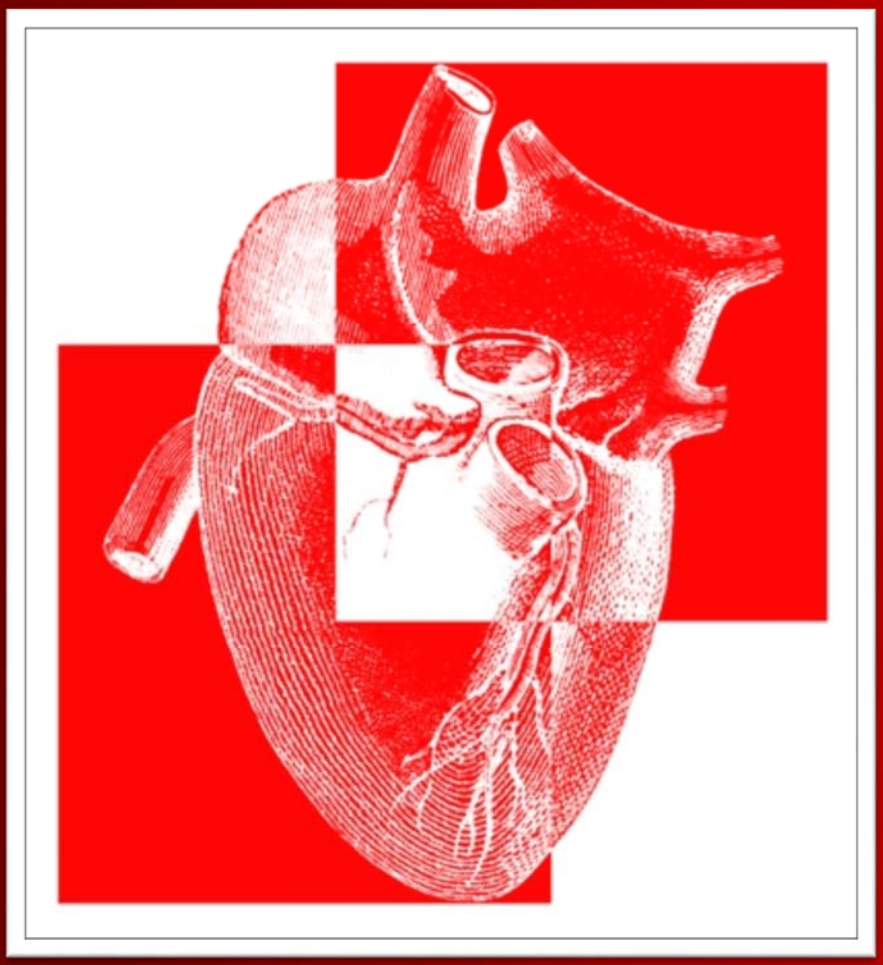
ANZSCTS Cardiac Surgery Database Program



National Annual Report 2014

The Australian and New Zealand Society of Cardiac and Thoracic Surgeons (ANZSCTS)

National Cardiac Surgery Database Program

National Annual Report

2014

Authors: Lavinia Tran, Nicole Marrow, Christina Ayres, Baki Billah, Gilbert Shardey and Christopher Reid on behalf of the ANZSCTS National Database Program Steering Committee

Foreword

This is the eighth National Report of the ANZSCTS Database Program. That is, the eighth year when information from meaningful numbers of patients who had cardiac surgery in States other than Victoria contributed to the database.

The format of data presentation in the report enables individual units to compare their performance in certain outcomes to that of the other participants. Hospital and surgeon comparative data, where given, is coded. Each Unit will be informed of the codes relevant only to it.

The format of data presentation in the report is unchanged. However, it is under discussion. We have canvassed contributors to the Program, indeed all ANZSCTS members, intending to ensure the report is increasingly useful and relevant.

A revised dataset will be introduced in 2016. It will include new information that will form part of the formal review.

Statistical analysis of Unit and Surgeon performance for coronary artery surgery involves CUSUM curves and Funnel Plots. Mortality data is risk-adjusted.

The data in the Web-based National Unit Report module may be used by each Unit to compare its outcomes- on a broad range of parameters with that of the entire group. Indeed, Units may use the web-based Report to do so for individual surgeons.

The Society will continue in its mission to ensure that high quality and safety standards are maintained in all Units undertaking cardiac surgical procedures in Australia.

Gil Shardey
Chairman
Steering Committee

TABLE OF CONTENTS

List of Figures

List of Tables

Introduction

ANZSCTS Database Program – 27 Australian Hospitals

The Australian and New Zealand Society of Cardiac and Thoracic Surgeons (ANZSCTS) developed a program to collect data in reference to, and report on, cardiac (heart) surgery in Australian hospitals.

This is the eighth National report of the Program. It describes the data from surgery performed at 22 specialist cardiac surgery units in Australian hospitals. These are:

- 6 Victorian Public Hospitals
  - Austin Hospital
  - Geelong Hospital
  - Monash Medical Centre
  - Royal Melbourne Hospital
  - St Vincent's Hospital
  - The Alfred Hospital
- Cabrini Hospital
- Jessie McPherson Private Hospital
- Epworth Healthcare
- Peninsula Private Hospital
- 5 NSW Public Hospitals
  - John Hunter Hospital
  - Liverpool Hospital
  - Royal Prince Alfred Hospital
  - Westmead Hospital
  - Royal North Shore Hospital
- Royal Adelaide Hospital
- Flinders Medical Centre
- Mater Health Services, Pimlico
- Holy Spirit Northside
- Sir Charles Gairdner
- St John of God Hospital
- Royal Perth Hospital

N.B. Lake Macquarie Private, St George (NSW public hospital), St Vincent's NSW (NSW public hospital), Prince of Wales (NSW public hospital) and Canberra submitted less than six months' worth of data and have therefore been excluded from this report.

This report provides an overview of the patients who underwent surgery, the types of surgery performed, complications encountered, and other details relating to risk and the outcomes of surgery.

Data Preparation

Data for the 2014 calendar year includes all cases performed in participating units from January 1 through December 31, 2014.

Final data related to this report was received by the ANZSCTS Data Management Centre up to March 31st, 2015 so that the data was locked on April 2nd 2015. Until that date, submitted data was checked for completeness and Data Managers in each Unit

were given opportunities to amend any errors in their Unit's data. Any changes to the data after April 2nd 2015 are not reflected in this report.

Cases with missing data fields for clinical status and procedure type are excluded from the analyses. For 2014, 2 cases were excluded for this reason.

All data from the current year is based on this data preparation. Data from previous years remains unchanged from existing reports. Reanalysis occurred if multiple years were grouped, provided this data was not presented in previous years. Grouped data that was generated for this report does not include Units excluded from the 2014 Annual Report.

Analysed data from previous years (2009-2013) included in this report included all cases from the hospitals outlined below:

Year	Hospitals†	
2009	6 VIC Public Hospitals	*Canberra Hospital*
21 Hospitals	Cabrini Health	Flinders Medical Centre
	Jessie McPherson Private Hospital	*Townsville Hospital*
	8 NSW Public Hospitals	Mater Health Services, Pimlico
	Lake Macquarie Private Hospital	
2010	6 VIC Public Hospitals	Flinders Medical Centre
23 Hospitals	Cabrini Health	Townsville Hospital
	Jessie McPherson Private Hospital	Mater Health Services, Pimlico
	8 NSW Public Hospitals	*Sir Charles Gairdner Hospital*
	Lake Macquarie Private Hospital	*Royal Perth Hospital*
	Canberra Hospital	
2011	6 VIC Public Hospitals	Flinders Medical Centre
25 Hospitals	Cabrini Health	Townsville Hospital
	Jessie McPherson Private Hospital	Mater Health Services, Pimlico
	Epworth Healthcare	*Holy Spirit Northside*
	8 NSW Public Hospitals	Sir Charles Gairdner Hospital
	Lake Macquarie Private Hospital	Royal Perth Hospital
	Canberra Hospital	
2012	6 VIC Public Hospitals	Flinders Medical Centre
24 Hospitals	Cabrini Health	Townsville Hospital
	Jessie McPherson Private Hospital	Mater Health Services, Pimlico
	Epworth Healthcare	Holy Spirit Northside
	7 NSW Public Hospitals*	Sir Charles Gairdner Hospital
	Lake Macquarie Private Hospital	Royal Perth Hospital
	Canberra Hospital	
2013	6 VIC Public Hospitals	*Royal Adelaide Hospital*
27 Hospitals	Cabrini Health	Flinders Medical Centre
	Jessie McPherson Private Hospital	Townsville Hospital
	Epworth Healthcare	Mater Health Services, Pimlico
	Peninsula Private Hospital	Holy Spirit Northside
	7 NSW Public Hospitals*	Sir Charles Gairdner Hospital
	Lake Macquarie Private Hospital	*St John of God Hospital*
	Canberra Hospital	Royal Perth Hospital

* Royal North Shore Hospital only submitted 3 months' worth of data in 2012 and 2013 and was therefore excluded from the 2012 and 2013 Reports. † Italicised hospitals are new to the report for that year.

Clinical Status data

Clinical Status data was assessed for adherence to the data definitions. Urgent and Emergency cases were recoded to align with the data definitions for 2014 data. The Risk Adjusted Mortality Rate (RAMR) was also recalculated to use this derived status.

Mortality data

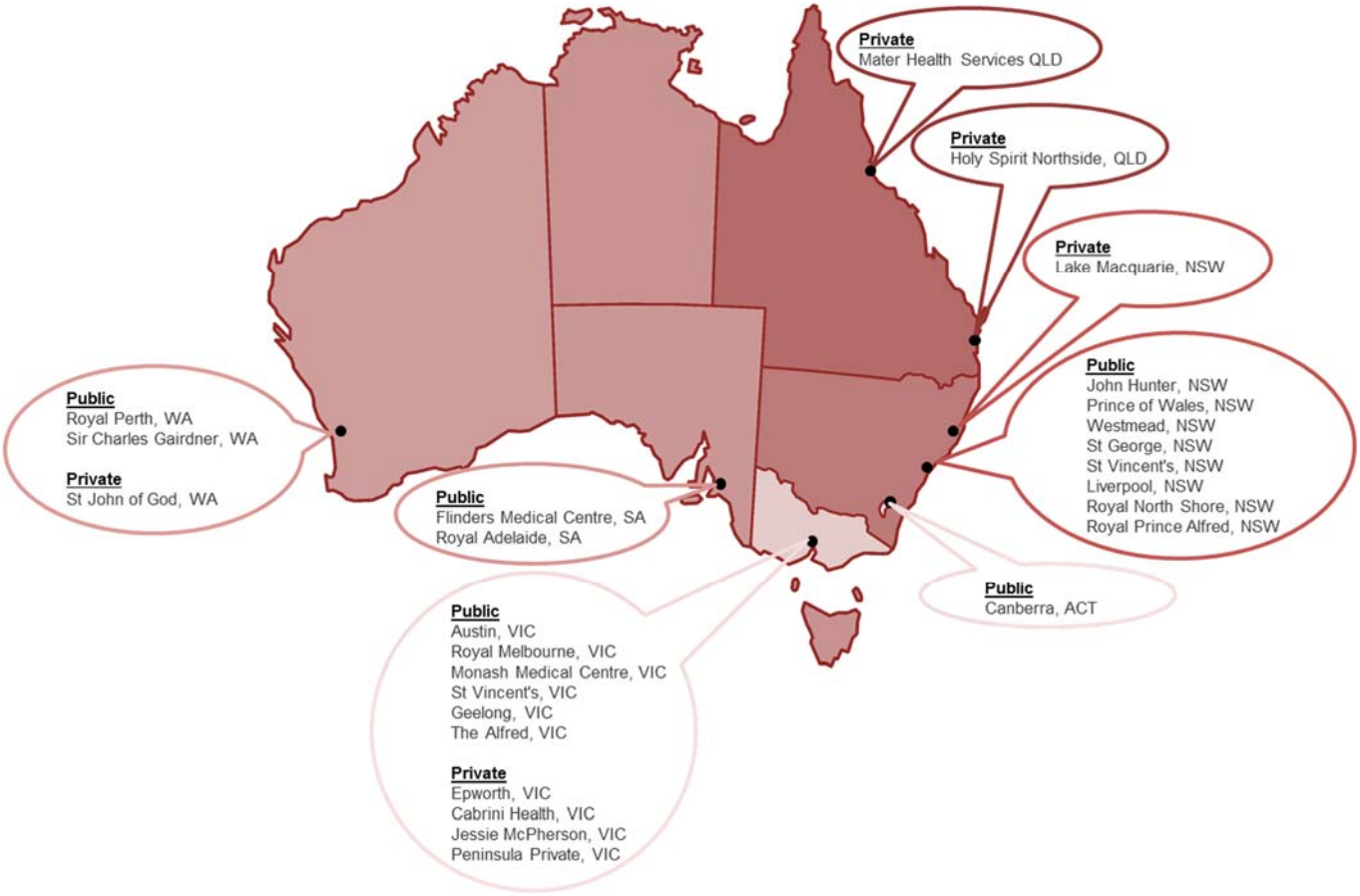
In this report, mortality includes all deaths in hospital prior to discharge at any time plus all deaths occurring after discharge from hospital but within 30 days of the surgical date.

Redo operations

“Redo” operations in this report includes any cardiac surgery the patient had undergone within or prior to their current admission.

National Report 2014

This is the eighth report of the National Program. It describes the data for surgery performed in 2014.
As shown below, at the time of this report, 27 of the 58 Cardiac Surgery Units in Australia had registered with the ANZSCTS Program, including 19 of the 25 Public Units.



Non-Participating Hospitals						
VIC	**NSW**	**QLD**	**SA**	**WA**	**TAS**	**ACT**
Private	**Private**	**Public**	**Private**	**Public**	**Public**	**Private**
Knox	Macquarie University	*Gold Coast University	Ashford	Fremantle	Royal Hobart	National Capital Private
Melbourne	North Shore	*Prince Charles	Flinders	**Private**		
*St Vincent's	Norwest	*Princess Alexandra	St Andrew's	Hollywood		
Valley	Prince of Wales	*Townsville	Wakefield	Mount		
Warringal	St George	**Private**				
	Strathfield	Allamanda				
	St Vincent's	Greenslopes				
	Sydney Adventist	John Flynn				
	Westmead	St Andrew's				

*Prince Charles, Princess Alexandra, Gold Coast University, Townsville (QLD) and St Vincent's Private (VIC) are in the process of joining the database

Table 1 - Hospitals contributing to ANZSCTS Cardiac Surgery Program

Hospital	Contributing	Total number of procedures submitted 2001-14*
Austin Hospital, VIC	Yes	4867
Geelong Hospital, VIC	Yes	5396
Monash Medical Centre, VIC	Yes	5614
Royal Melbourne Hospital, VIC	Yes	8559
St Vincent's Hospital, VIC	Yes	6119
The Alfred Hospital, VIC	Yes	7213
Flinders Medical Centre, SA	Yes	3710
Mater Health Services, North Queensland	Yes	2012
Lake Macquarie Private Hospital, NSW	Yes	Excluded (1968 as of 2013)
John Hunter Hospital, NSW	Yes	1885
Prince of Wales Hospital, NSW	Yes	Excluded (2576 as of 2013)
St George Hospital, NSW	Yes	Excluded (1789 as of 2013)
St Vincent's Hospital, NSW	Yes	Excluded (2726 as of 2013)
Royal North Shore Hospital, NSW	Yes	1720
Royal Prince Alfred Hospital, NSW	Yes	3567
Liverpool Hospital, NSW	Yes	2694
Westmead Hospital, NSW	Yes	2403
The Canberra Hospital, ACT	Yes	Excluded (1086 as of 2013)
Cabrini Medical Centre, VIC	Yes	4454
Jessie McPherson, VIC	Yes	885
Royal Perth Hospital, WA	Yes	1445
Sir Charles Gairdner Hospital, WA	Yes	1350
Holy Spirit Northside Hospital, QLD	Yes	1912
Epworth Private Hospital, VIC	Yes	2655
Royal Adelaide Hospital, SA	Yes	1587
Peninsula Private, VIC	Yes	228
St John of God, WA	Yes	367
Prince Charles Hospital, QLD	No	0
Princess Alexandra Hospital, QLD	No	0
Gold Coast University Hospital, QLD	No	0
Townsville Hospital, QLD	No	Not currently contributing (1920 as of 2013)
Fremantle Hospital, WA	No	0
Royal Hobart Hospital, TAS	No	0
Melbourne Private Hospital, VIC	No	0
Knox Private Hospital, VIC	No	0
St Vincent's Private Hospital, VIC	No	0
Warringal Private Hospital, VIC	No	0
Valley Private Hospital, VIC	No	0
St Vincent's Private Hospital, NSW	No	0
St George Private Hospital, NSW	No	0
Strathfield Private Hospital, NSW	No	0
Westmead Private Hospital, NSW	No	0
Prince of Wales Private Hospital, NSW	No	0
Sydney Adventist Private Hospital, NSW	No	0
Norwest Private Hospital, NSW	No	0
North Shore Private, NSW	No	0
Macquarie University, NSW	No	0
National Capital Private Hospital, ACT	No	0
Allamanda Private Hospital, QLD	No	0
John Flynn, QLD	No	0
St Andrew's Hospital, QLD	No	0
Greenslopes Private Hospital, QLD	No	0
Flinders Private Hospital, SA	No	0
Ashford Private Hospital, SA	No	0
Wakefield Private Hospital, SA	No	0
St Andrews Private Hospital, SA	No	0
Hollywood Private Hospital, WA	No	0
Mount Hospital, WA	No	0
Total contributing hospitals & procedures	**27**	**82707**

*Calendar year, numbers are accurate as of data lock 2nd April 2015.

	Number of patients	Number of procedures
2014	9355	9412

This section provides a detailed assessment of the data. It provides a facility to look for emerging trends and inter-relationships between variables.

The Surgeons' Report includes detailed information about:

Isolated CABG Surgery

Data is presented on:

- Mortality
- Grafts applied
- Patient characteristics
- Post-operative complications
- Post-operative clinical indicators

Valve Surgery

This section includes data on valve procedures, performed with and without Coronary Artery Bypass Grafts.

Data is presented on:

- Mortality
- Procedure type
- Prosthesis use
- Aetiology
- Post-operative complications
- Post-operative clinical indicators

Other Cardiac Surgery

This section provides outcome data for operations other than isolated CABG, isolated valve and CABG + valve procedures. This data also includes combinations of procedures, not covered in the previous section, that were performed in the same surgical episode.

Data for the Entire Cardiac Surgical Population

This section provides outcome data for ALL operations, including isolated CABG, valve and other cardiac surgery procedures.

Isolated CABG Surgery

Figure 1: Observed mortality rate for isolated CABG

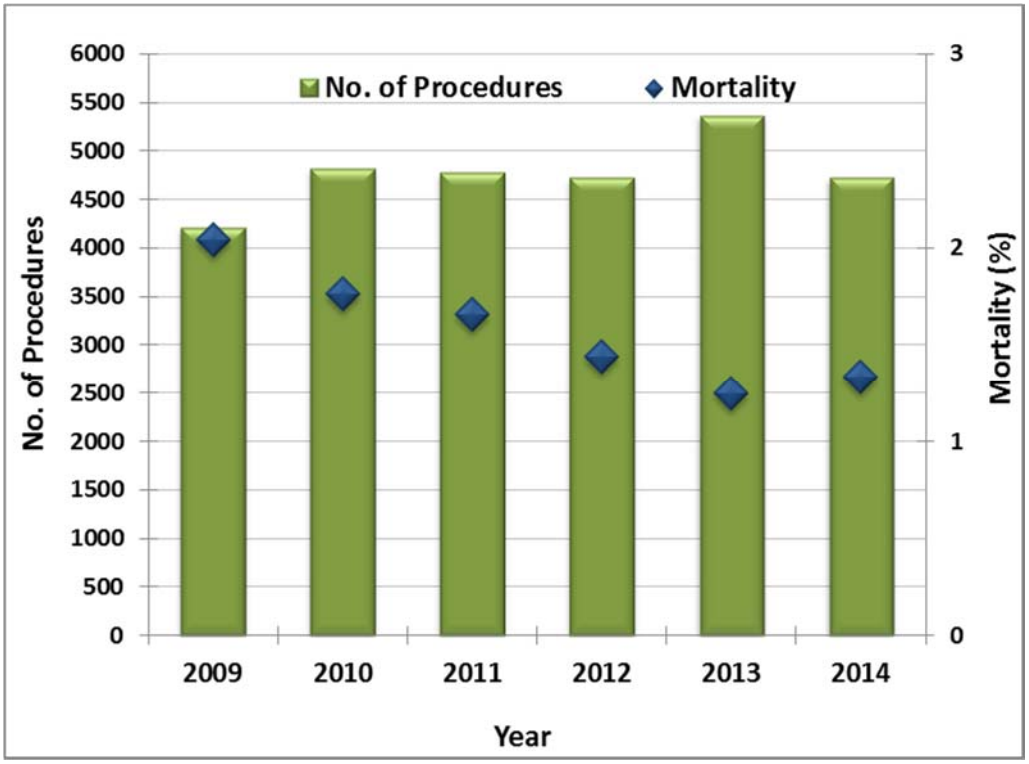


Figure 1: Despite an increase in the average age of the operated population and an associated perceived increase in co-morbid processes, the trend demonstrates an overall decrease in observed mortality for isolated coronary surgery since 2009.

Table 1a - Number of Procedures for 2014

	Total Number of procedures				Redo Surgery			
	Number		Mortality		Number		Mortality	
Procedure type	Number of procedures	% of Isolated CABG	Number	% of Procedure type	Number of procedures	% of Redo	Number	% of Procedure type (redo)
Isolated CABG On-Pump	4242	89.8	56	1.3	93	90.3	5	5.4
Isolated CABG Off-Pump	484	10.2	7	1.4	10	9.7	0	-
Total	4726	100	63	1.3	103	100	5	4.9

The overall mortality for isolated CABG procedures was 1.3%. The mortality for isolated CABG as an initial operation was 58/4623 (1.3%) and for isolated CABG as a redo procedure 5/103 (4.9%).

Isolated CABG Surgery

Table 1b - Number of Procedures for 2013

	Total Number of procedures				Redo Surgery			
	Number		Mortality		Number		Mortality	
Procedure type	Number of procedures	% of Isolated CABG	Number	% of Procedure type	Number of procedures	% of Redo	Number	% of Procedure type (redo)
Isolated CABG On-Pump	4953	92.2	62	1.3	141	96.6	3	2.1
Isolated CABG Off-Pump	417	7.8	5	1.2	5	3.4	0	-
Total	5370	100	67	1.2	146	100	3	2.1

Table 1c - Number of Procedures for 2010 - 2012

	Total Number of procedures				Redo Surgery			
	Number		Mortality		Number		Mortality	
Procedure type	Number of procedures	% of Isolated CABG	Number	% of Procedure type	Number of procedures	% of Redo	Number	% of Procedure type (redo)
Isolated CABG On-Pump	10095	89.3	172	1.7	315	91.3	15	4.8
Isolated CABG Off-Pump	1208	10.7	13	1.1	30	8.7	1	3.3
Total	11303*	100	185	1.6	345	100	16	4.6

*5 missing cases

Isolated CABG Surgery

Figure 2: Mortality rates for initial and redo isolated CABG surgery

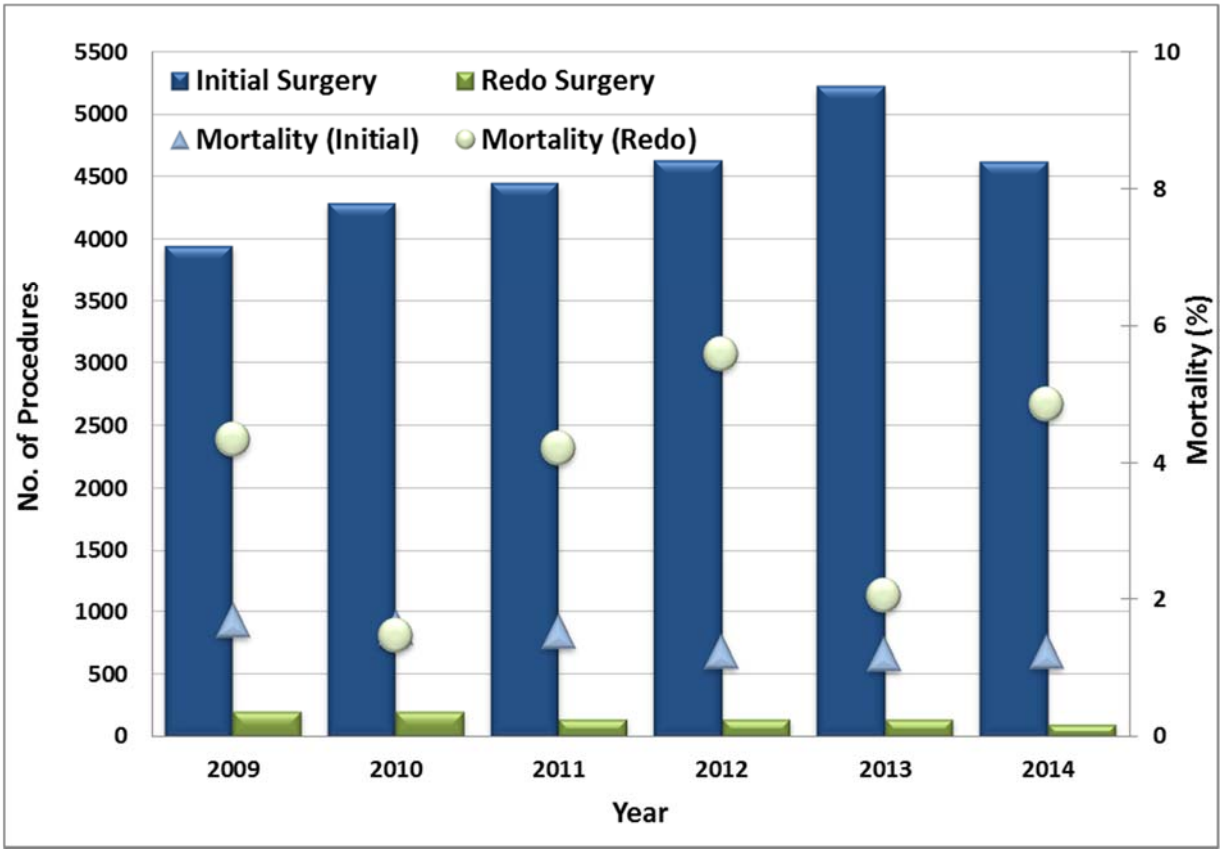


Figure 2: Approximately 2% of isolated CABG operations were redo procedures in 2014. The mortality for redo procedures is variably greater than for the initial procedure.

Isolated CABG Surgery

Figure 3: Observed mortality rate for isolated CABG On-Pump

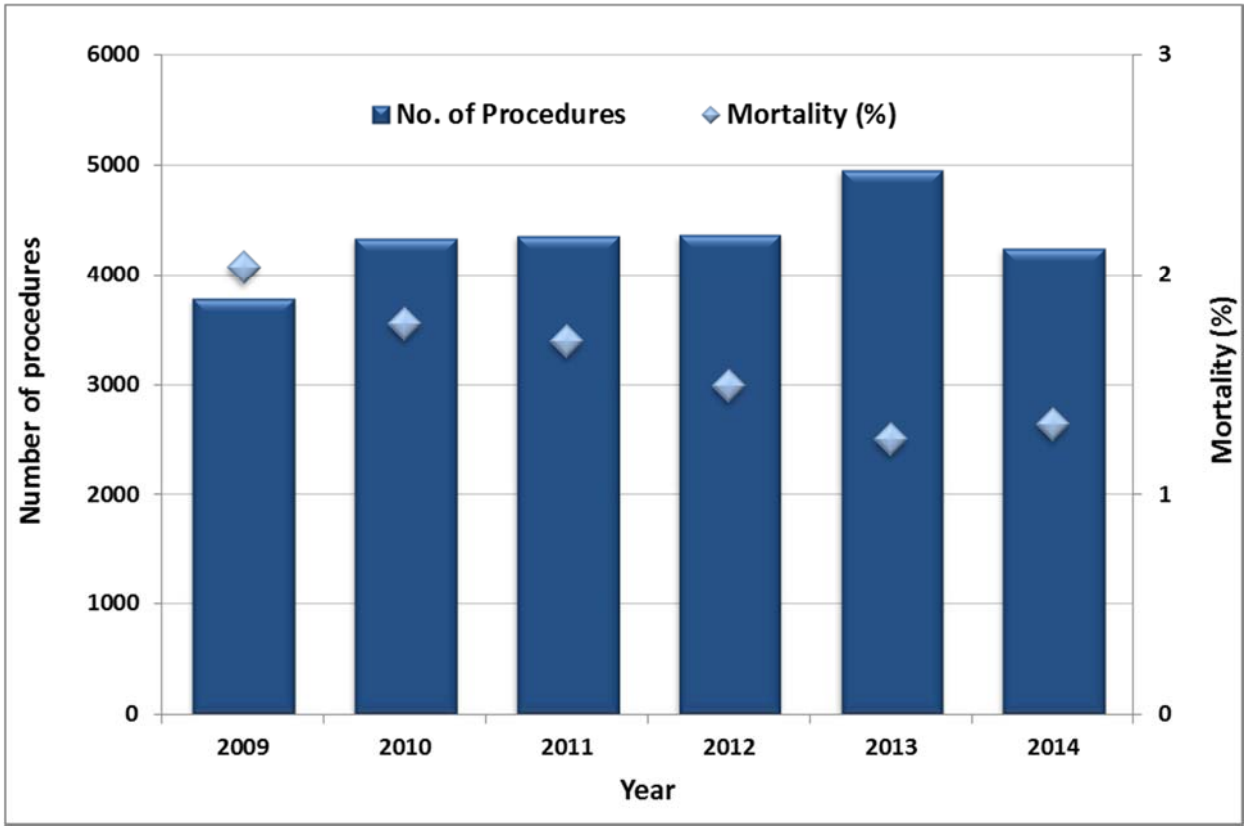
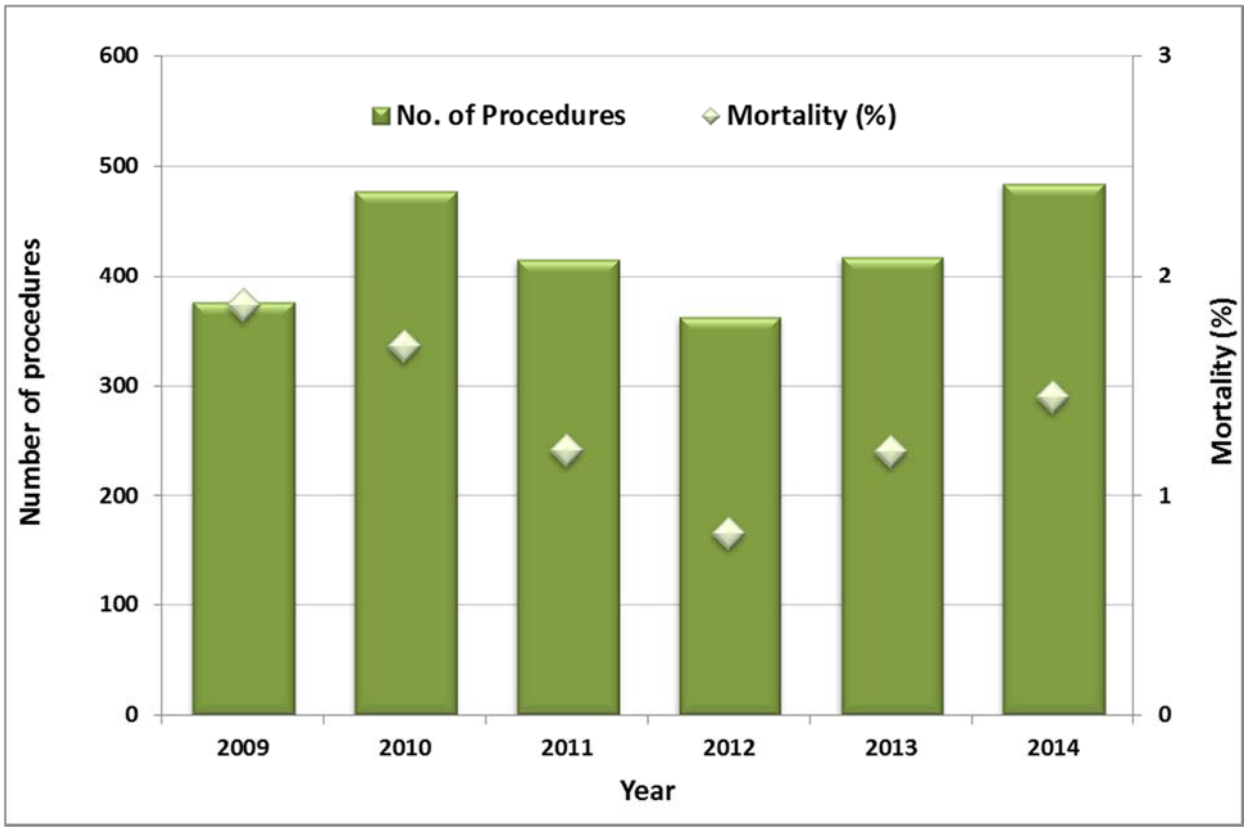


Figure 4: Observed mortality rate for isolated CABG Off-Pump



Isolated CABG Surgery

Table 2a - Number of distal anastomoses for 2014

Procedure type	Total number of procedures	X 1	X 2	X 3	X 4	X 5	X 6	X 7	Mean no. grafts
Isolated CABG On-Pump	4242	110	873	1598	1232	341	66	9	3.2
Isolated CABG Off-Pump	484	120	136	112	81	26	3	2	2.5
Total	4726	230	1009	1710	1313	367	69	11	3.2

Table 2b - Number of distal anastomoses for 2013

Procedure type	Total number of procedures	X 1	X 2	X 3	X 4	X 5	X 6	X 7	Mean no. grafts
Isolated CABG On-Pump	4953	116	967	1949	1385	448	73	5	3.3
Isolated CABG Off-Pump	417	110	120	119	45	17	3	0	2.4
Total	5370	226	1087	2068	1430	465	76	5	3.2

Table 2c - Number of distal anastomoses for 2010 – 2012

Procedure type	Total number of procedures	X 1	X 2	X 3	X 4	X 5	X 6	X 7	Mean no. grafts
Isolated CABG On-Pump	10095	305	1966	4016	2715	894	156	22	3.2
Isolated CABG Off-Pump	1208	292	383	315	157	53	2	0	2.4
Total	11303*	597	2349	4331	2872	947	158	22	3.2

*5 missing cases

Table 2: Over the last 5 years of ANZSCTS data collection, the average number of grafts has been approximately 3.2-3.3 for on-pump procedures and 2.4-2.5 for off-pump. In 2014, approximately 23% of on-pump and 53% of off-pump procedures had one or two grafts.

Isolated CABG Surgery

Figure 5: All arterial grafts in isolated CABG On-Pump

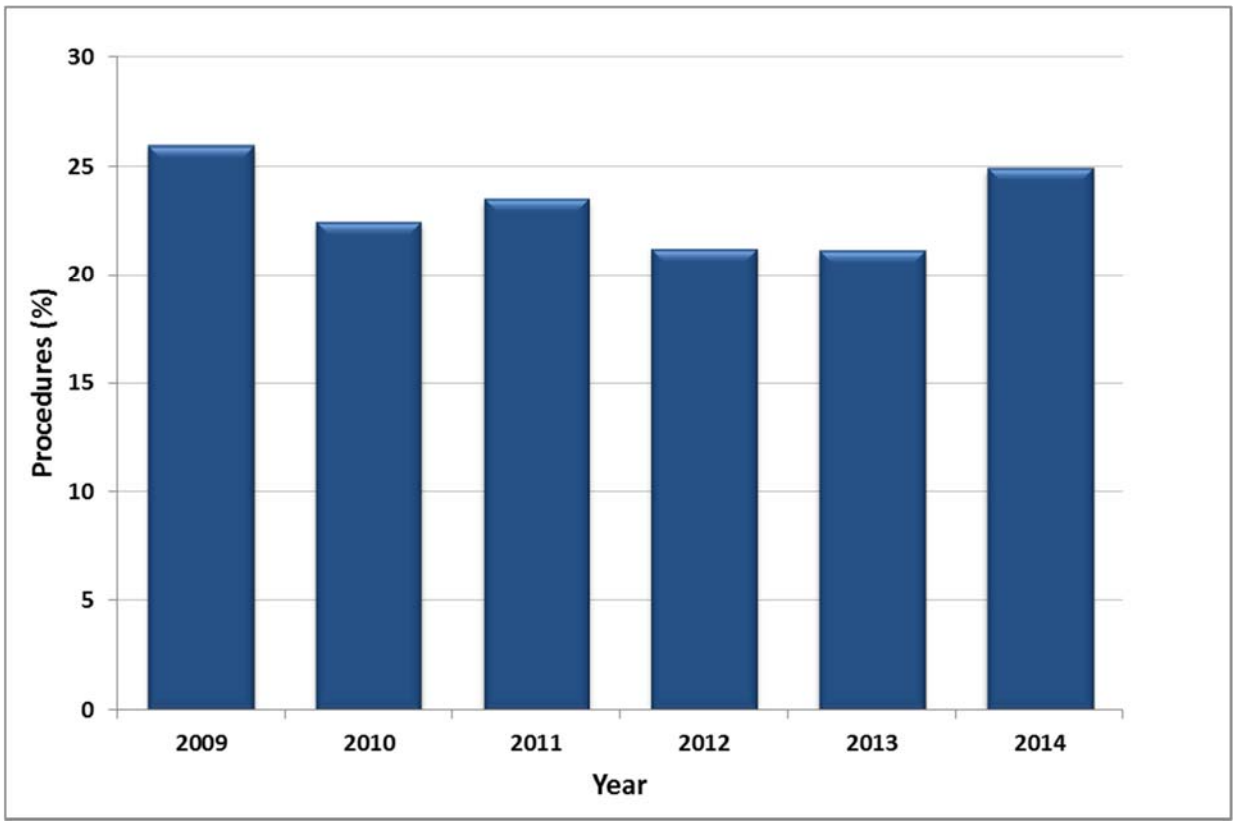


Table 3a - Arterial grafts for 2014

Procedure type	Total number of procedures	All arterial		T or Y grafts	
		Number of procedures	% of procedure type	Number of procedures	% of procedure type
Isolated CABG On-Pump	4237	1057	24.9	427	10.1
Isolated CABG Off-Pump	483	316	65.3	138	28.6
Total	4720*	1373	29.1	565	12.0

*6 missing cases

As expected, all arterial grafting techniques and the use of T and Y grafts are more commonly utilised in off-pump procedures.

Isolated CABG Surgery

Table 3b - Arterial grafts for 2013

Procedure type	Total number of procedures	All arterial		T or Y grafts	
		Number of procedures	% of procedure type	Number of procedures	% of procedure type
Isolated CABG On-Pump	4953	1047	21.1	384	7.8
Isolated CABG Off-Pump	417	286	68.6	102	24.5
Total	5370	1333	24.8	486	8.9

Table 3c - Arterial grafts for 2010 - 2012

Procedure type	Total number of procedures	All arterial		T or Y grafts	
		Number of procedures	% of procedure type	Number of procedures	% of procedure type
Isolated CABG On-Pump	10095	2737	27.1	792	7.8
Isolated CABG Off-Pump	1208	835	69.1	428	35.5
Total	11303*	3572	31.6	1220	10.8

*5 missing cases

Arterial grafting techniques are utilised in about one quarter of on-pump and two thirds of off-pump coronary grafts.

Isolated CABG Surgery

Figure 6: Arterial conduits used in isolated CABG On-Pump

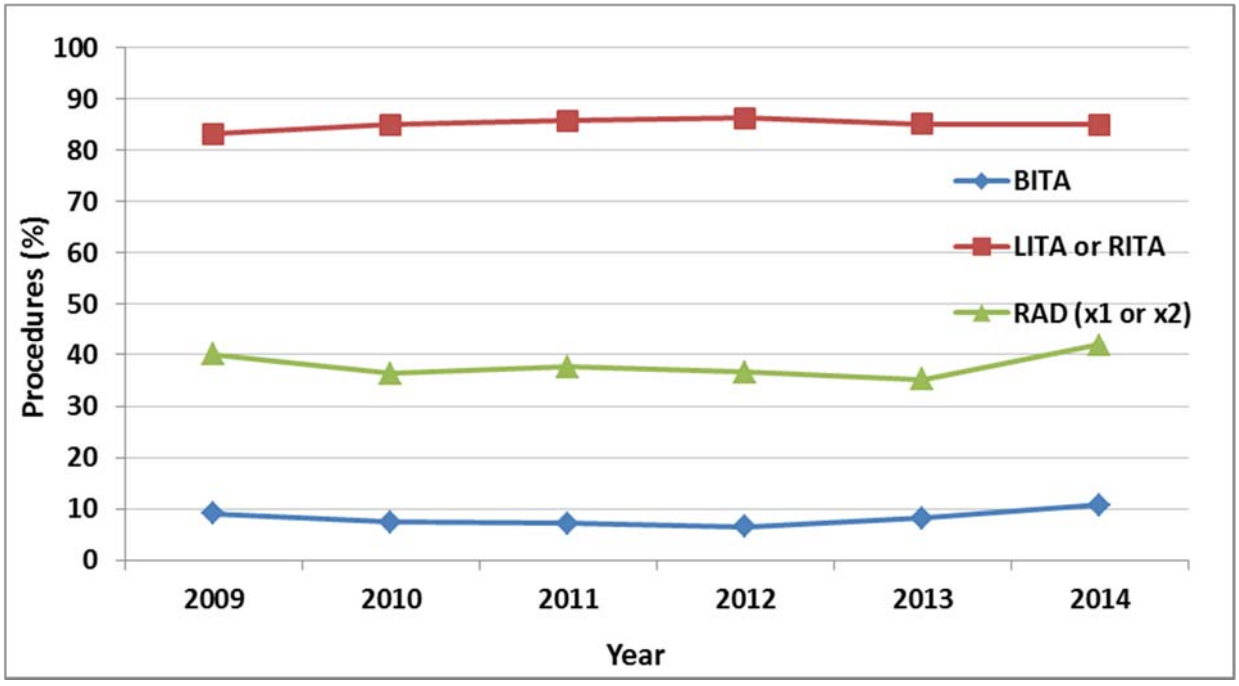
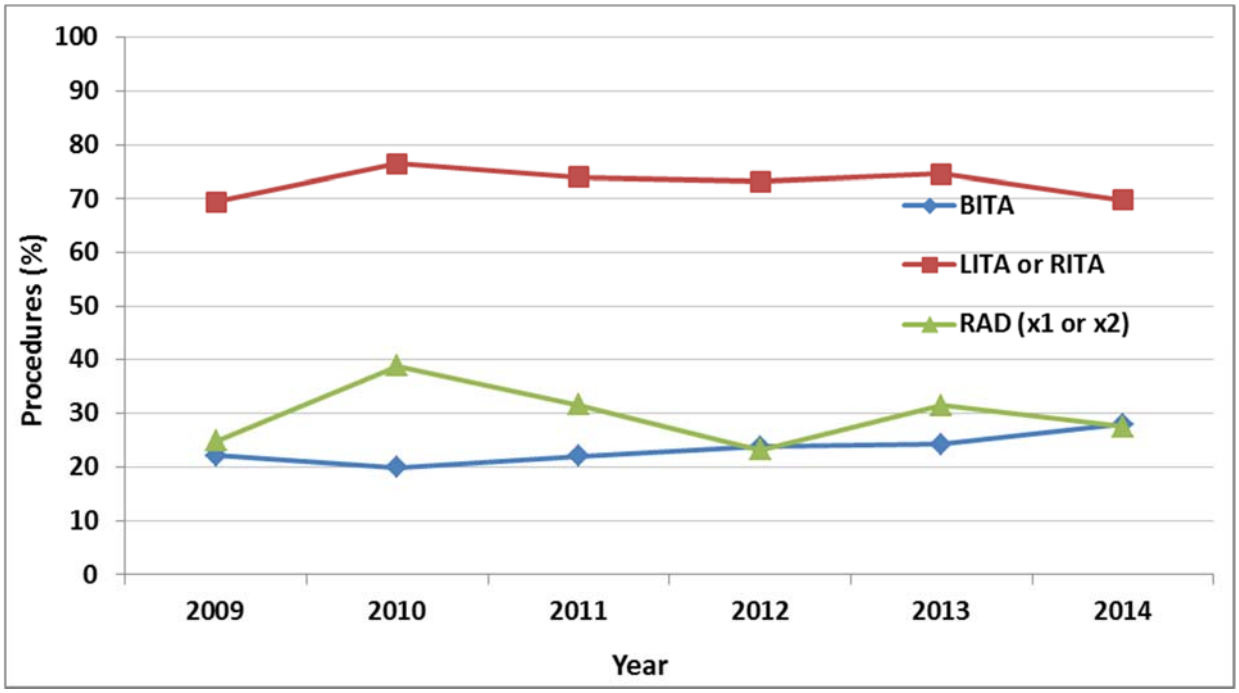


Figure 7: Arterial conduits used in isolated CABG Off-Pump



In 2014, on- and off-pump procedures had a similar use of ITA in total, being 95.7% and 97.7% respectively. However, there was a marked difference in BITA use, being 10.7% and 27.9% respectively. GEPA procedures, used in 0.4% of patients, are not indicated on these graphs.

Isolated CABG Surgery

Table 4a - Conduits used for 2014

Procedure type	Total number of procedures	Number of ITA conduits (mutually exclusive)			Number of RAD (mutually exclusive)		Number of GEPA procedures	Number of SVG procedures
		LITA	RITA	BITA	RAD x 1	RAD x 2		
Isolated CABG On-Pump	4242	3585	17	456	1527	255	15	3174
Isolated CABG Off-Pump	484	330	8	135	119	14	2	166
Total	4726	3915	25	591	1646	269	17	3340

Table 4b - Conduits used for 2013

Procedure type	Total number of procedures	Number of ITA conduits (mutually exclusive)			Number of RAD (mutually exclusive)		Number of GEPA procedures	Number of SVG procedures
		LITA	RITA	BITA	RAD x 1	RAD x 2		
Isolated CABG On-Pump	4953	4201	14	403	1477	269	32	3902
Isolated CABG Off-Pump	417	302	9	101	122	9	1	130
Total	5370	4503	23	504	1599	278	33	4032

Table 4c - Conduits used for 2010 - 2012

Procedure type	Total number of procedures	Number of ITA conduits (mutually exclusive)			Number of RAD (mutually exclusive)		Number of GEPA procedures	Number of SVG procedures
		LITA	RITA	BITA	RAD x 1	RAD x 2		
Isolated CABG On-Pump	10095	8553	58	880	3662	942	37	7348
Isolated CABG Off-Pump	1208	865	26	273	384	24	1	365
Total	11303*	9418	84	1153	4046	966	38	7713

*5 missing cases

Isolated CABG Surgery

Patient Characteristics by Unit 2014

Figure 8a: Total number of isolated CABG by Unit

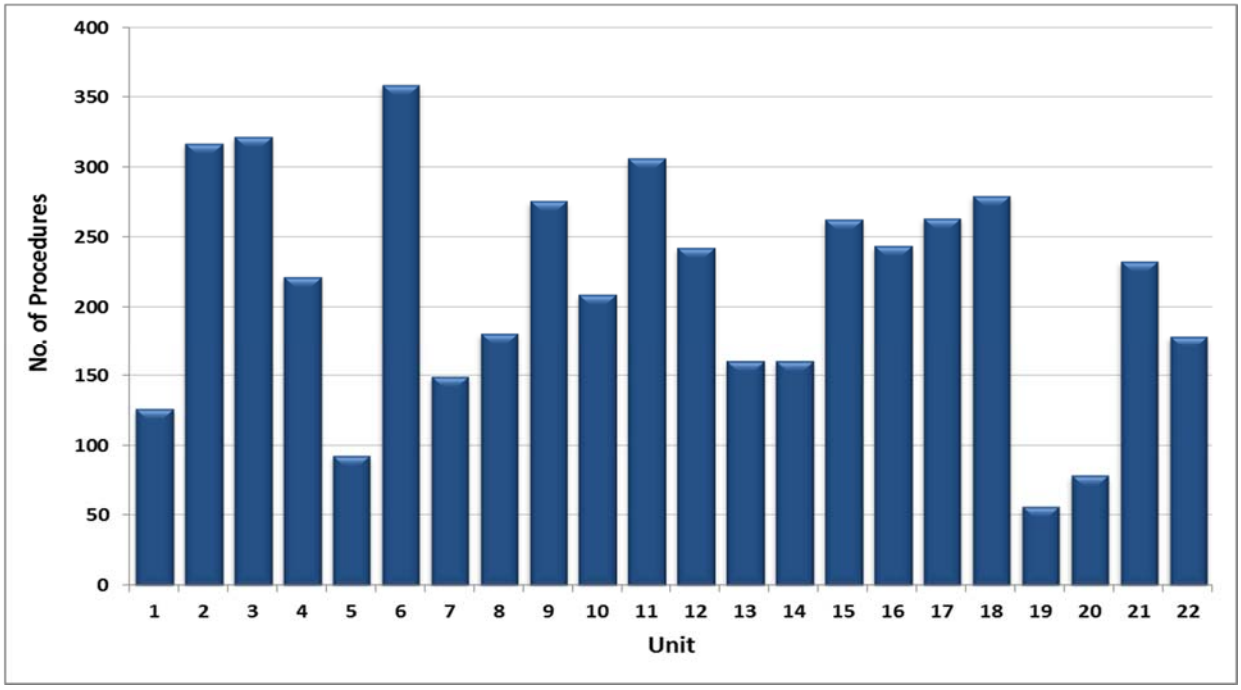
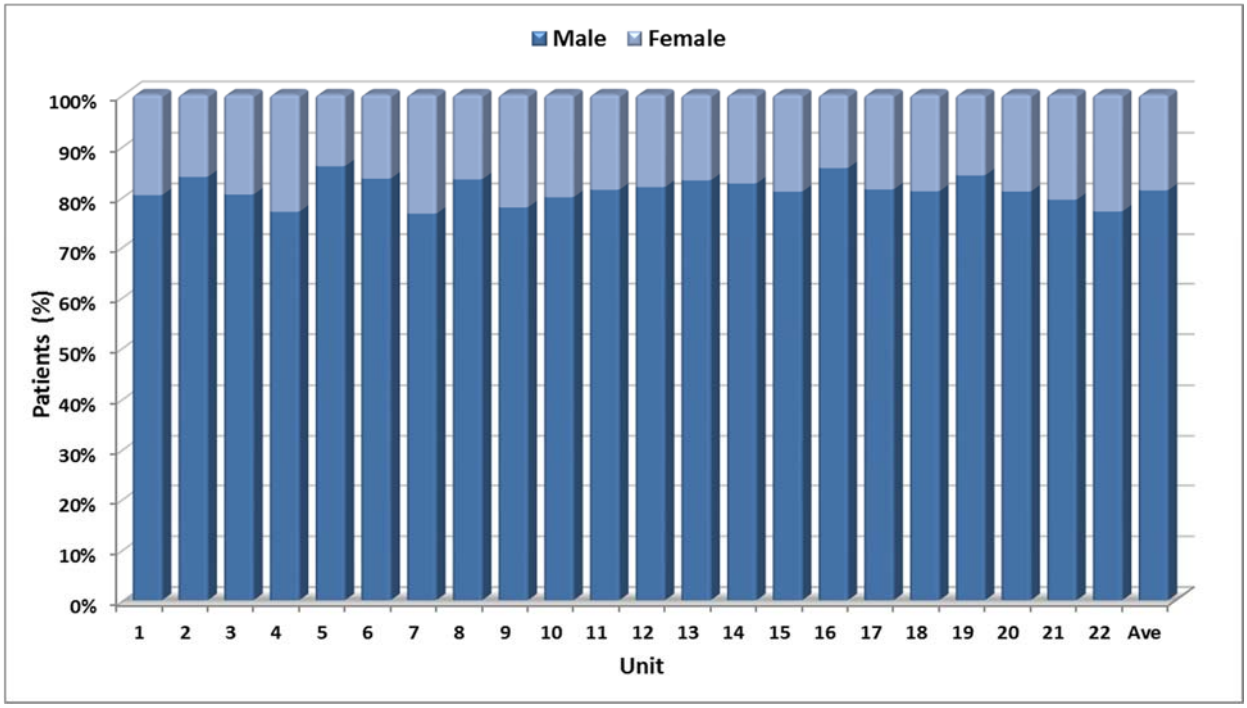


Figure 8b: Patients by sex and Unit



Isolated CABG Surgery

Figure 8c: Percentage of patients ≥70yrs old by Unit 2014

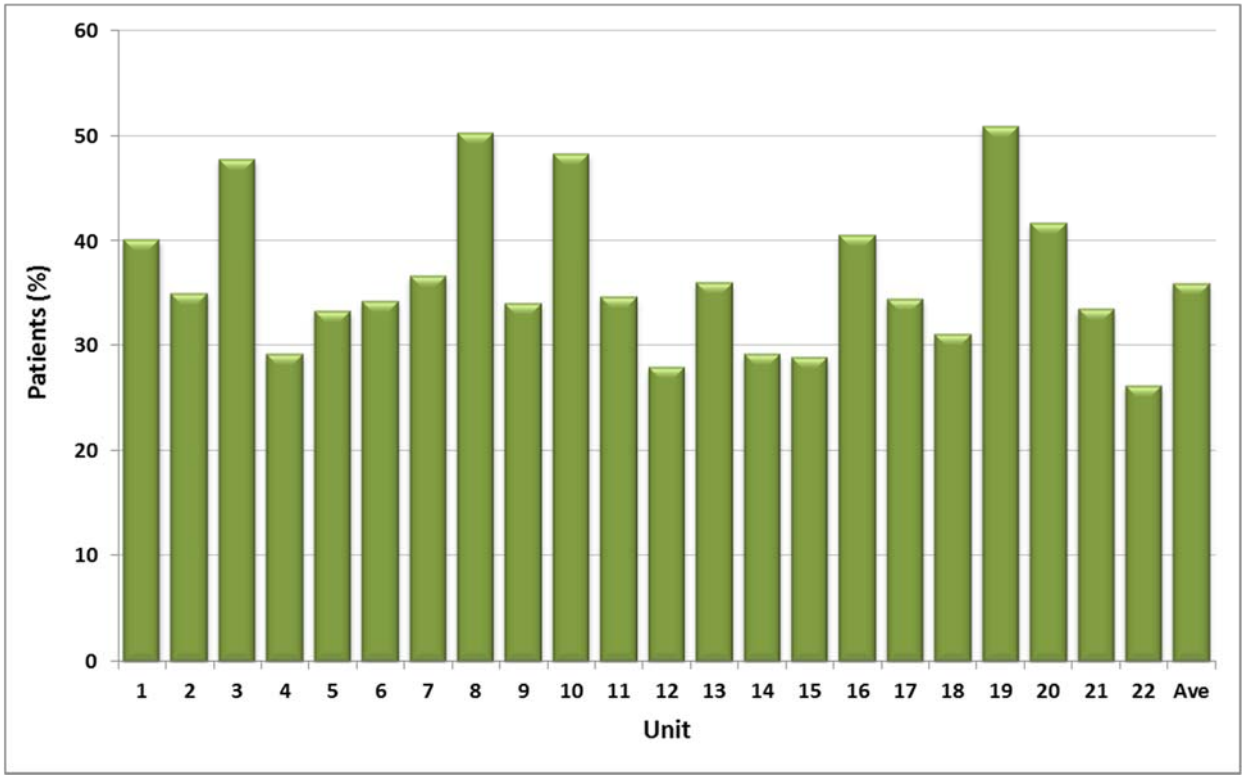
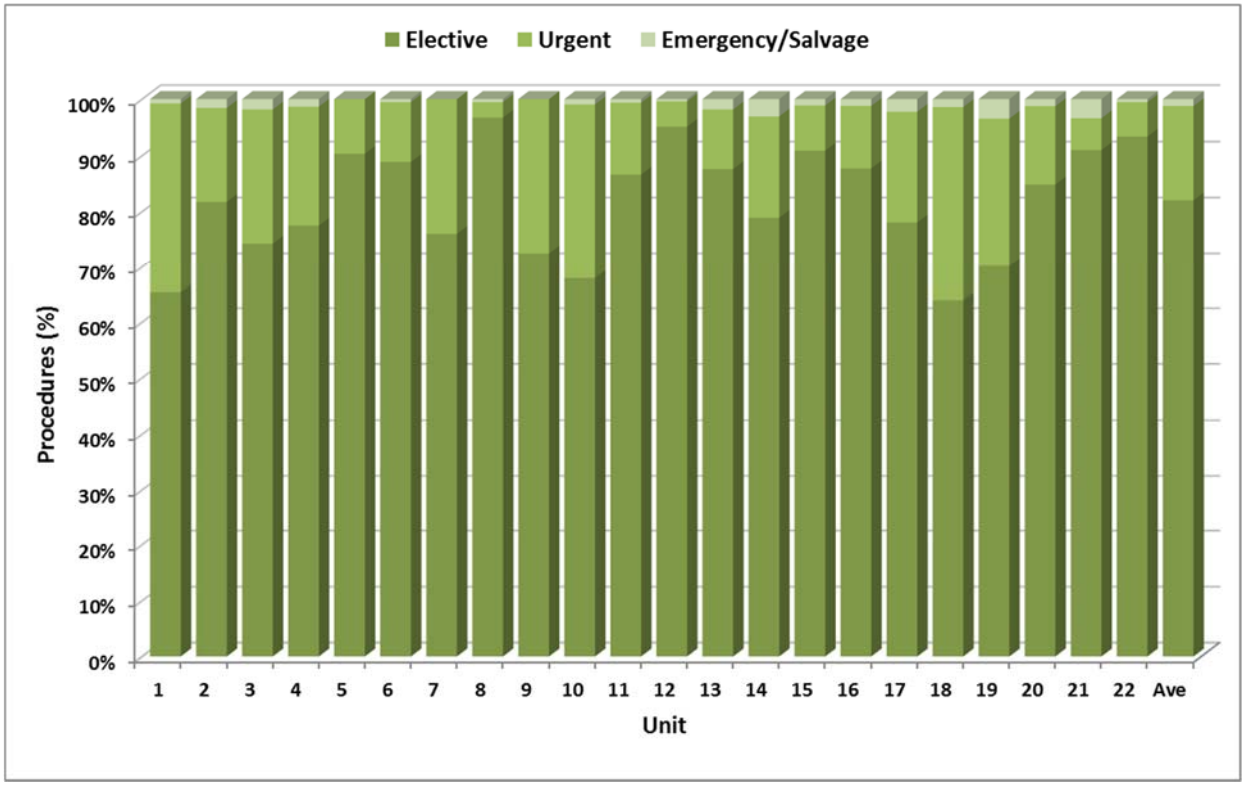
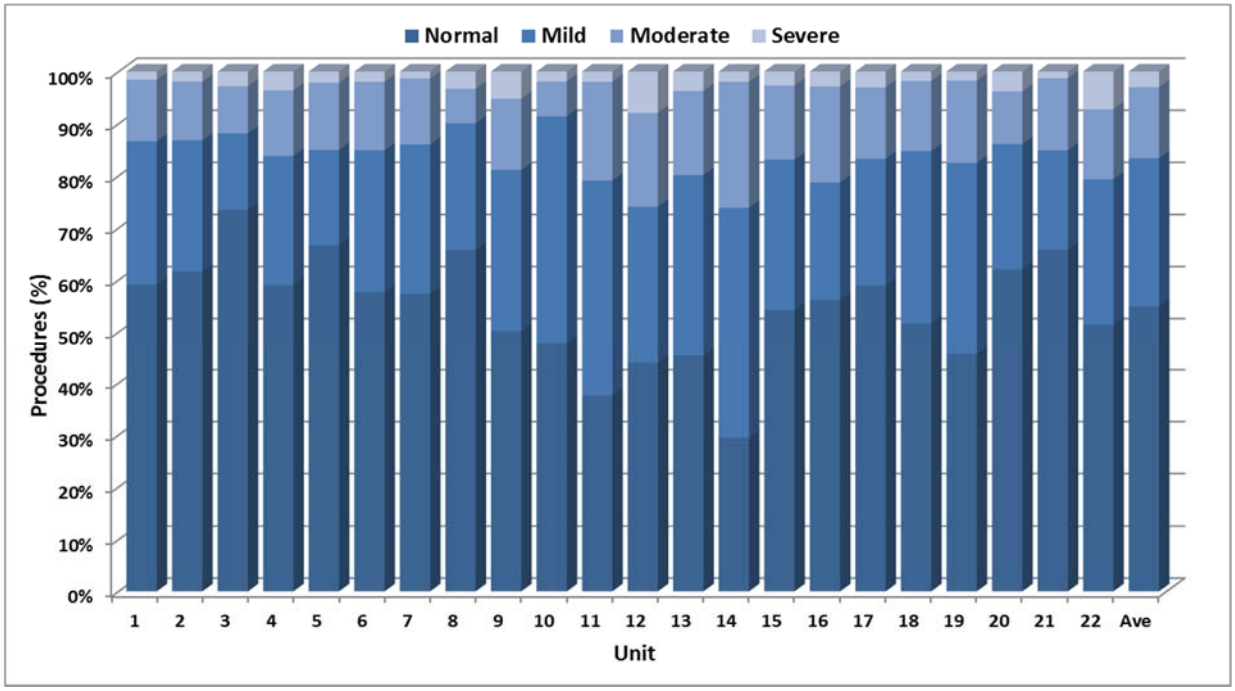


Figure 8d: Patients by clinical status and Unit 2014



Isolated CABG Surgery

Figure 8e: LV dysfunction by Unit 2014



Isolated CABG Surgery

Risk Adjusted Mortality

Figure 9a: Mortality rate after isolated CABG by Unit 2014

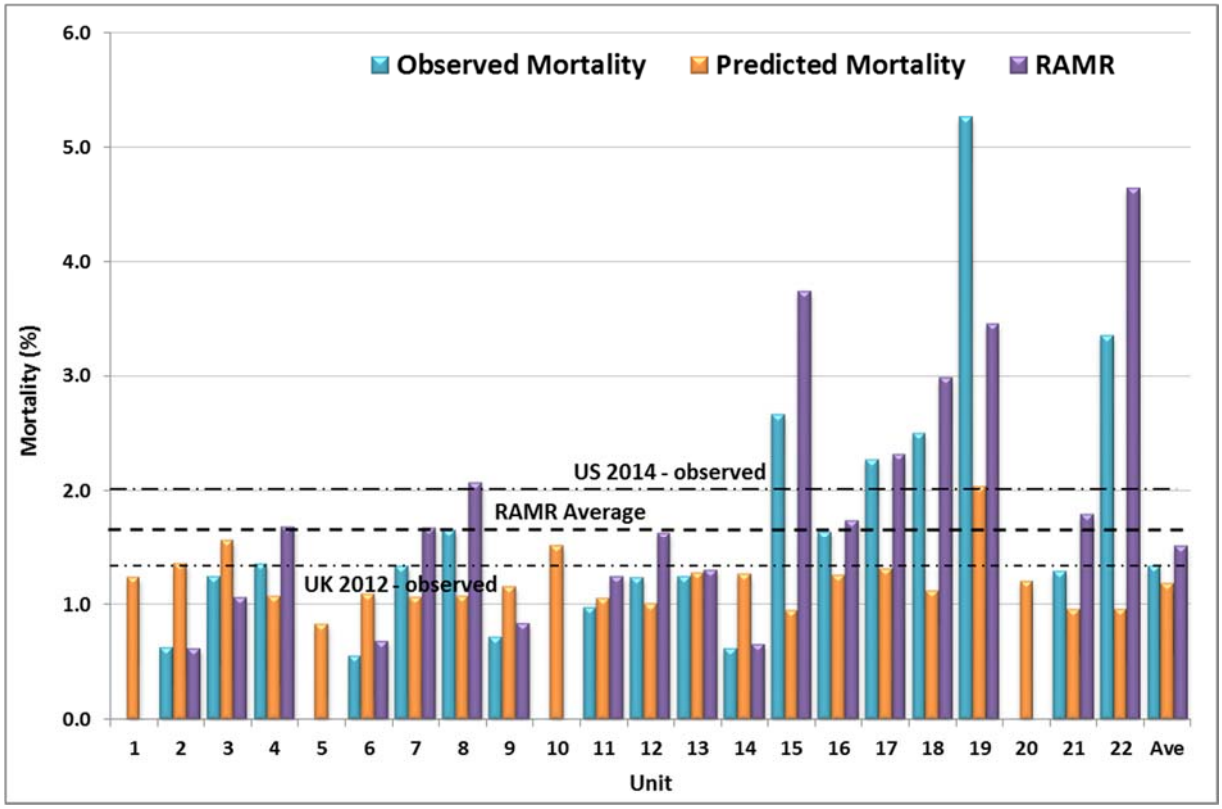


Figure 9a includes both "observed or actual" and "predicted" and "risk-adjusted" mortality. Since the degree of risk associated with the operation varies with the characteristics of patients who undergo cardiac surgery and those characteristics may differ between hospitals, risk-adjustment is necessary to allow comparison of mortality between hospitals. The Risk-Adjusted Mortality Rate (RAMR) compares the mortality rates for the units involved in this analysis.

In 2014, 11/22 hospitals had predicted mortality that was lower than the observed, suggesting that their observed mortality was higher than expected based on the risk-algorithm (All Procedures Model) used.

However Figure 9b indicates that statistically, based on 95% CI, the performances of those units are not significantly different from the group mean.

Isolated CABG Surgery

Figure 9b: Confidence intervals for RAMR following isolated CABG during 2014

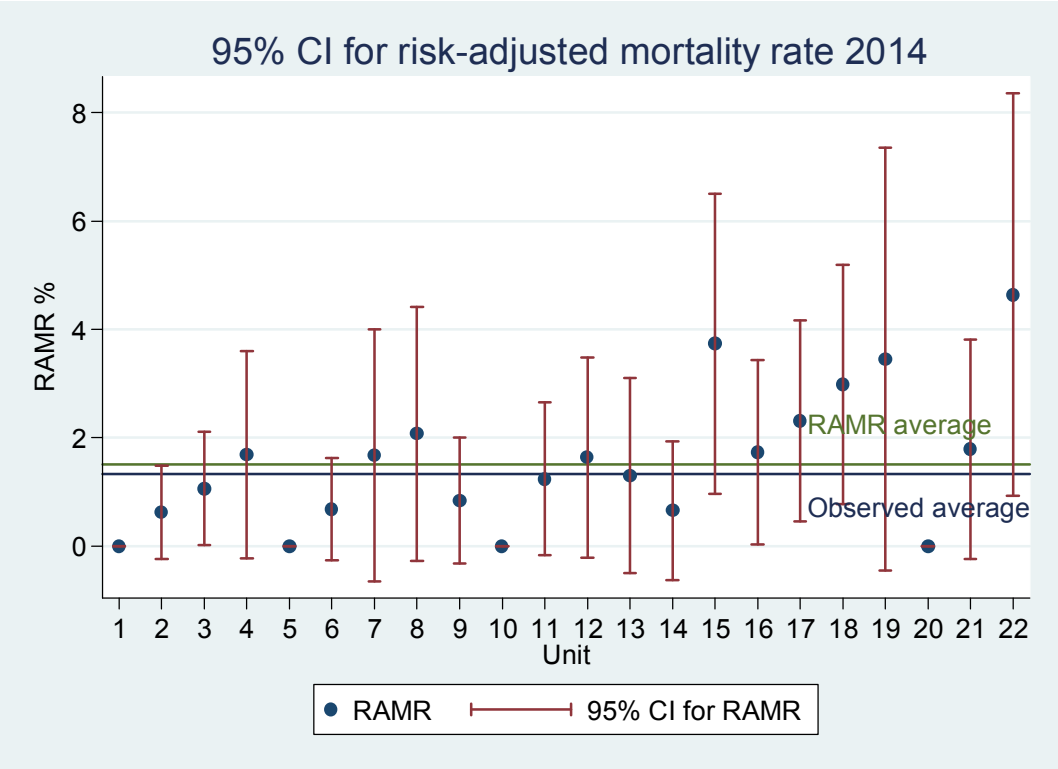
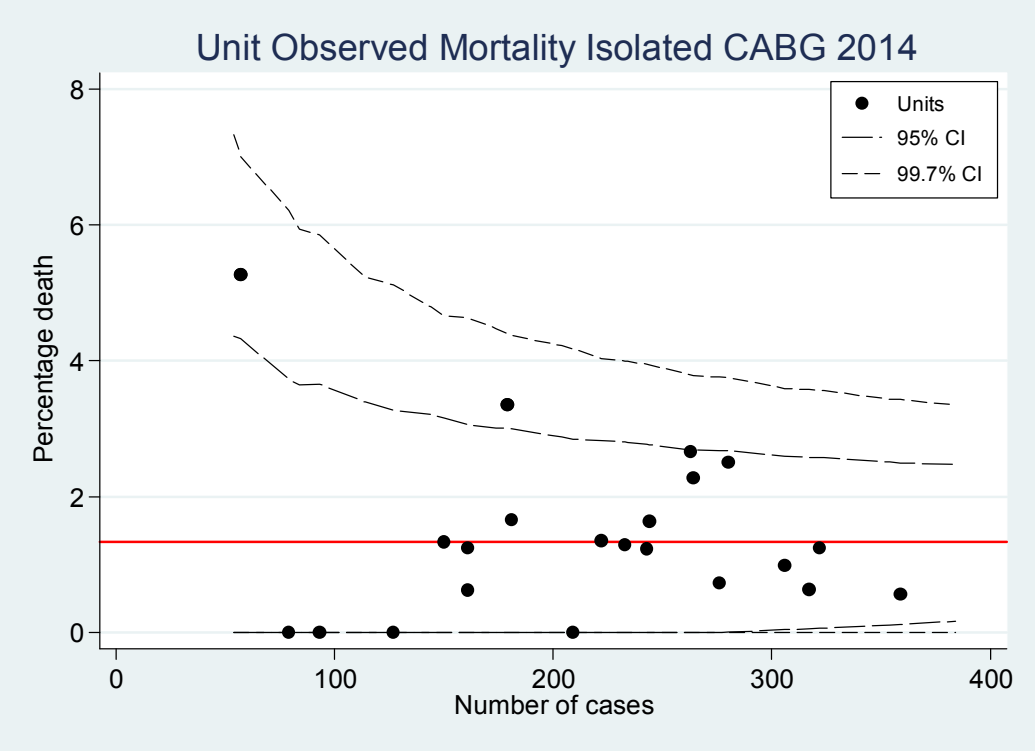
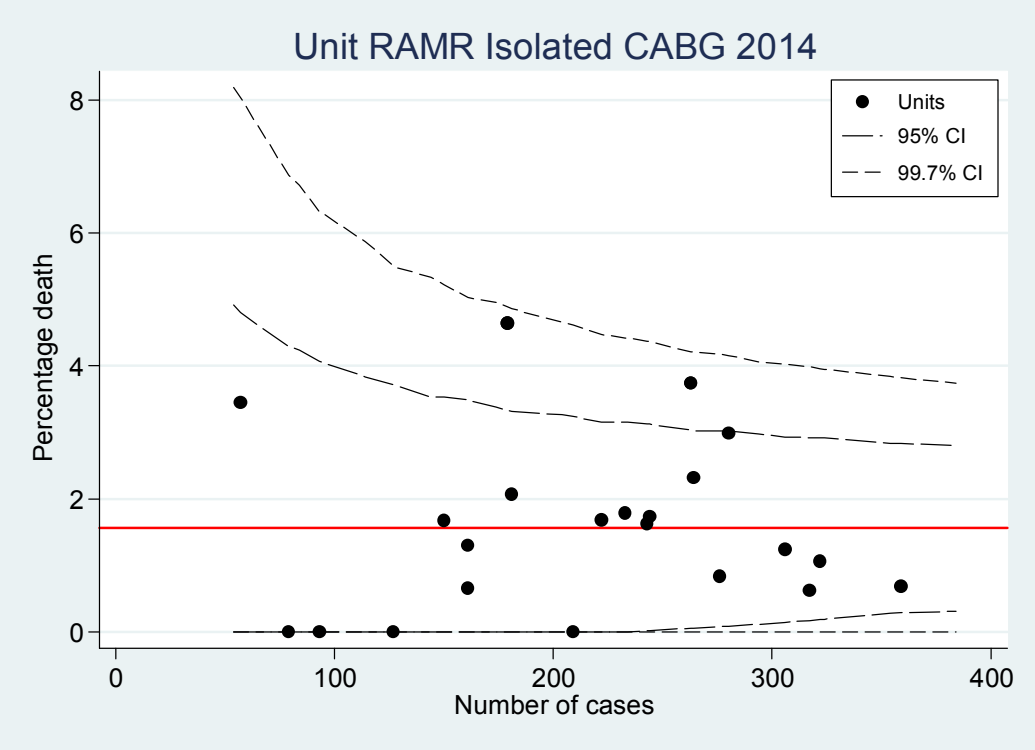


Figure 9b: The 95% CI for risk-adjusted mortality rate for each unit suggests that at that level, no units have significantly higher mortality than the group average. However, four units (Units 1, 5, 10, and 20) had no mortalities. See Appendix B.

Isolated CABG Surgery

Funnel Plots 2014 by Unit





The first plot shows that Unit 19 (N=57) and Unit 22 (N=179) were outside the 95% confidence interval for observed mortality. Unit 19 became within limits after risk adjustment, however Unit 22 did not. Unit 15 (N=263), although outside the 95% confidence interval after risk adjustment remained within 3 standard deviations of the group mean.

Isolated CABG Surgery

Figure 10: Mortality rate for isolated CABG by age and year

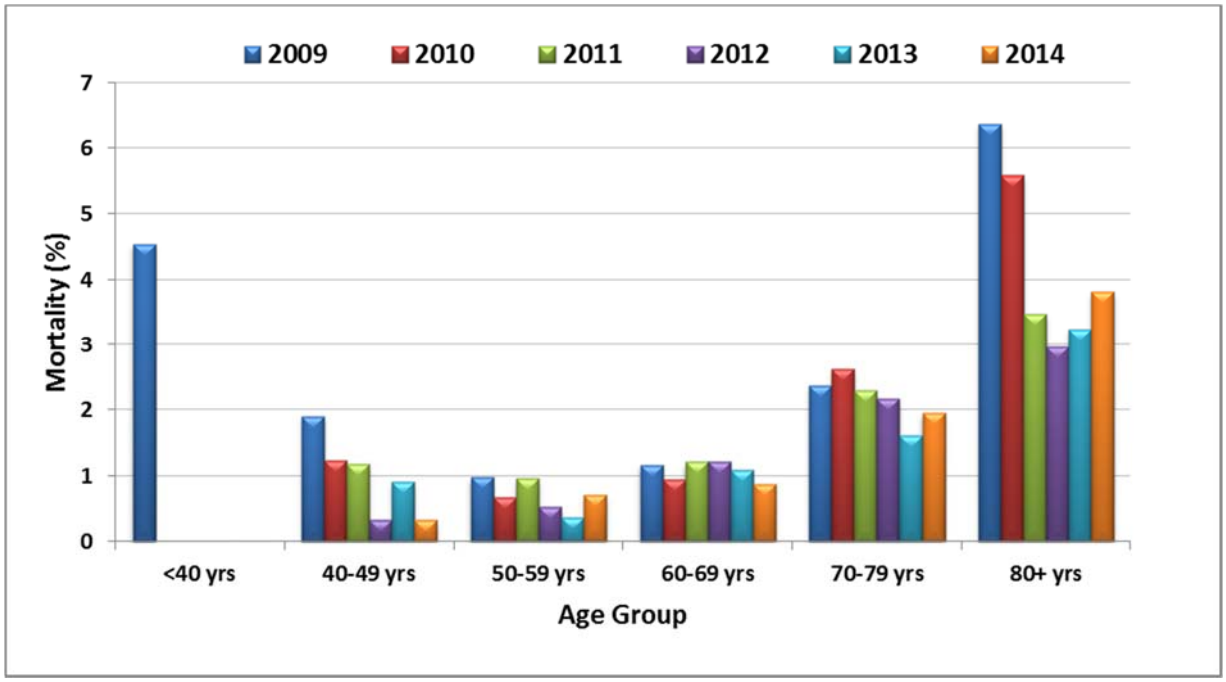


Table 5 - Mortality rate by age 2009 - 2014

	Mortality (mortality/n, %)					
	<40yrs	**40-49yrs**	**50-59yrs**	**60-69yrs**	**70-79yrs**	**80+yrs**
2014	0/33, -	1/302, 0.3	7/992, 0.7	15/1704, 0.9	26/1328, 2.0	14/367, 3.8
2013	0/50, -	3/328, 0.9	4/1073, 0.4	21/1938, 1.1	25/1550, 1.6	14/431, 3.2
2012	0/48, -	1/297, 0.3	5/954, 0.5	20/1643, 1.2	30/1380, 2.2	12/404, 3.0
2011	0/46, -	4/339, 1.2	9/942, 1.0	20/1650, 1.2	32/1395, 2.3	14/403, 3.5
2010	0/60, -	4/323, 1.2	7/1037, 0.7	15/1599, 0.9	37/1406, 2.6	22/393, 5.6
2009	2/44, 4.5	6/315, 1.9	8/816, 1.0	16/1373, 1.2	31/1304, 2.4	23/361, 6.4
Total	2/281, 0.7	19/1904, 1.0	40/5814, 0.7	107/9907, 1.1	181/8363, 2.2	99/2359, 4.2

Figure 10 and Table 5: There is a progressive increase in operative mortality with advancing age. Mortality for the highest risk group, the 80+ years, has been between 3% and 4% over the past three years.

Isolated CABG Surgery

Figure 11: Mortality rate for isolated CABG by year and clinical status

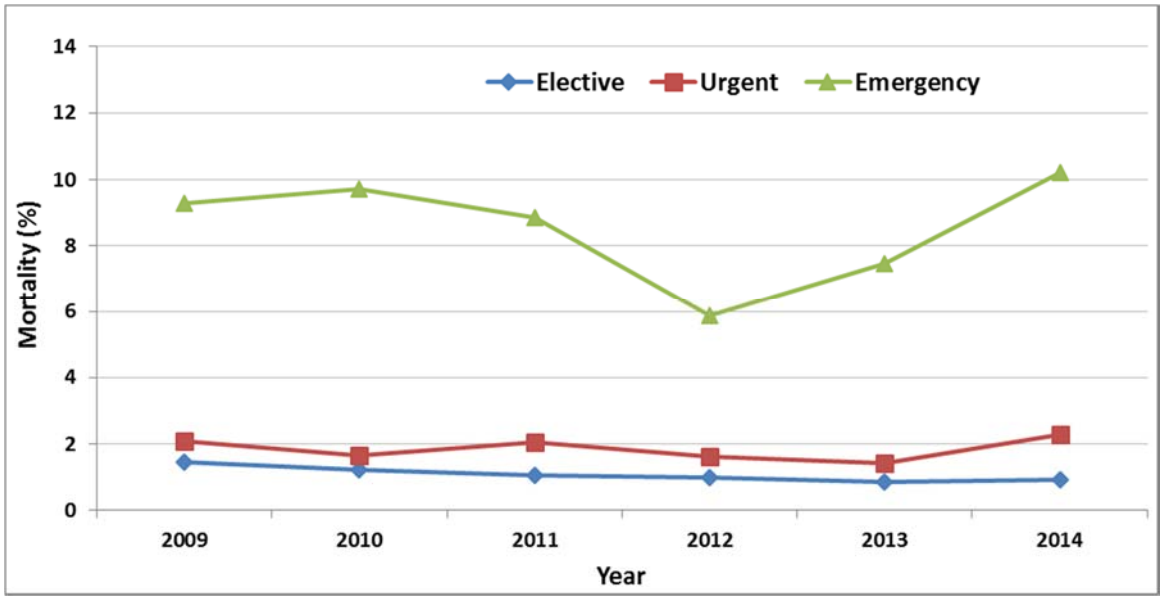


Figure 11: Clinical urgency also significantly influences mortality so that it was approximately 0.9% for elective, 2.3% for urgent and 10.2% for emergency surgery in 2014.

Isolated CABG Surgery

Table 6 - Mortality rate by clinical status 2009 - 2014

	Mortality (mortality/n, %)			
	Elective	Urgent	Emergency	Salvage
2014	36/3875, 0.9	18/792, 2.3	5/49, 10.2	4/10, 40.0
2013	30/3465, 0.9	25/1760, 1.4	10/134, 7.5	2/11, 18.2
2012	29/2952, 1.0	26/1595, 1.6	10/170, 5.9	3/9, 33.3
2011	32/3060, 1.0	32/1560, 2.1	13/147, 8.8	2/9, 22.2
2010	39/3155, 1.2	24/1449, 1.7	20/206, 9.7	2/8, 25.0
2009	36/2498, 1.4	32/1525, 2.1	17/183, 9.3	1/7, 14.3

Figure 12a: Mortality rate for isolated CABG by pre-operative MI 2009 - 2014

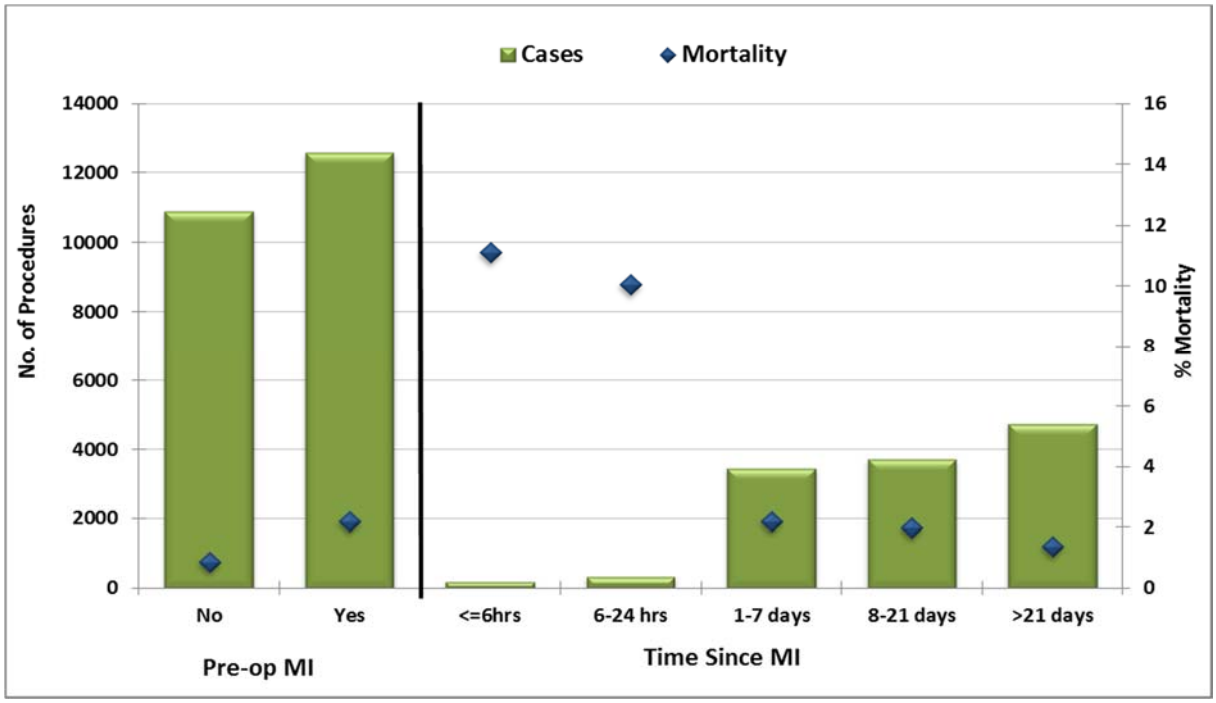
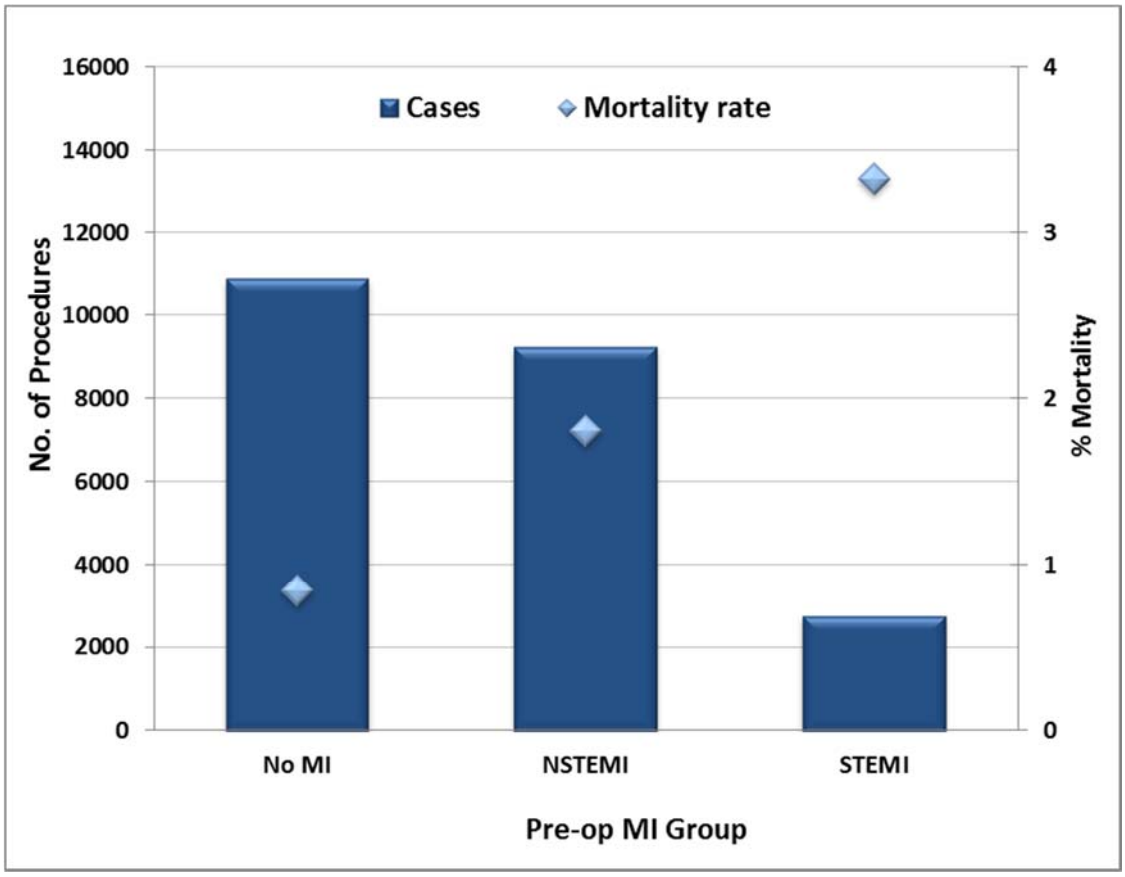


Figure 12a: In 2014, the surgical risk of mortality after MI is approximately 2.2% or just over two and a half times that without MI. The risk is high at intervals <24 hours after MI, then falls rapidly to 2.2% in the 1-7 day group and to 1.3% in the >21 day group. Table 7 details the mortality related to pre-operative MI in 2014.

Isolated CABG Surgery

Figure 12b: Mortality rate for isolated CABG by type of MI 2009 - 2014



The type of pre-operative MI has been recorded for the past 7 years, with 6 years of data shown above. The histogram indicates that overall, whereas the presence of a non-STEMI approximately doubles mortality, that of a STEMI increases mortality by nearly four times.

Table 7 - Mortality rate by pre-operative MI 2009 - 2014

	Mortality (mortality/n, %)						
	Pre-op MI		Time since MI				
	Yes	No	≤6 hrs	6-24 hrs	1-7 days	8-21 days	> 21 days
2014	47/2437, 1.9	16/2289, 0.7	7/33, 21.2	9/70, 12.9	10/688, 1.5	11/741, 1.5	10/905, 1.1
2013	50/2744, 1.8	17/2625, 0.6	3/38, 7.9	6/80, 7.5	14/806, 1.7	11/825, 1.3	16/993, 1.6
2012	52/2551, 2.0	15/2173, 0.7	6/38, 15.8	4/67, 6.0	14/681, 2.1	16/816, 2.0	12/948, 1.3
2011	60/2598, 2.3	19/2177, 0.9	3/46, 6.5	9/62, 14.5	22/837, 2.6	12/746, 1.6	14/905, 1.5
2010	62/2618, 2.4	23/2192, 1.0	6/65, 9.2	7/82, 8.5	16/682, 2.3	18/768, 2.3	15/1014, 1.5
2009	59/2238, 2.6	25/1951, 1.3	6/30, 20.0	4/50, 8.0	13/551, 2.4	20/640, 3.1	16/950, 1.7
Total	330/15186, 2.2	115/13407, 0.9	31/250, 12.4	39/411, 9.5	89/4245, 2.1	88/4536, 1.9	83/5715, 1.5

Isolated CABG Surgery

Figure 13: Mortality rate for isolated CABG by LV dysfunction 2009-2014

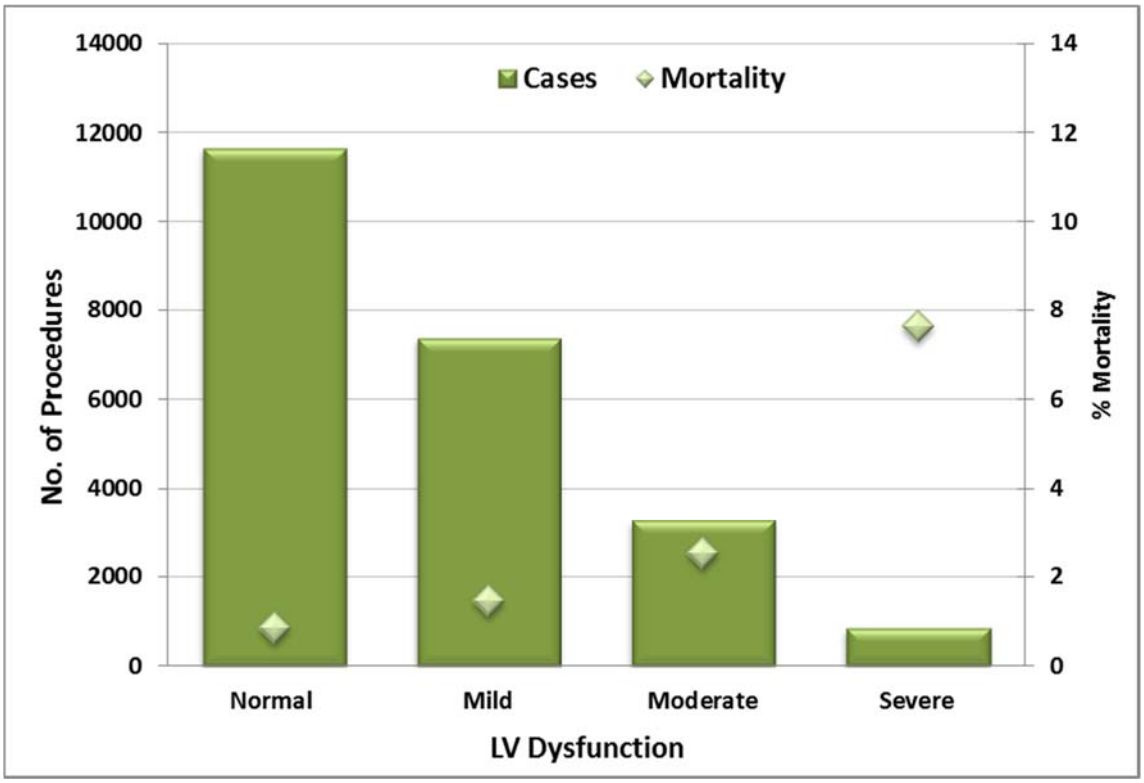


Figure 13: Reduced ventricular function remains a significant determinant of peri-operative mortality over the past 6 years.

Table 8 - Mortality rate by LV dysfunction 2009 - 2014

	Mortality (mortality/n %)			
	LV Dysfunction			
	Normal	Mild	Moderate	Severe
2014*	20/2562, 0.8	20/1326, 1.5	11/637, 1.7	9/140, 6.4
2013	24/2872, 0.8	15/1580, 0.9	15/626, 2.4	12/188, 6.4
2012	13/2398, 0.5	20/1438, 1.4	16/640, 2.5	15/166, 9.0
2011	21/2279, 0.9	23/1571, 1.5	19/669, 2.8	13/156, 8.3
2010	21/2213, 0.9	21/1556, 1.3	20/704, 2.8	18/185, 9.7
2009	20/1969, 1.0	27/1366, 2.0	20/647, 3.1	13/131, 9.9
Total	119/14293, 0.8	126/8837, 1.4	101/3923, 2.6	80/966, 8.3

*2 missing cases

Isolated CABG Surgery

Table 9 - Mortality rate by sex and procedure type (Off-/On- Pump) 2009 - 2014

	Sex (n, %)		Procedure type (n, %)	
	Male	Female	Off-Pump	On-Pump
2014	44/3840, 1.1	19/886, 2.1	7/484, 1.4	56/4242, 1.3
2013	50/4387, 1.1	17/983, 1.7	5/417, 1.2	62/4953, 1.3
2012	50/3777, 1.3	18/949, 1.9	3/362, 0.8	65/4364, 1.5
2011	51/3813, 1.3	28/963, 2.9	5/415, 1.2	74/4361, 1.7
2010	53/3881, 1.4	32/937, 3.4	8/477, 1.7	77/4337, 1.8
2009	60/3287, 1.8	26/926, 2.8	7/376, 1.9	77/3786, 2.0
Total	308/22985, 1.3	140/5644, 2.5	35/2531, 1.4	411/26043, 1.6

Table 10 - Mortality rate by diabetes and renal function 2009 - 2014

	Diabetes (n, %)		Pre-op creatinine (n, %)		Pre-op eGFR (n, %)	
	Yes	No	<200µmol/L	≥200µmol/L	≤60ml /min/1.73m^2	>60ml /min/1.73m^2
2014	27/1838, 1.5	36/2888, 1.2	54/4561, 1.2	9/165, 5.5	27/945, 2.9	36/3781, 1.0
2013*	33/1949, 1.7	34/3419, 1.0	54/5197, 1.0	13/173, 7.5	32/1133, 2.8	35/4237, 0.8
2012	34/1748, 1.9	33/2962, 1.1	58/4569, 1.3	10/157, 6.4	40/1022, 3.9	28/3704, 0.8
2011	34/1735, 2.0	45/3065, 1.5	69/4600, 1.5	10/176, 5.7	43/1094, 3.9	36/3682, 1.0
2010	35/1697, 2.1	52/3121, 1.7	81/4665, 1.7	4/153, 2.6	48/1158, 4.1	37/3660, 1.0
2009	42/1447, 2.9	41/2748, 1.5	82/4086, 2.0	4/127, 3.1	44/970, 4.5	42/3243, 1.3
Total	205/10414, 2.0	241/18203, 1.3	398/27678, 1.4	50/951, 5.3	234/6322, 3.7	214/22307, 1.0

*2 missing cases

Table 9 and 10: The overall mortality rate for the 6 year period is significantly affected by female sex, renal impairment, and diabetes.

Isolated CABG Surgery

Table 11 - Post-operative complications by age 2014 (% of cases)

	Age Group						
	<40yrs	40-49yrs	50-59yrs	60-69yrs	70-79yrs	80+yrs	Total
n	33	302	992	1704	1327	366	4724*
New Renal Failure	9.1	3.3	4.3	5.0	5.4	6.8	5.0
Cerebrovascular Complication	-	1.0	0.3	1.0	1.5	2.5	1.1
Permanent Stroke	-	1.0	0.3	0.6	1.0	1.6	0.7
Deep Sternal Wound Infection (30 days post-op)	3.0	0.7	0.9	0.7	1.1	1.4	0.9
Septicaemia	-	-	0.2	0.7	1.0	1.1	0.7
Return to theatre (all cases)	3.0	3.6	3.3	3.9	5.7	7.7	4.6
Re-op for Bleeding	3.0	2.6	2.2	2.1	2.8	3.0	2.4
Peri-operative AMI	-	1.0	0.6	1.0	1.5	1.4	1.1
New Cardiac Arrhythmia	6.1	10.3	15.1	25.1	31.6	37.7	24.7
Pneumonia	12.1	6.0	4.3	4.8	5.0	4.9	4.9
GIT complication	-	0.3	1.0	1.4	1.2	1.1	1.2
Multi-system Failure	-	-	0.5	0.6	1.1	1.4	0.7
Anticoagulant complication	-	0.3	0.4	0.1	0.6	0.3	0.3
Red Blood Cells transfused	36.4	17.9	24.2	24.2	34.9	44.3	28.4
Non-RBC blood products	21.2	10.9	15.9	16.7	19.6	23.8	17.6

*2 missing cases

Table 11: Advancing age is consistently associated with an increased likelihood of most post-operative complications. It also associated with an increased likelihood of transfusion requirement.

Isolated CABG Surgery

Table 12 - Post-operative complications by clinical status 2014 (% of cases)

	Clinical Status				
	Elective	Urgent	Emergency	Salvage	Total
n	3875	790	49	10	4724*
New Renal Failure	4.6	5.8	20.4	30.0	5.0
Cerebrovascular Complication	1.0	1.1	10.2	10.0	1.1
Permanent Stroke	0.7	0.6	2.0	-	0.7
Deep Sternal Wound Infection (30 days post-op)	1.0	0.8	2.0	-	0.9
Septicaemia	0.5	1.0	2.0	10.0	0.7
Return to theatre (all cases)	4.3	5.2	8.2	30.0	4.6
Re-op for Bleeding	2.3	2.7	2.0	10.0	2.4
Peri-operative AMI	0.9	1.5	4.1	10.0	1.1
New Cardiac Arrhythmia	24.4	24.8	44.9	50.0	24.7
Pneumonia	4.7	4.2	22.4	30.0	4.9
GIT complication	1.0	1.6	2.0	20.0	1.2
Multi-system Failure	0.4	1.5	4.1	40.0	0.7
Anticoagulant complication	0.3	0.5	2.0	-	0.3
Red Blood Cells transfused	27.2	31.8	59.2	100	28.4
Non-RBC blood products	16.4	19.7	63.3	80.0	17.6

*2 missing cases

Table 12: Increasingly acute clinical status is similarly associated with an increased likelihood of developing post-operative complications and need for transfusion.

Isolated CABG Surgery

Table 13 - Post-operative complications by redo, Off-pump and renal function 2014 (% of cases)

	Redo		Off-pump		Pre-op creatinine		Pre-op eGFR		Total
	1st proc	Redo	Off-pump	On-pump	<200 µmol/L	≥200 µmol/L	>60mL /min /1.73m^2	≤60mL /min /1.73m^2	Procedures
n	4621	103	484	4240	4559	165	3781	943	4724*
New Renal Failure	5.0	8.8	2.7	5.3	4.7	14.5	3.8	10.2	5.0
Cerebrovascular Complication	1.1	-	0.8	1.1	1.1	1.2	0.7	2.6	1.1
Permanent Stroke	0.8	-	0.6	0.8	0.7	0.6	0.5	1.6	0.7
Deep Sternal Wound Infection (30 days post-op)	0.9	1.0	0.6	1.0	0.9	1.8	0.8	1.3	0.9
Septicaemia	0.6	1.9	0.4	0.7	0.6	3.0	0.5	1.3	0.7
Return to theatre (all cause)	4.5	8.8	3.7	4.7	4.4	9.1	3.8	7.5	4.6
Re-op for Bleeding	2.4	3.9	1.4	2.5	2.3	4.2	2.0	4.0	2.4
Peri-operative AMI	1.0	2.9	1.2	1.1	1.0	3.0	0.9	1.8	1.1
New Cardiac Arrhythmia	24.7	26.2	23.8	24.8	24.6	29.1	23.5	29.6	24.7
Pneumonia	4.9	3.9	3.7	5.0	4.8	7.9	4.7	5.7	4.9
GIT complication	1.1	1.9	0.8	1.2	1.2	1.2	0.9	2.2	1.2
Multi-system Failure	0.7	2.9	0.4	0.8	0.6	3.0	0.6	1.2	0.7
Anticoagulant complication	0.3	1.0	0.4	0.3	0.3	-	0.2	0.7	0.3
Red Blood Cells transfused	28.0	46.6	19.2	29.5	27.1	64.6	22.5	52.2	28.4
Non-RBC blood products	17.3	28.2	8.9	18.5	17.3	25.0	15.9	24.4	17.6

*2 missing cases

Table 13 shows redo procedures and impaired renal function in patients tend to be associated with higher incidence of adverse outcomes and the use of blood products.

Isolated CABG Surgery

Table 14 - Resource utilisation by age (median value)

		Age Group (years)					
		<40	40-49	50-59	60-69	70-79	80+
Intubation Time (hours)	2014	11.0	8.0	9.0	9.0	11.0	11.0
	2013	9.0	9.0	9.0	10.0	11.0	12.0
	2012	9.0	9.0	10.0	10.0	11.0	11.0
	2011	12.0	10.0	9.0	10.0	11.0	12.0
	2010	11.0	10.0	10.0	11.0	12.0	13.0
	2009	6.0	9.0	10.0	11.0	12.0	13.0
Intensive Care Stay (hours)	2014	52.0	46.0	45.0	46.0	48.0	49.0
	2013	43.0	43.0	44.0	45.0	46.0	52.0
	2012	42.5	39.5	42.0	44.0	45.0	48.0
	2011	12.0	10.0	9.0	10.0	11.0	12.0
	2010	40.0	29.0	40.0	42.0	45.0	47.0
	2009	25.0	26.0	29.0	33.0	41.0	45.0
Post-op Length of Stay (days)	2014	7.0	6.0	6.0	7.0	8.0	9.0
	2013	6.0	6.0	6.0	7.0	8.0	9.0
	2012	6.0	6.0	6.0	7.0	7.0	8.2
	2011	12.0	10.0	9.0	10.0	11.0	12.0
	2010	6.0	6.0	6.0	7.0	8.0	8.5
	2009	6.0	6.0	6.0	7.0	7.0	9.0

Table 14: As expected, increasing age is associated with increased resource utilisation.

Isolated CABG Surgery

Table 15 - Resource utilisation by clinical status (median value)

		Elective	Urgent	Emergency	Salvage
Intubation Time (hours)	2014	10.0	10.0	23.0	106.0
	2013	9.0	11.0	18.5	66.0
	2012	10.0	12.0	19.0	47.0
	2011	10.0	11.0	17.0	25.0
	2010	10.0	13.0	22.0	158.0
	2009	10.0	13.0	19.5	59.0
Intensive Care Stay (hours)	2014	46.0	49.0	72.5	126.5
	2013	44.0	48.0	72.0	144.0
	2012	41.0	48.0	68.5	90.0
	2011	42.0	47.0	64.0	80.0
	2010	32.0	47.0	72.0	234.0
	2009	26.0	45.0	65.0	220.0
Post-op Length of Stay (days)	2014	7.0	7.0	9.0	9.5
	2013	7.0	7.0	9.0	11.0
	2012	7.0	7.0	8.0	8.0
	2011	7.0	7.0	8.0	6.5
	2010	7.0	7.0	9.0	17.0
	2009	7.0	7.0	8.0	16.0

Table 15: Over this six-year period, there has not been any significant change in the duration of intubation time, of stay in ICU or postoperative length of stay. Emergency and Salvage patient groups have increased resource utilisation requirements.

Isolated CABG Surgery

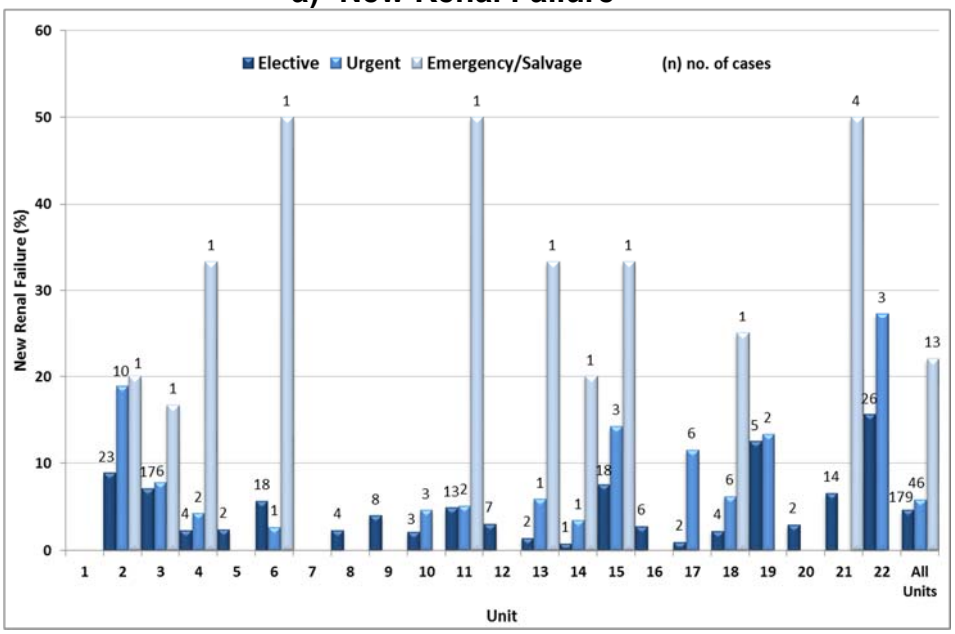
Table 16 - Resource utilisation by sex, redo, off-pump and renal function (median value)

		Sex		Redo		Off-pump		Pre-op creatinine	
		Male	Female	1st proc	Redo	Off-pump	On-pump	<200 µmol/L	≥200 µmol/L
Intubation Time (hours)	2014	9.0	11.0	10.0	11.5	9.0	10.0	10.0	14.5
	2013	10.0	11.0	10.0	12.0	8.0	10.0	10.0	17.0
	2012	10.0	11.0	10.0	13.0	10.0	11.0	10.0	14.0
	2011	10.0	11.0	10.0	11.0	11.0	10.0	10.0	13.0
	2010	11.0	12.0	11.0	12.0	13.0	11.0	11.0	15.0
	2009	10.0	12.0	11.0	11.0	12.0	11.0	11.0	13.0
Intensive Care Stay (hours)	2014	46.0	48.0	46.0	57.0	45.0	47.0	46.0	71.0
	2013	45.0	46.0	46.0	47.0	42.0	46.0	45.0	71.0
	2012	44.0	44.0	44.0	45.0	45.0	44.0	44.0	66.0
	2011	10.0	11.0	10.0	11.0	11.0	10.0	10.0	13.0
	2010	42.0	46.0	36.0	47.0	48.0	42.0	43.0	67.0
	2009	33.0	41.5	36.0	45.0	45.0	33.0	37.0	45.5
Post-op Length of Stay (days)	2014	7.0	7.8	7.0	7.0	6.0	7.0	7.0	8.6
	2013	7.0	8.0	7.0	8.0	6.0	7.0	7.0	9.0
	2012	7.0	7.0	7.0	7.0	10.0	7.0	7.0	9.0
	2011	10.0	11.0	10.0	11.0	11.0	10.0	10.0	13.0
	2010	7.0	7.0	7.0	8.0	7.0	7.0	7.0	9.0
	2009	7.0	7.0	7.0	8.0	6.0	7.0	7.0	8.0

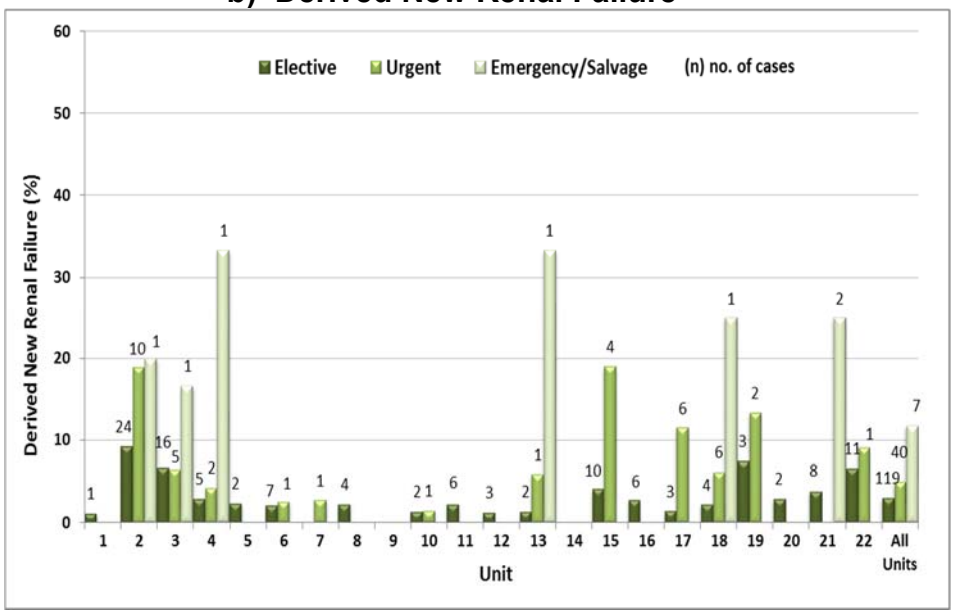
Isolated CABG Surgery

Figure 14: Morbidity by clinical status and Unit 2014

a) New Renal Failure



b) Derived New Renal Failure



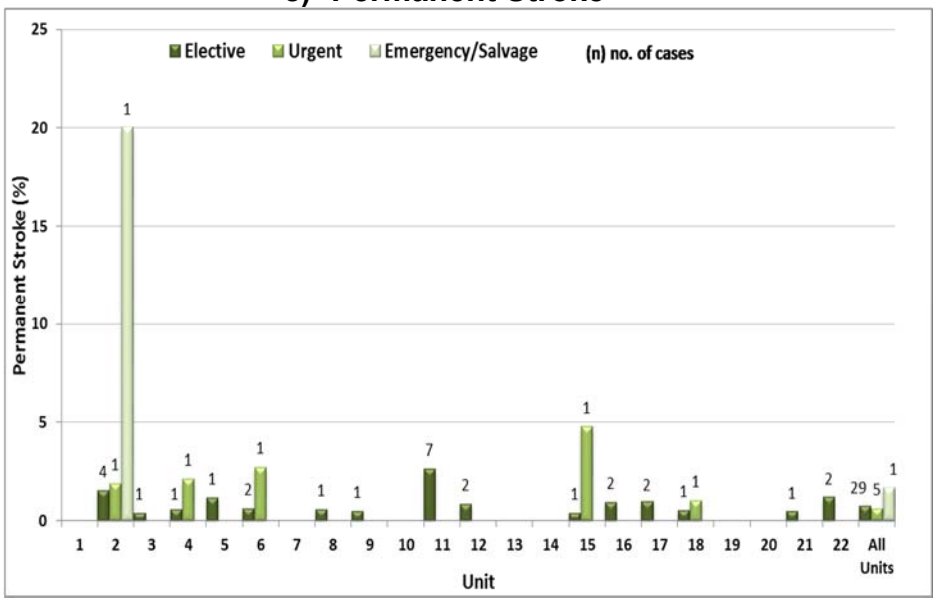
Derived New Renal Failure is calculated based on the revised definition of "New Renal Failure" that will be introduced in the Data Definitions version 4 in 2015. The revised definition of NRF will be:

Was there acute post-operative renal insufficiency characterised by one of the following:

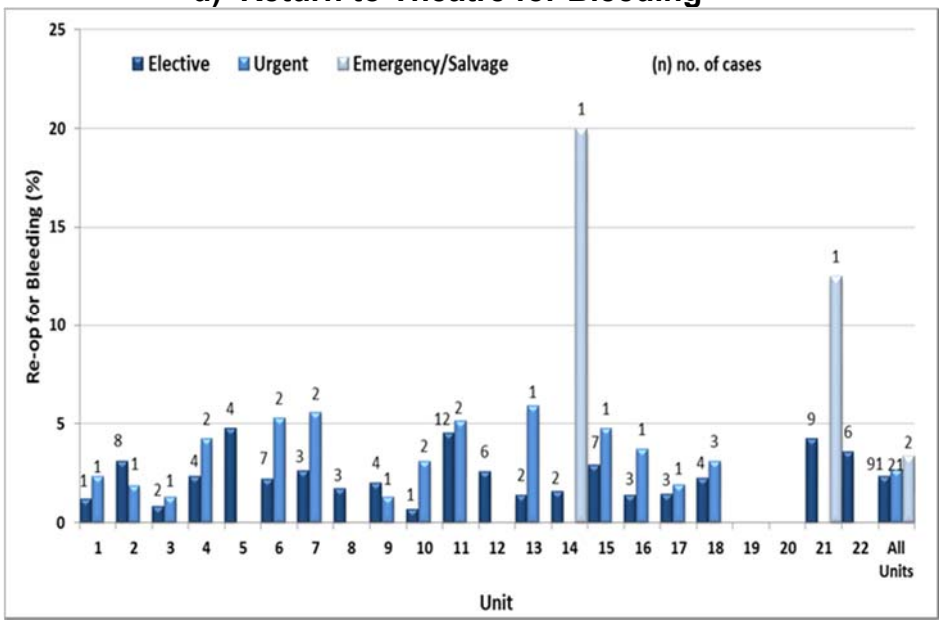
a. Increased serum creatinine to >0.2mmol/l (>200μmol/l) AND a doubling or greater increase in creatinine over the baseline pre-operative value AND the patient did not require pre-operative dialysis/haemofiltration
   OR
b. A new post-operative requirement for dialysis/haemofiltration (when the patient did not require this pre-operatively).

Isolated CABG Surgery

c) Permanent Stroke



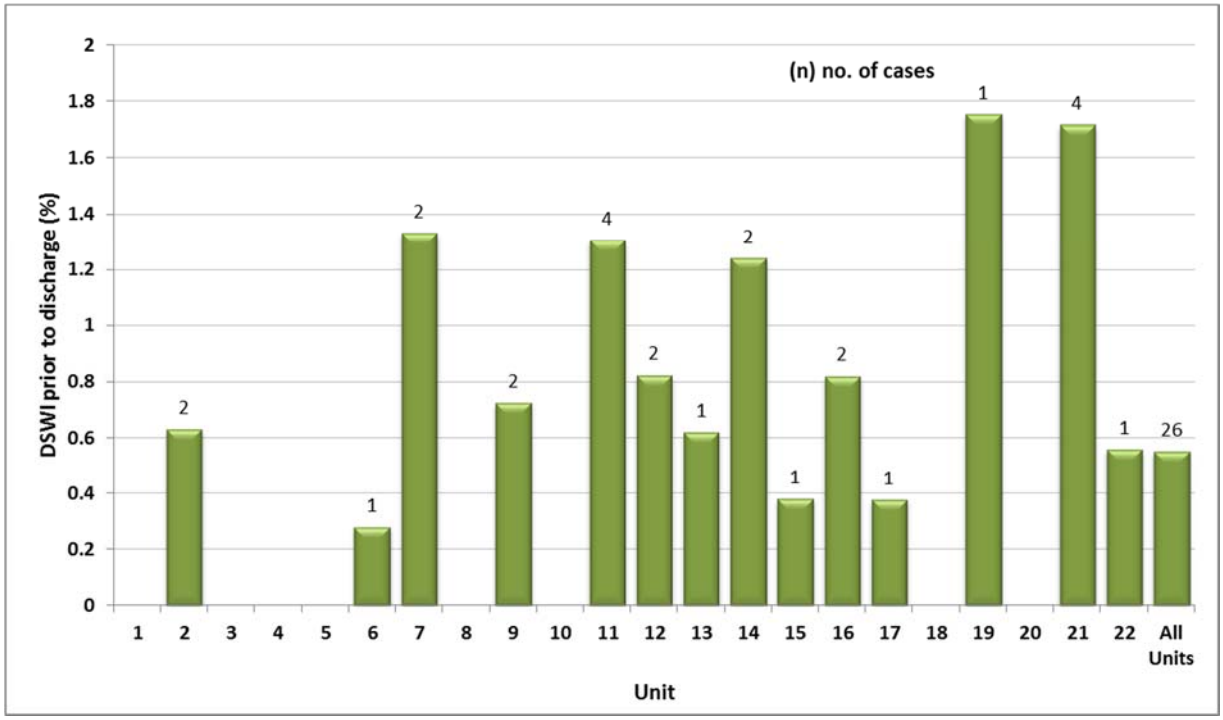
d) Return to Theatre for Bleeding



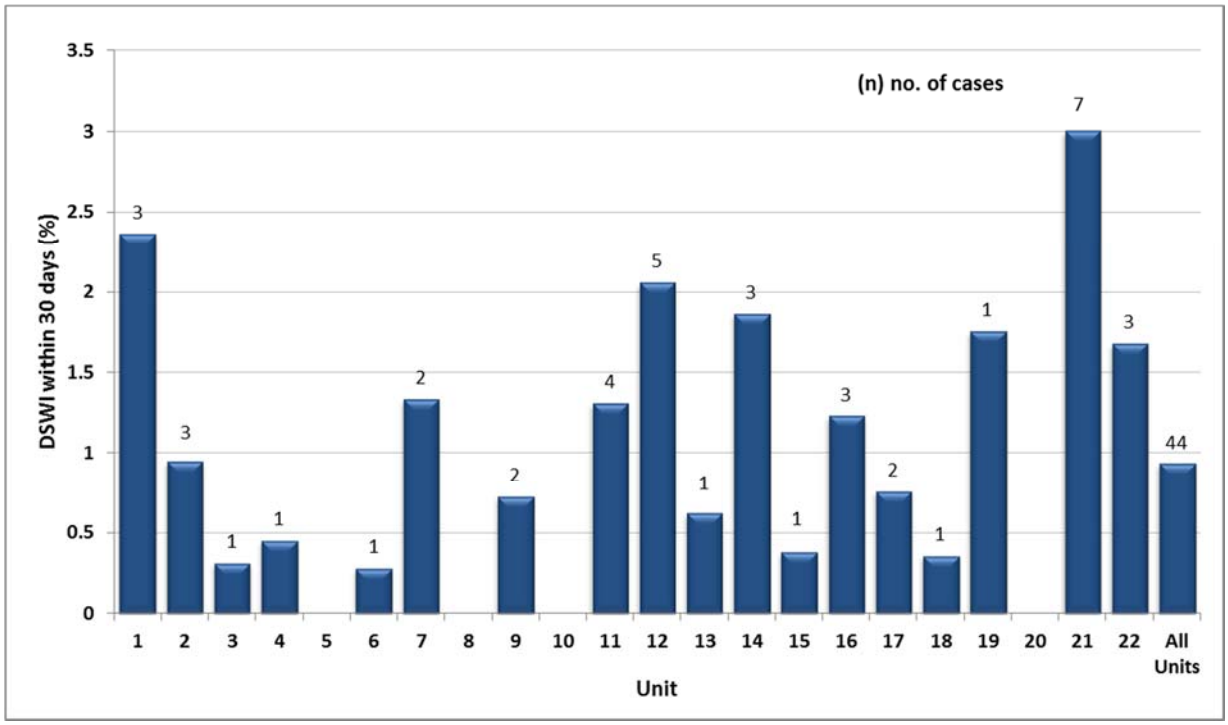
Isolated CABG Surgery

Figure 15: Post-operative complications by Unit 2014

a) Deep sternal wound infection prior to discharge

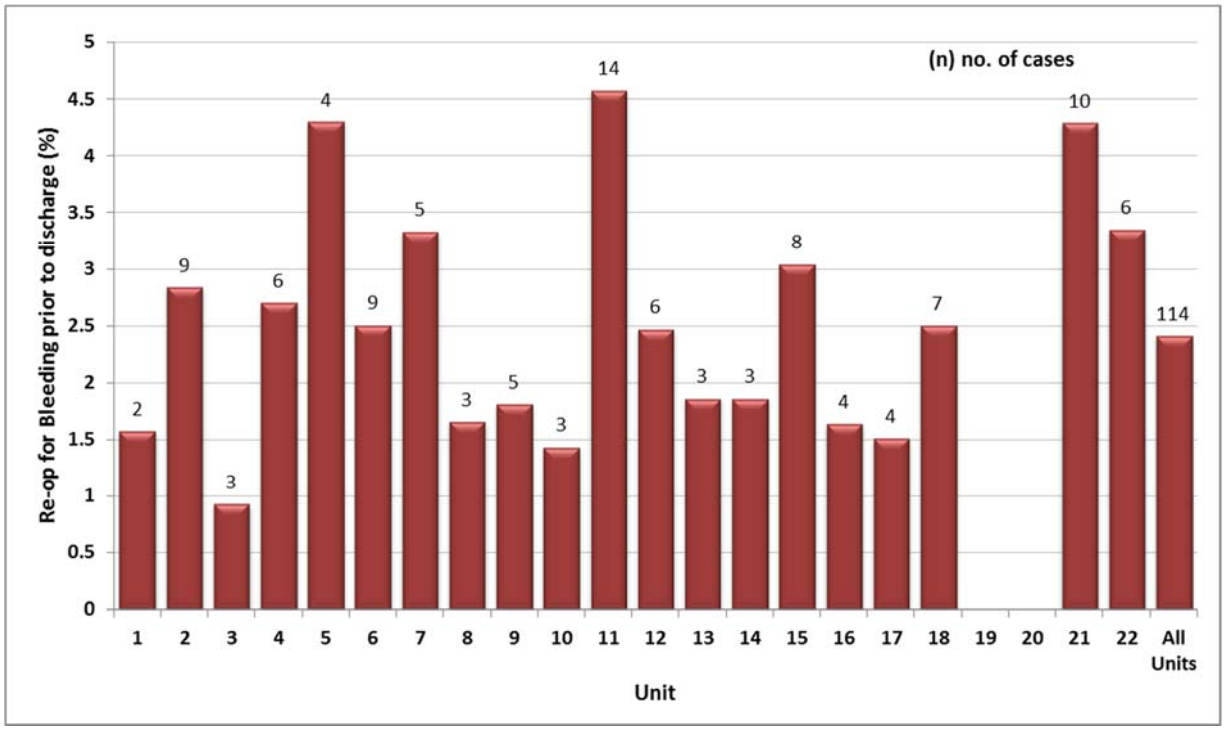


b) Deep sternal wound infection within 30 days of surgery



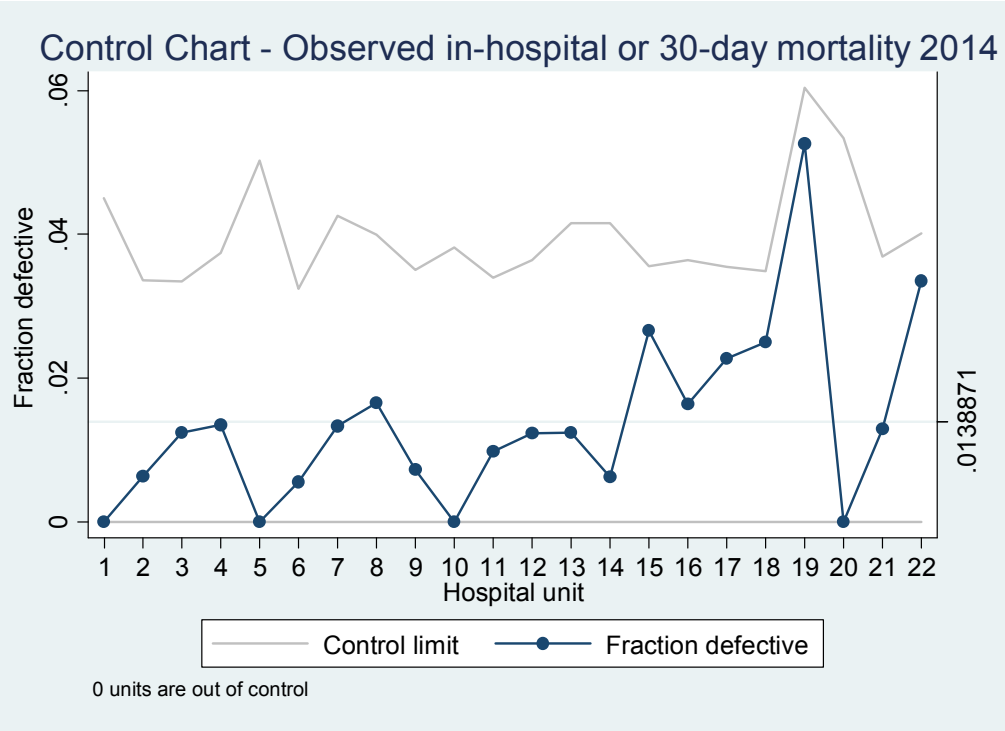
Isolated CABG Surgery

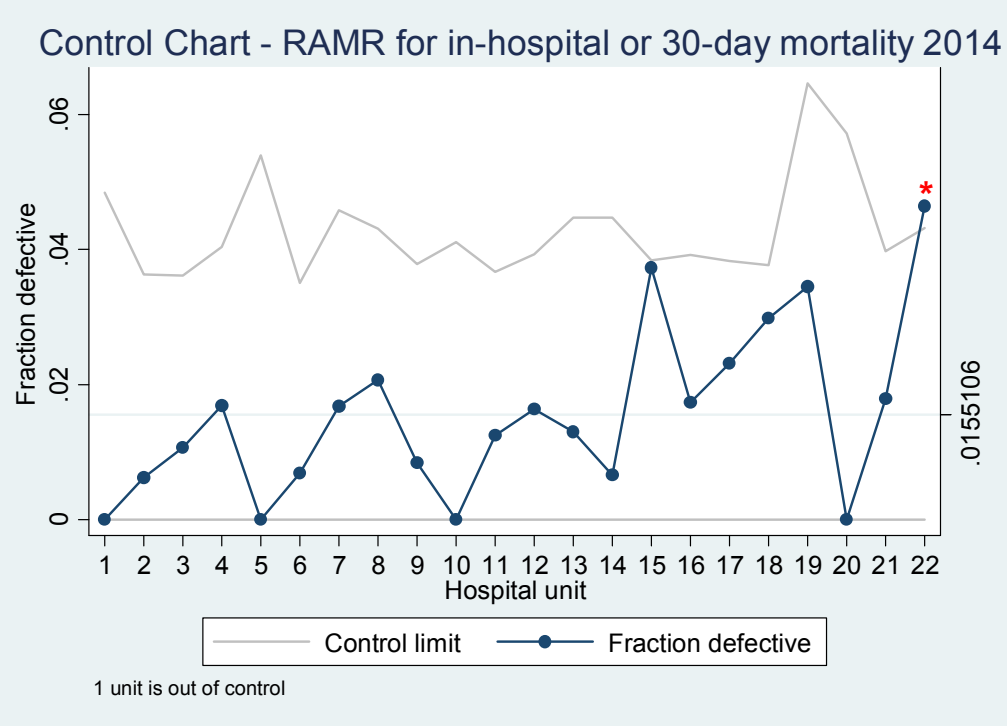
c) Return to theatre for bleeding prior to discharge



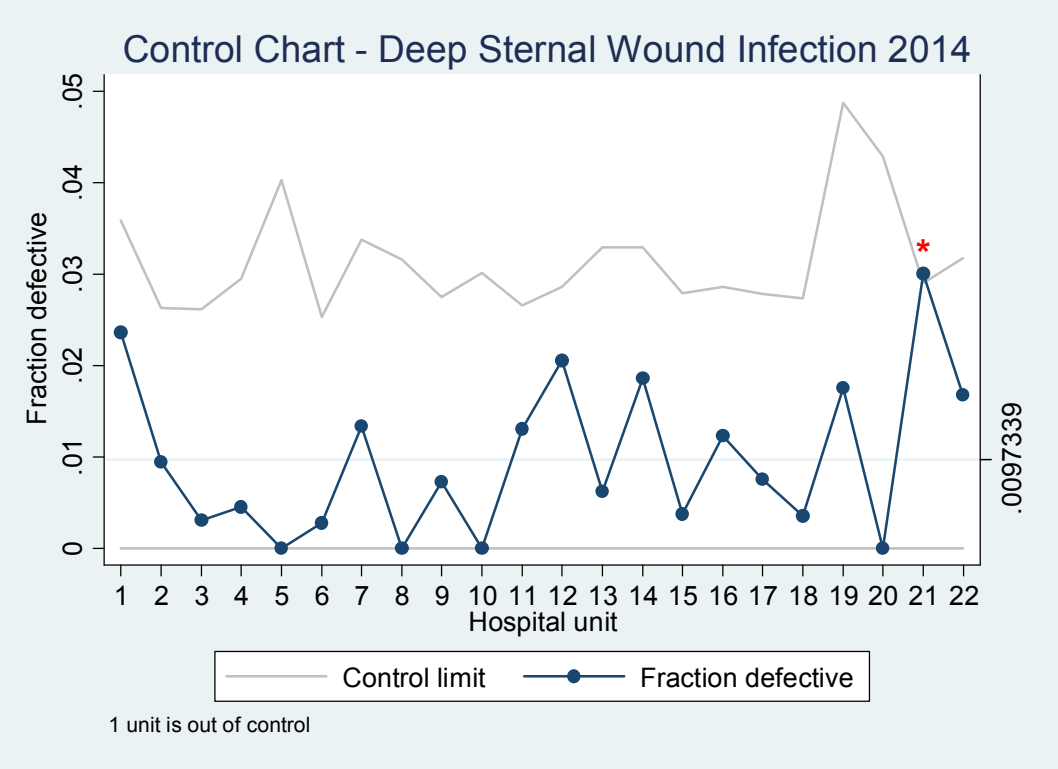
Control Charts for Isolated CABG 2014

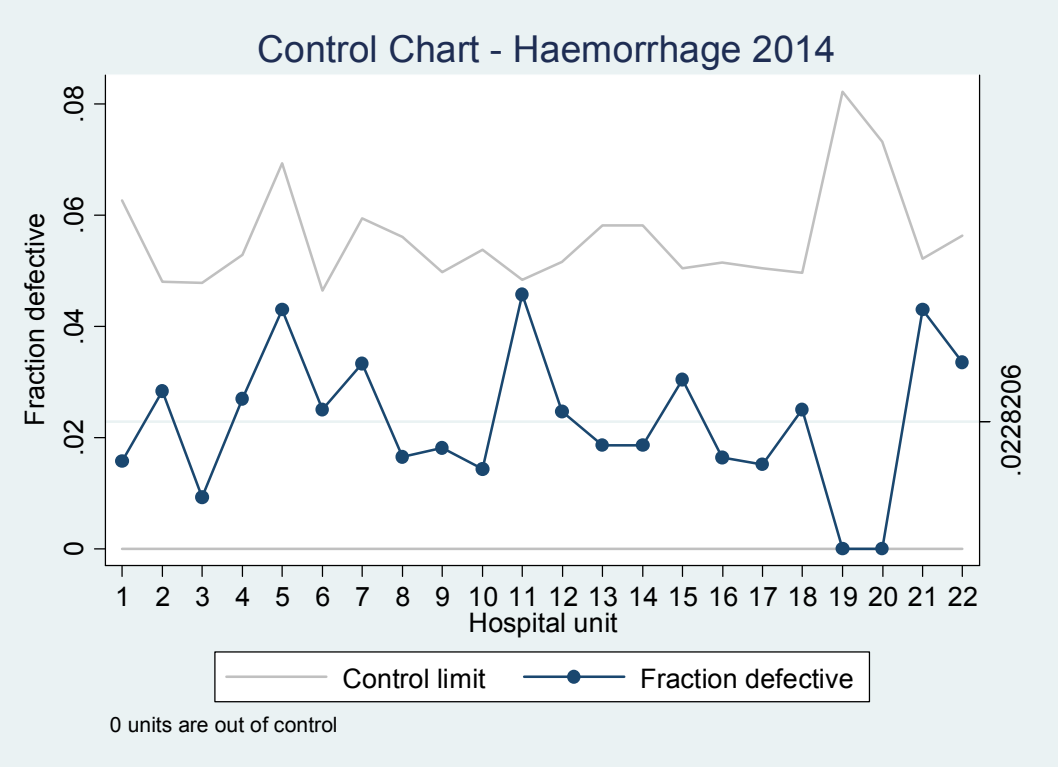
Control charts for in-hospital or 30-day mortality, deep sternal wound infection and haemorrhage represent variance from the control for each Unit. ICU time, intubation time, length of stay, and post-procedure length of stay represent variation from the mean. The boundaries represent 3 standard deviations from the mean.
The control chart for mortality is the only chart that is risk-adjusted using the All Procedures Model (see Appendix A).





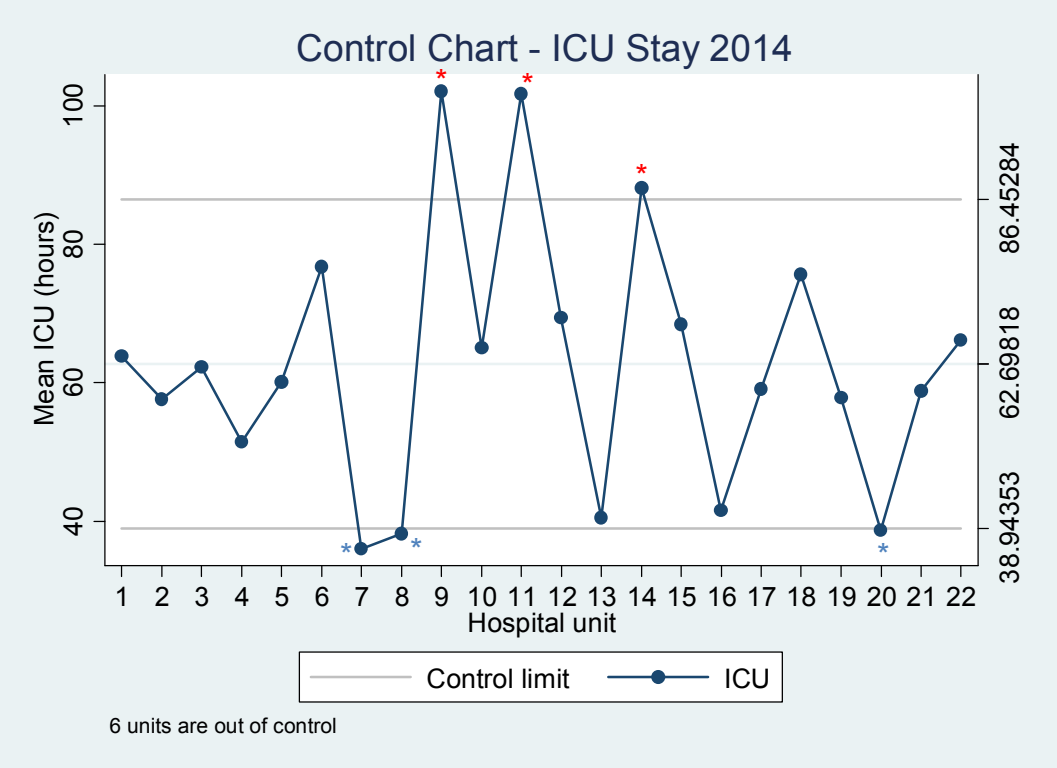
Isolated CABG Surgery



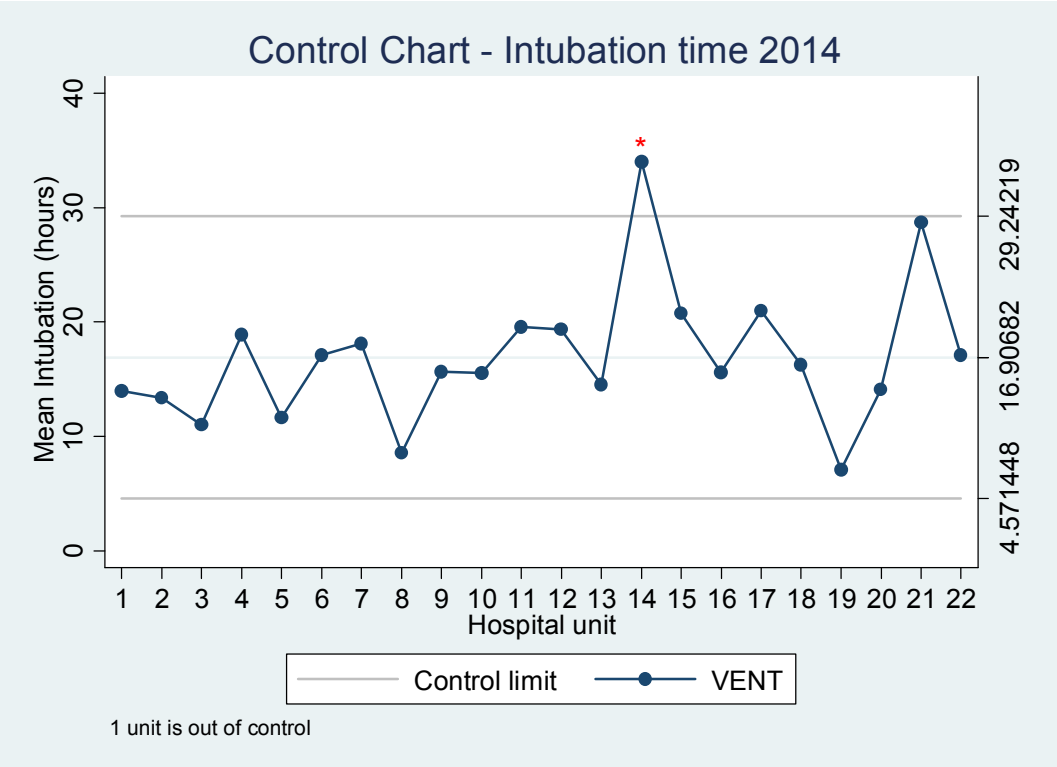


Isolated CABG Surgery

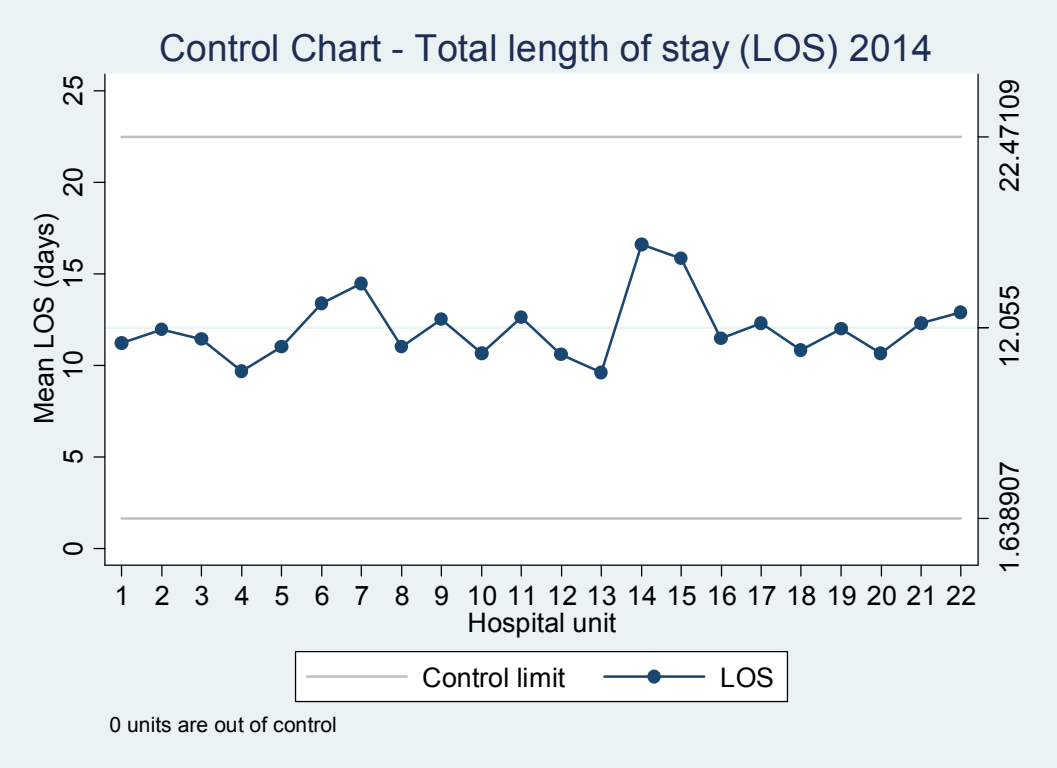
Note: the following control charts for ICU time (hours), intubation time (hours), length of stay (days), and post-procedure length of stay (days) are presented as the Mean, not the Median as they are elsewhere in the report.

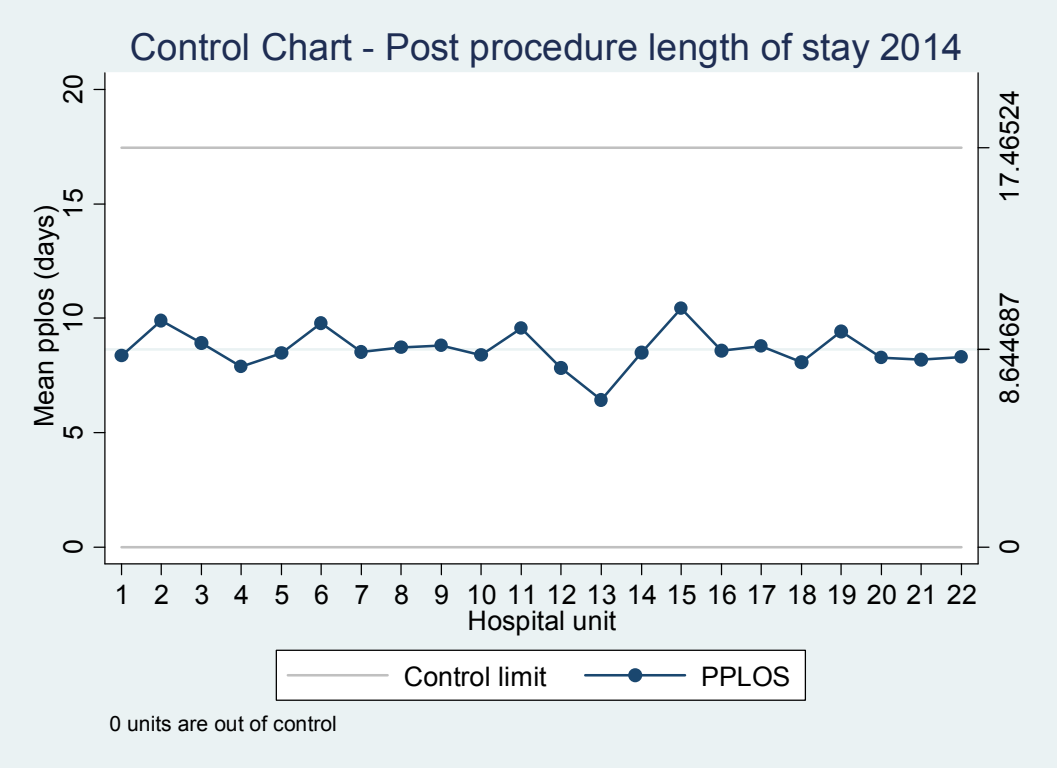


Unit 9 has been outside the upper limits for 6 consecutive years.



Isolated CABG Surgery

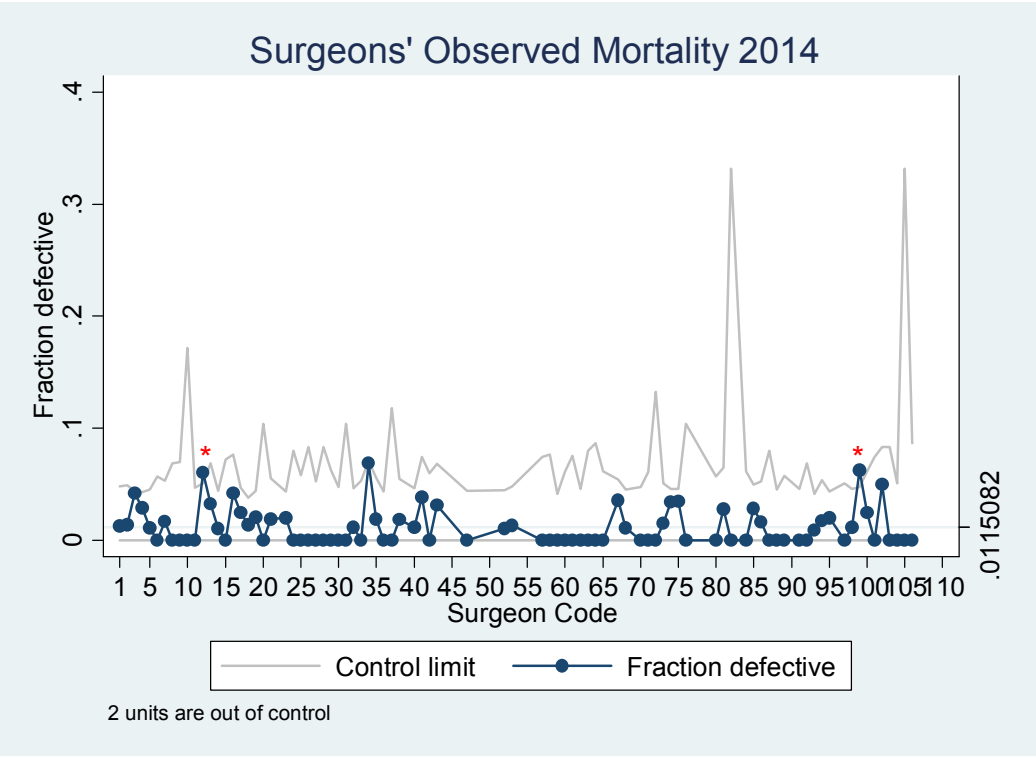


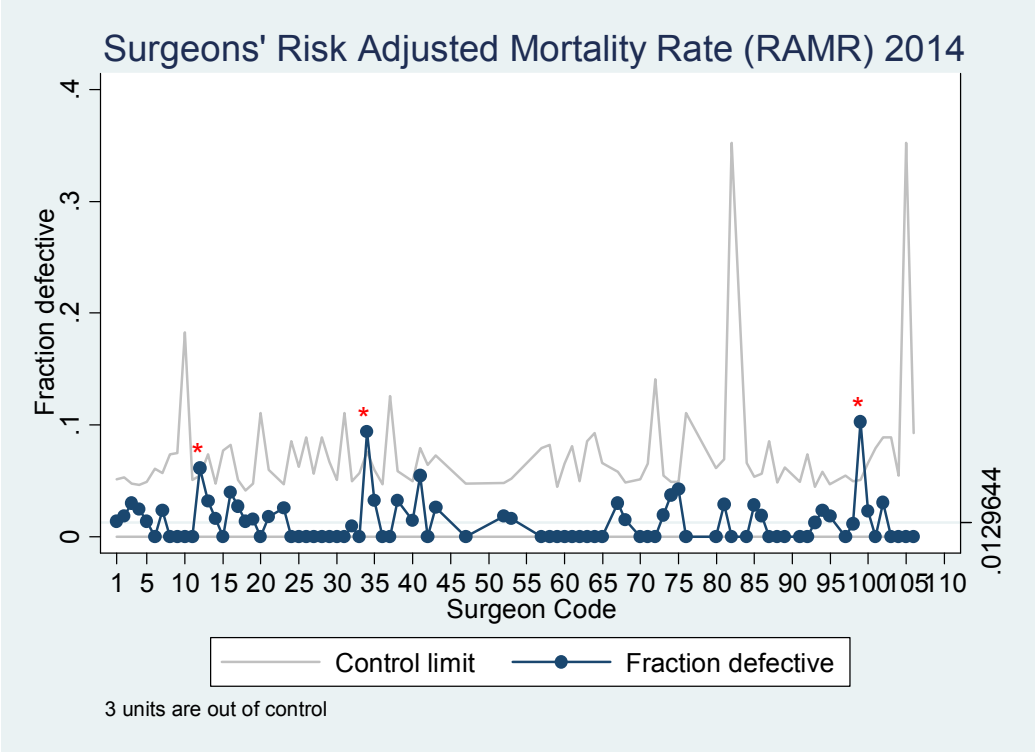


The difference between total and post-procedure length of stay represent surgical delay times.

Surgeons' Control Charts

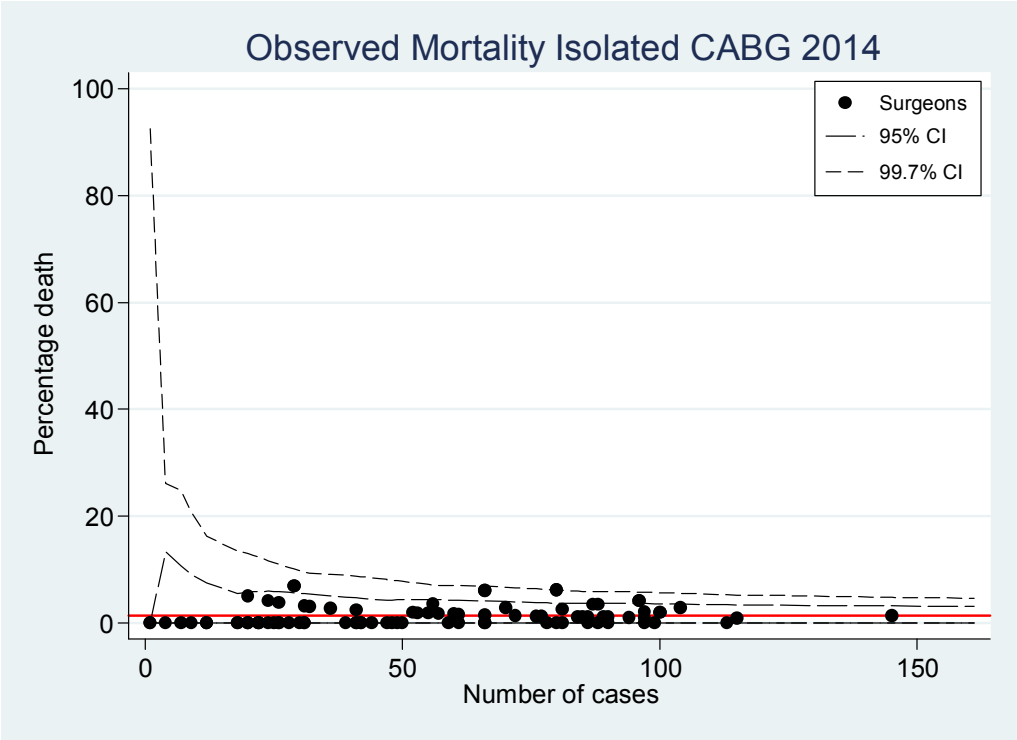
Note: Different surgeon codes were used in 2013 and 2014.

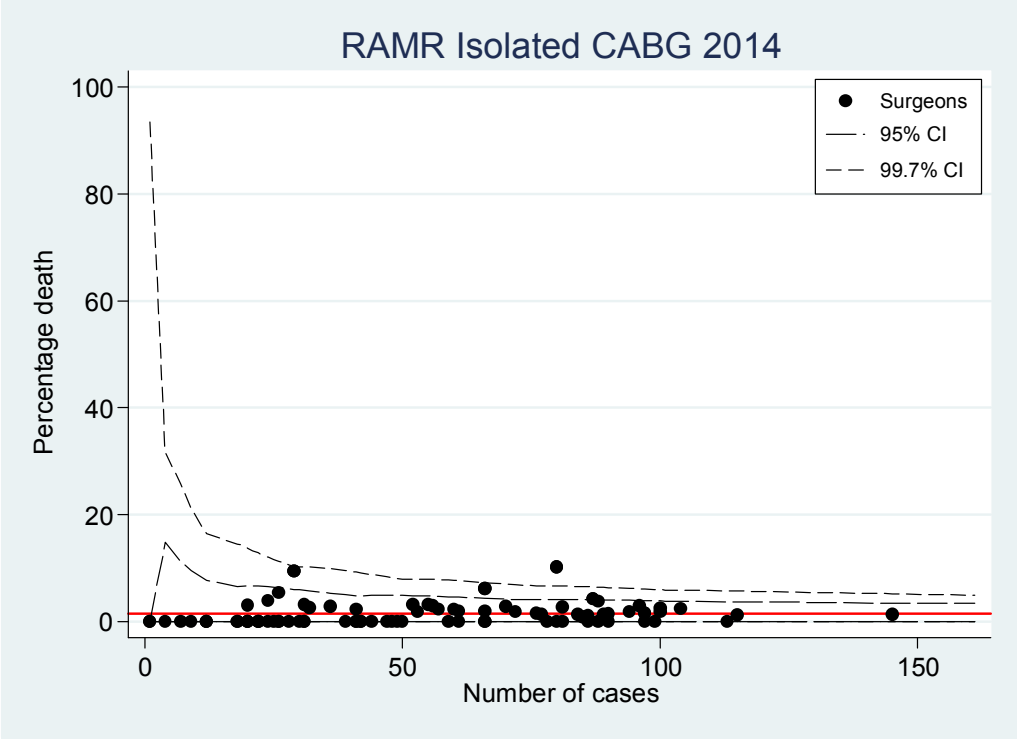




Observed mortality shows that surgeon 12 (4 deaths out of 66 cases) and surgeon 99 (5 deaths out of 80 cases) were more than 3SD over the mean. After risk adjustment, both surgeon 12 and 99 were still more than 3SD over the mean, while surgeon 34 (2 deaths out of 29 cases) was also more than 3SD from the mean. Data for these surgeons in 2015 will be closely monitored.

Surgeons' Funnel Plots

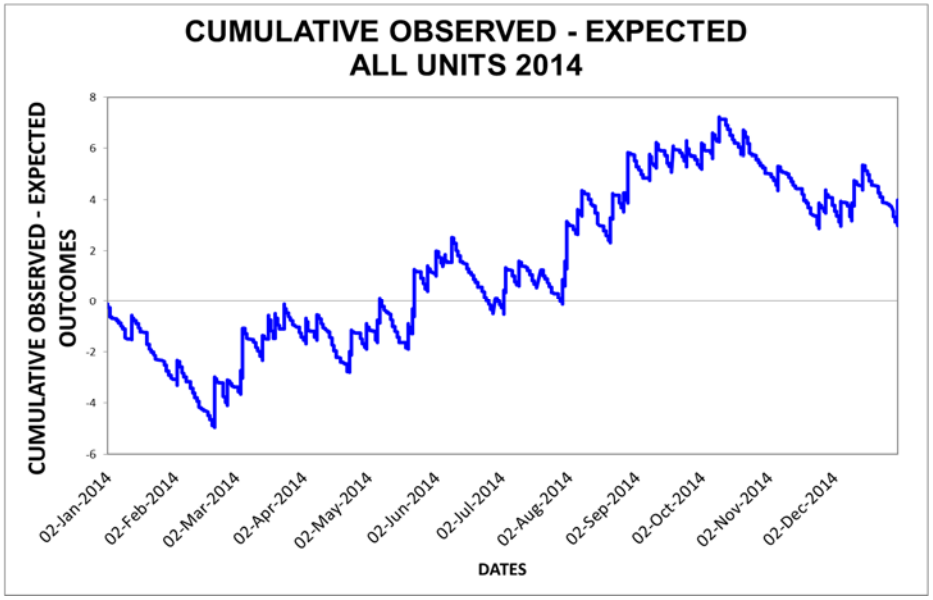


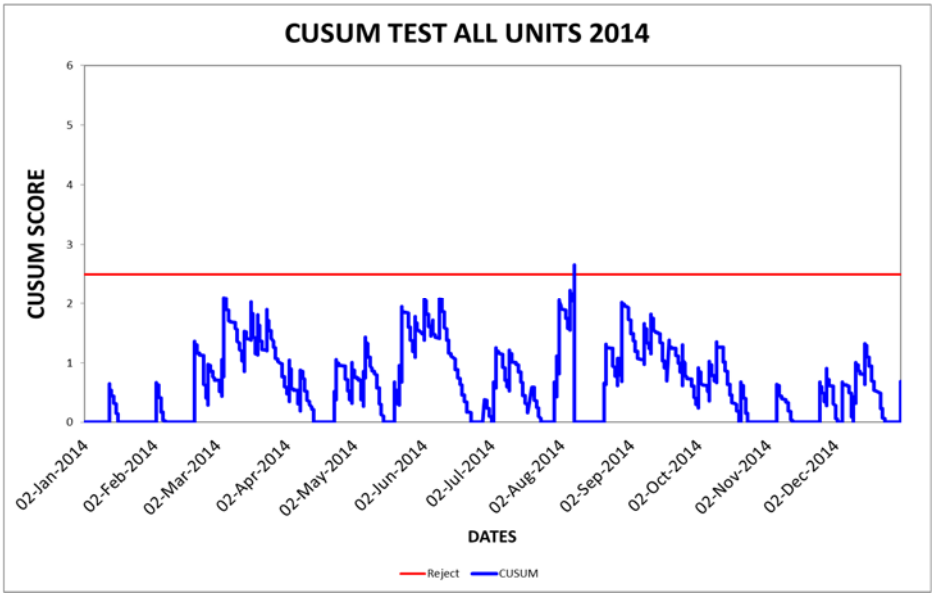


Observed mortality shows that surgeon 3 (4 deaths out of 96 cases), surgeon 12 (4 deaths out of 66 cases) and surgeon 34 (2 deaths out of 29 cases) are outside the 95% confidence interval (over 2SD from the mean). Surgeon 99 (5 deaths out of 80 cases) is outside the 99.7% confidence interval (over 3SD from the mean). After risk adjustment, surgeon 3 was no longer outside the 95% confidence interval; however

surgeons 12 and 34 were still more than 2SD from the mean. Surgeon 75 (3 deaths out of 87) was more than 2SD from the mean after risk adjustment, while surgeon 99 remained more than 3SD from the mean. Data for all aforementioned surgeons will be closely monitored in 2015 (see Appendix D).

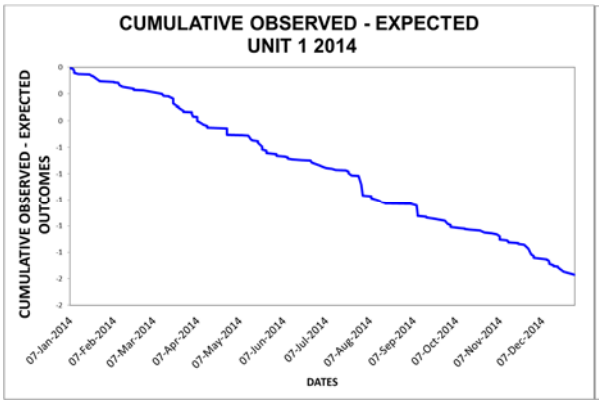
CUSUM curves for risk-adjusted 30-day mortality - Isolated CABG 2014

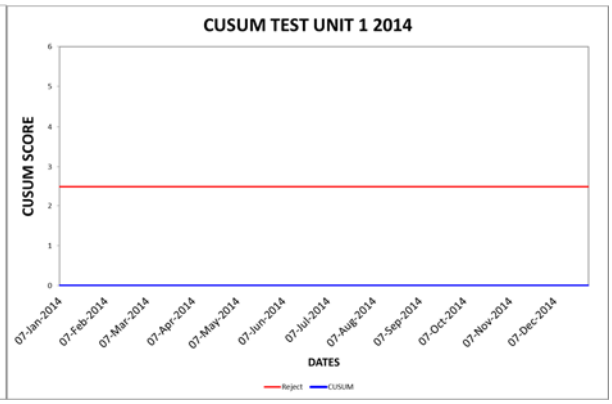


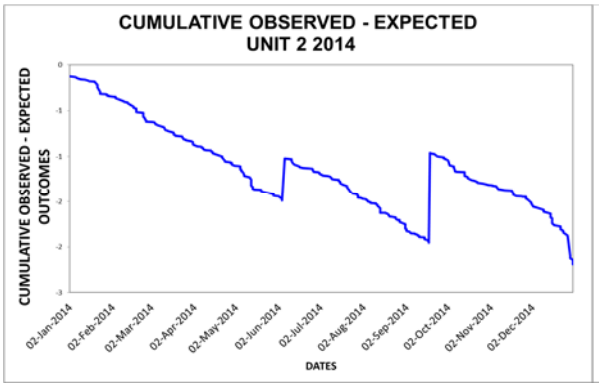


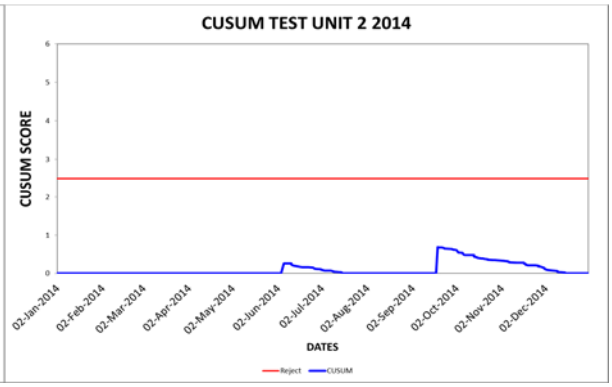
Cumulative Sum (CUSUM) control charts are suited to detect small and sustained shifts in mortality over time. In this report, changes in individual Unit performance during 2014 are displayed. The top graph above and the graphs on the left in the following pages show the Observed-Expected (O-E) mortality rates. A downward trend in the blue line shows that a unit is consistently performing well. The CUSUM test on the right shows whether the unit is out of control (if the blue line hits the rejection line and remains above it for a prolonged period of time). See Appendix C.

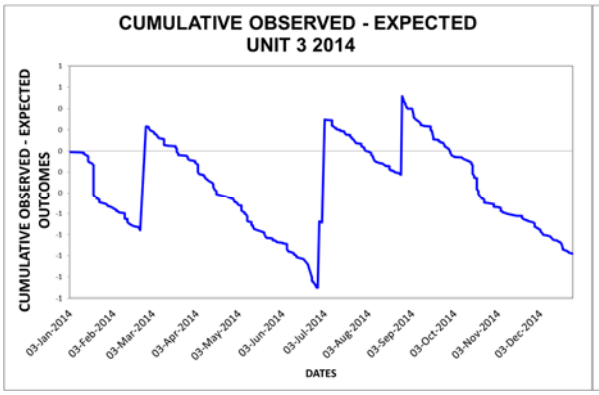
Isolated CABG Surgery

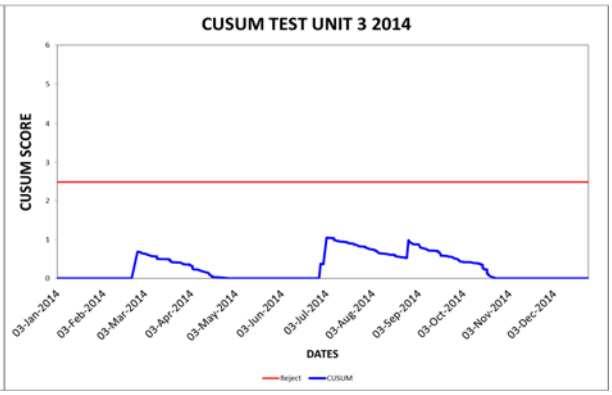


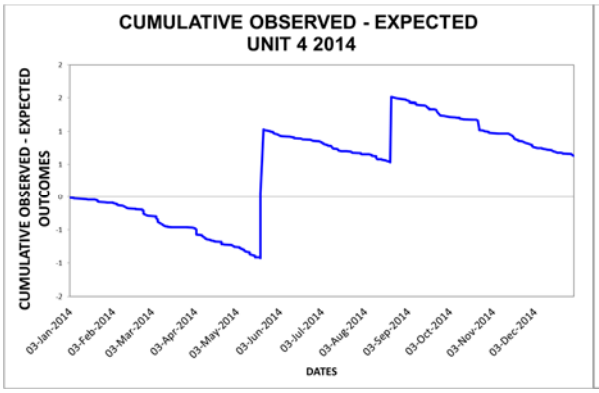


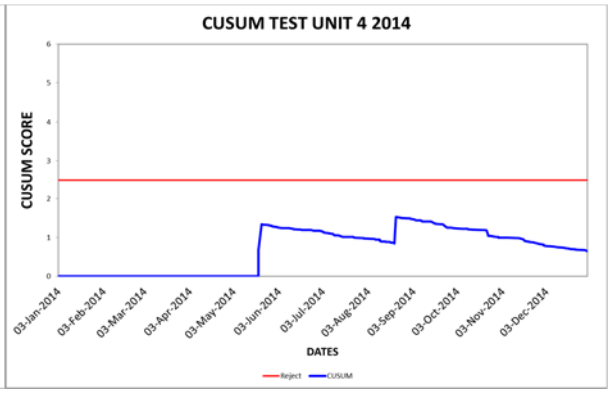




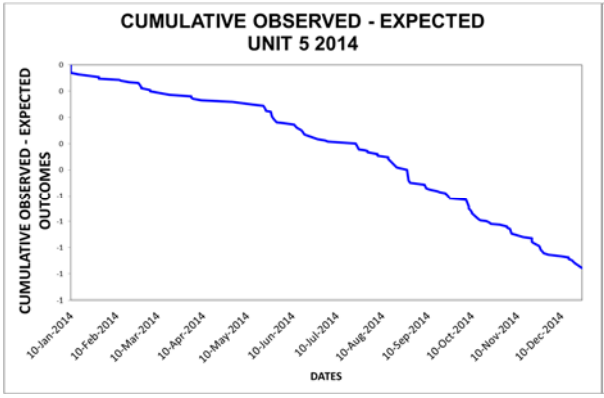


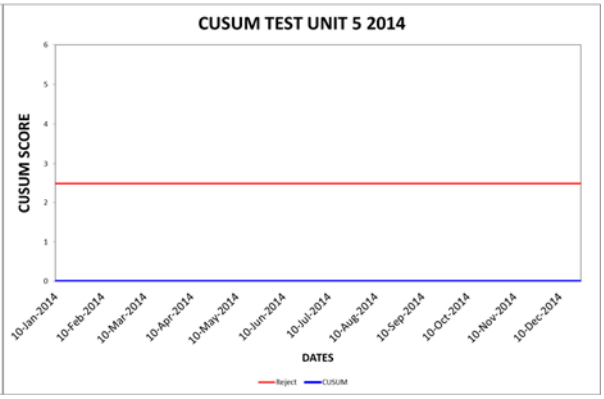


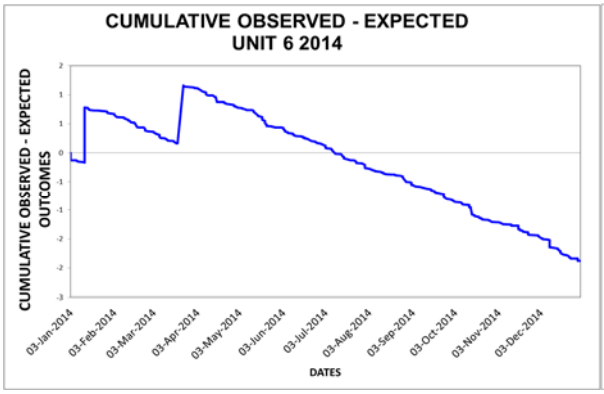


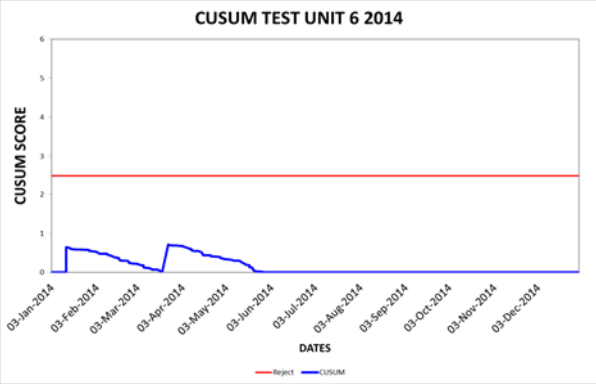


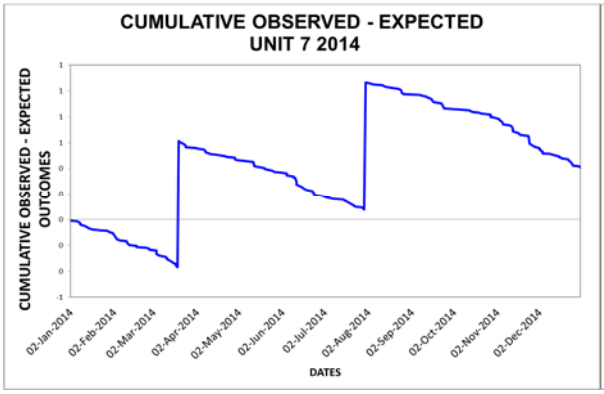
Isolated CABG Surgery

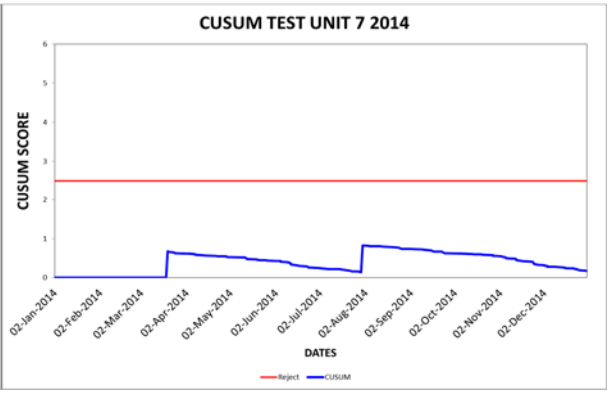


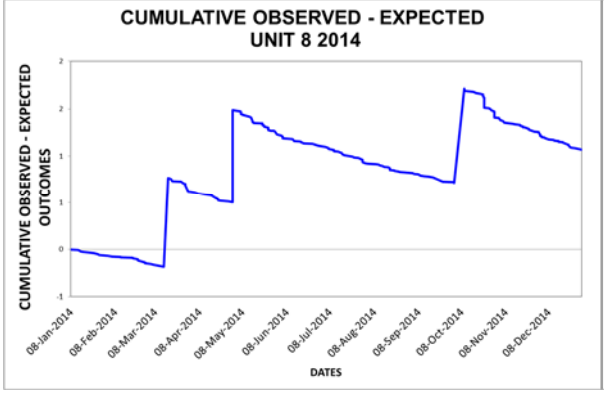


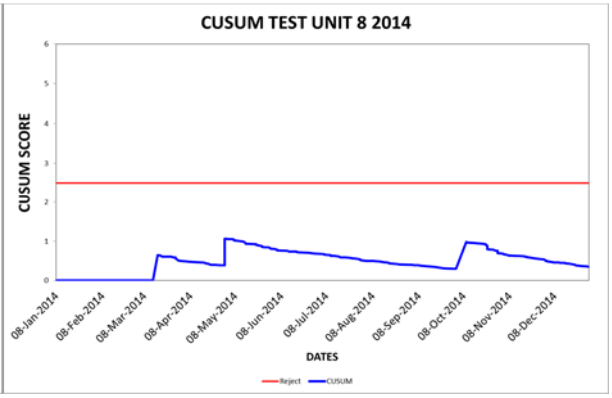




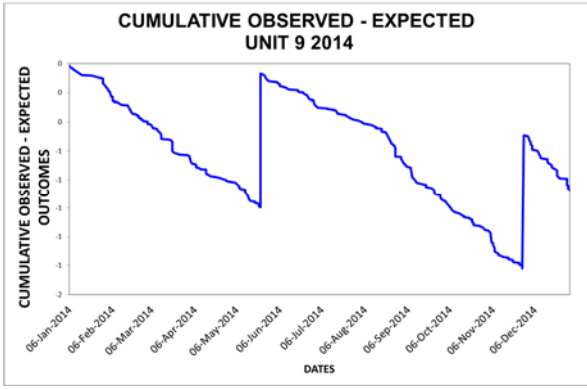


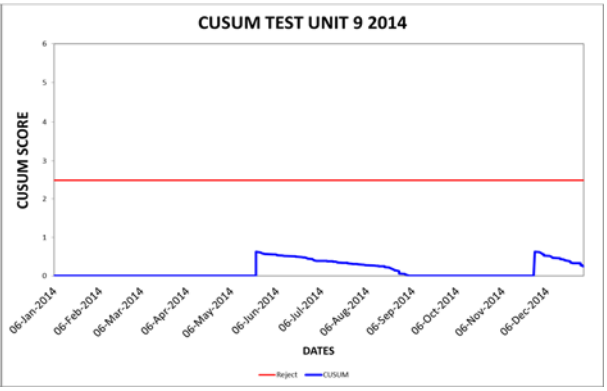


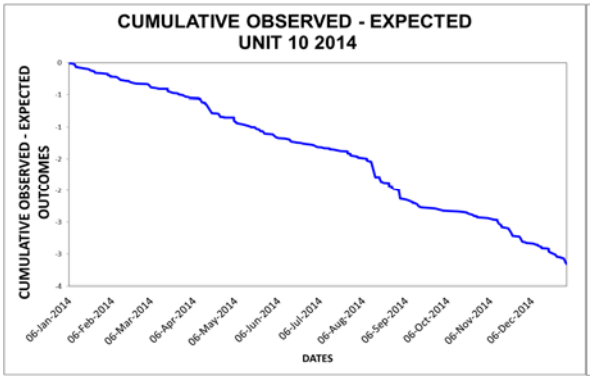


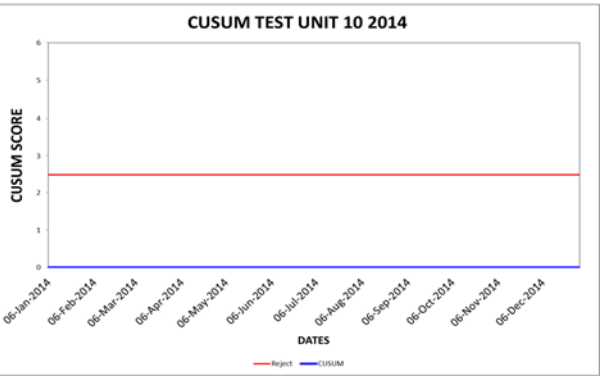


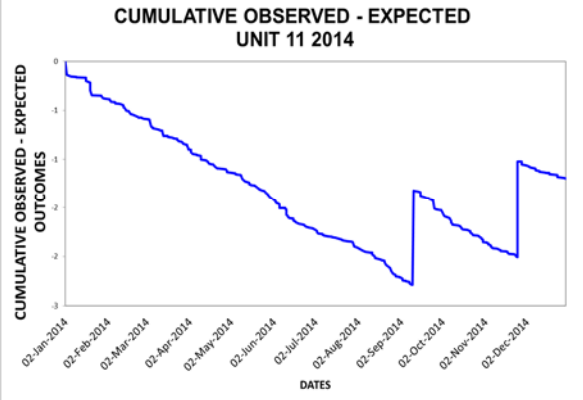
Isolated CABG Surgery

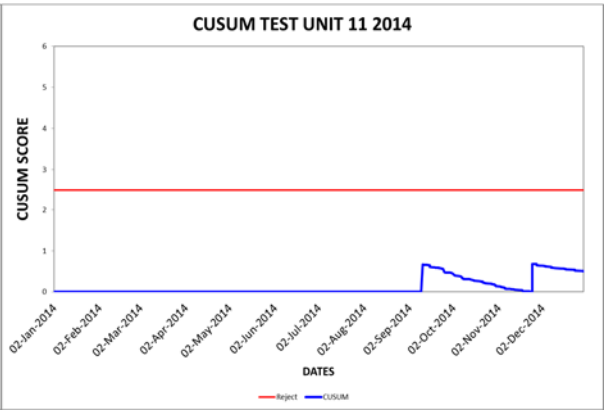


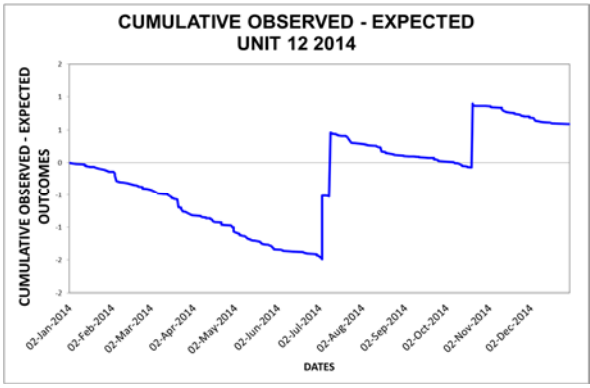


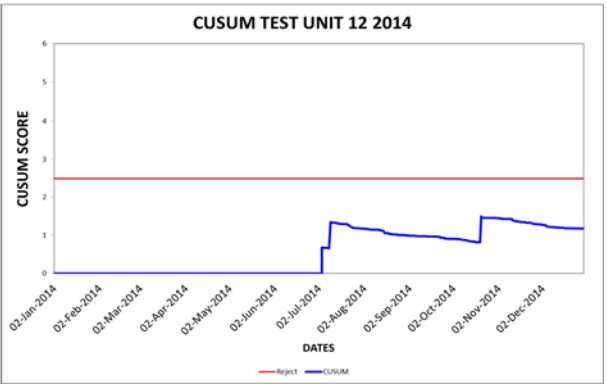




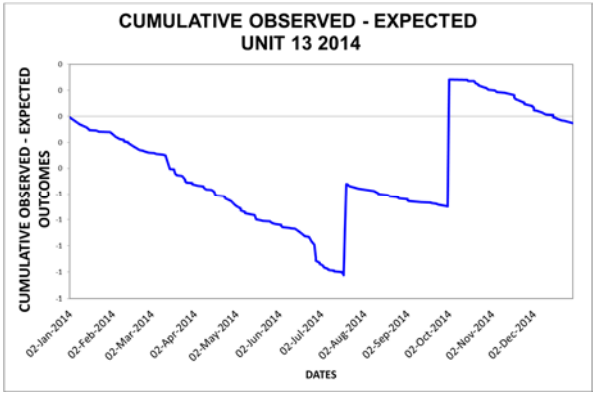


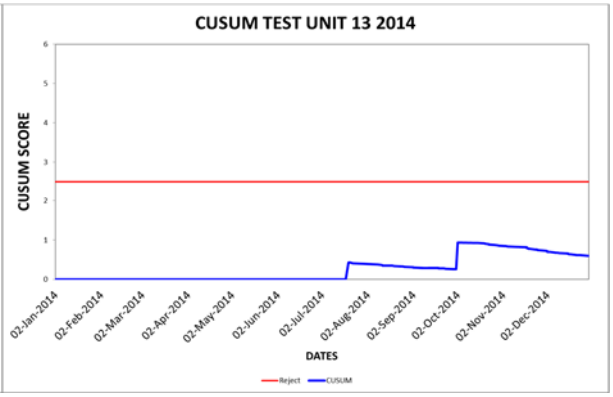


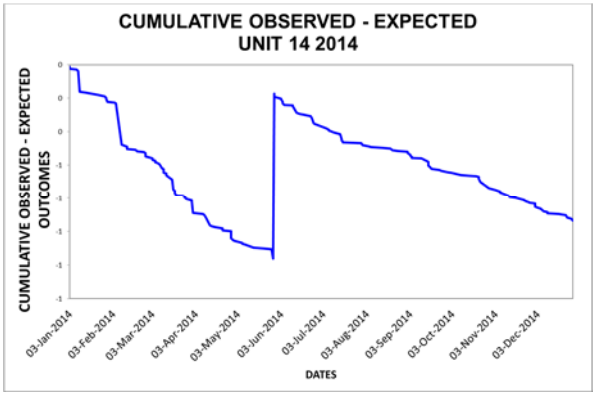


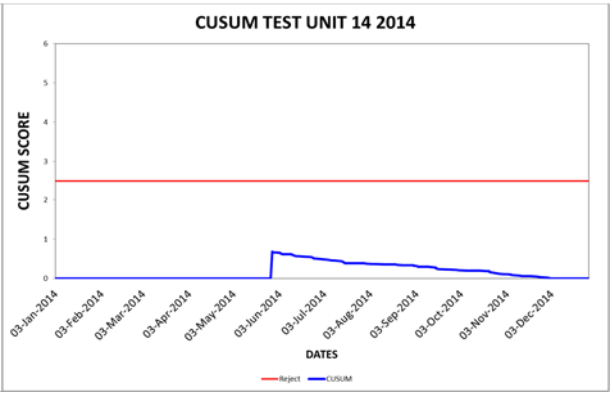


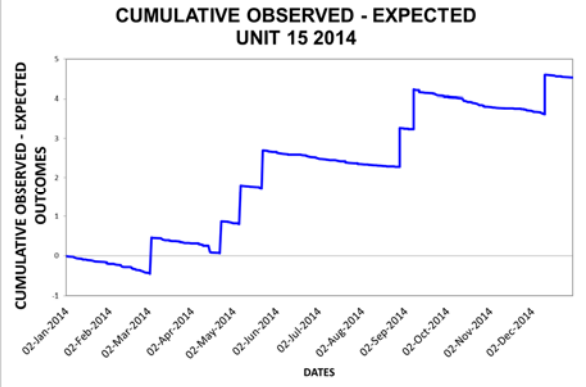
Isolated CABG Surgery

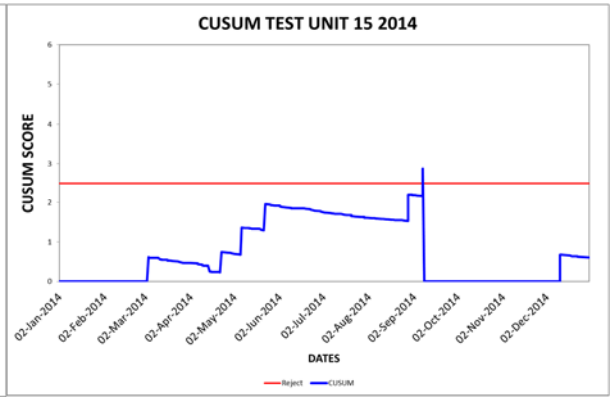


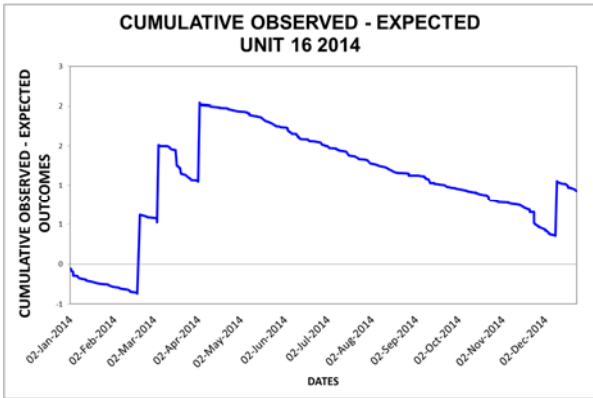


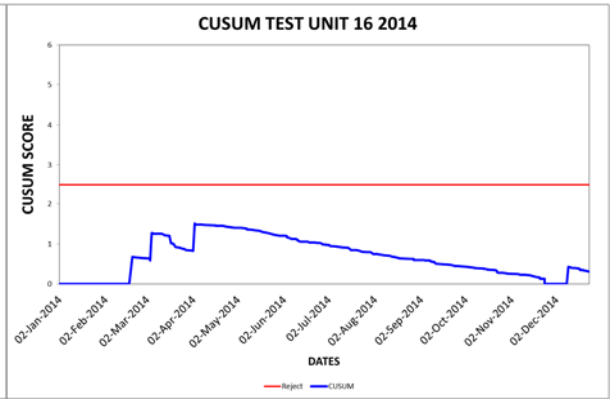




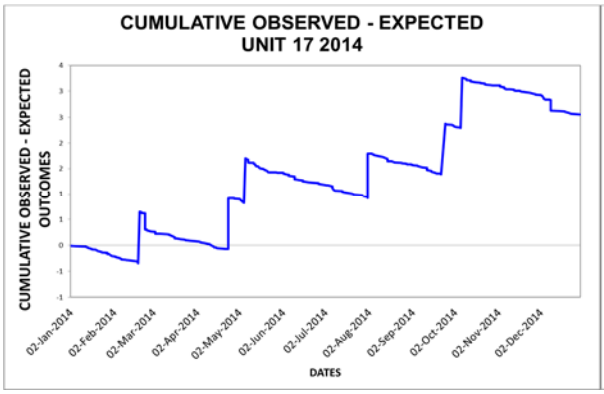


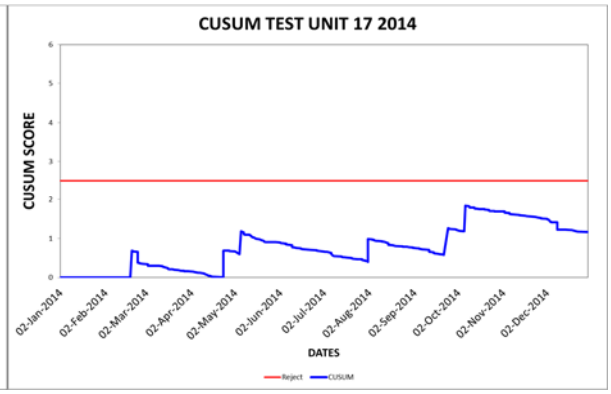


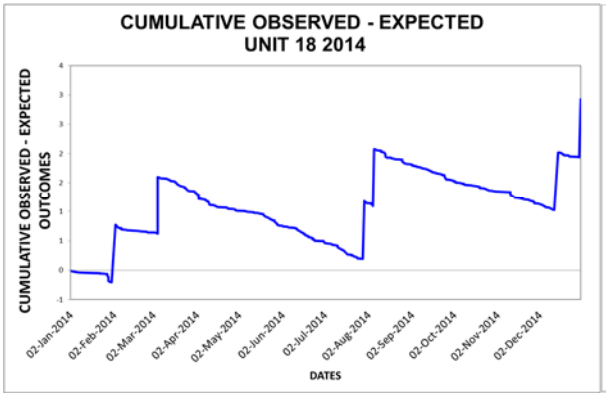


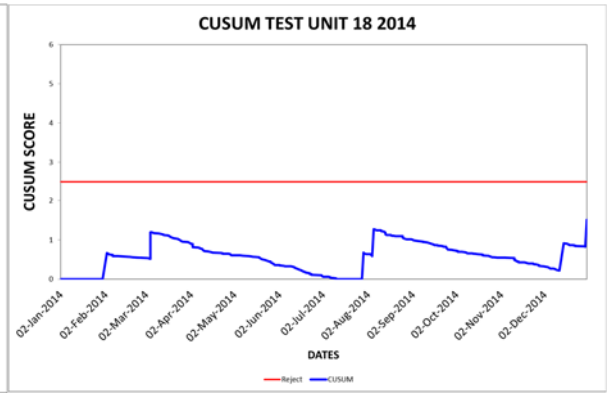


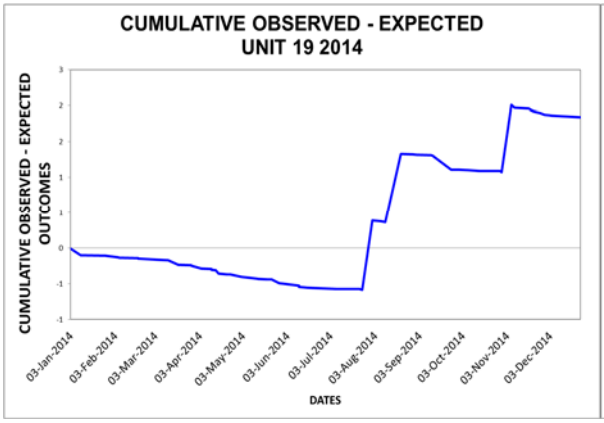
Isolated CABG Surgery

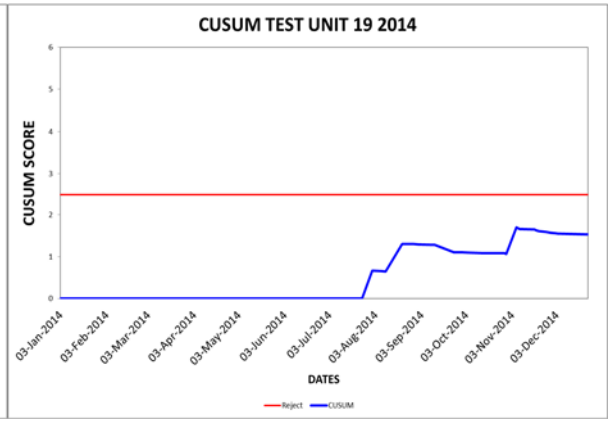


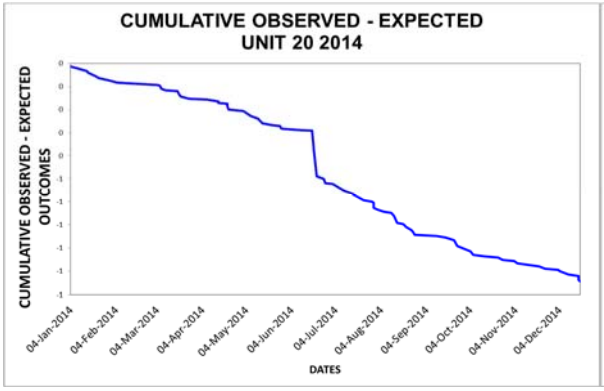


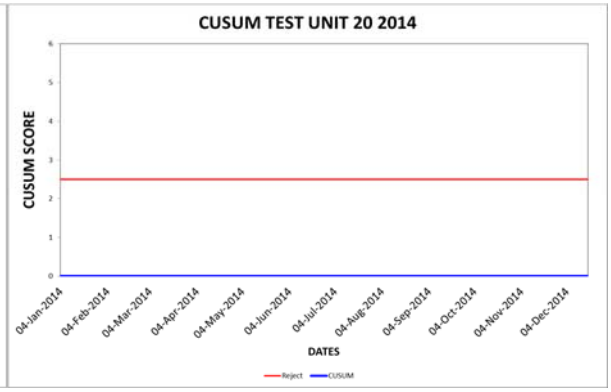




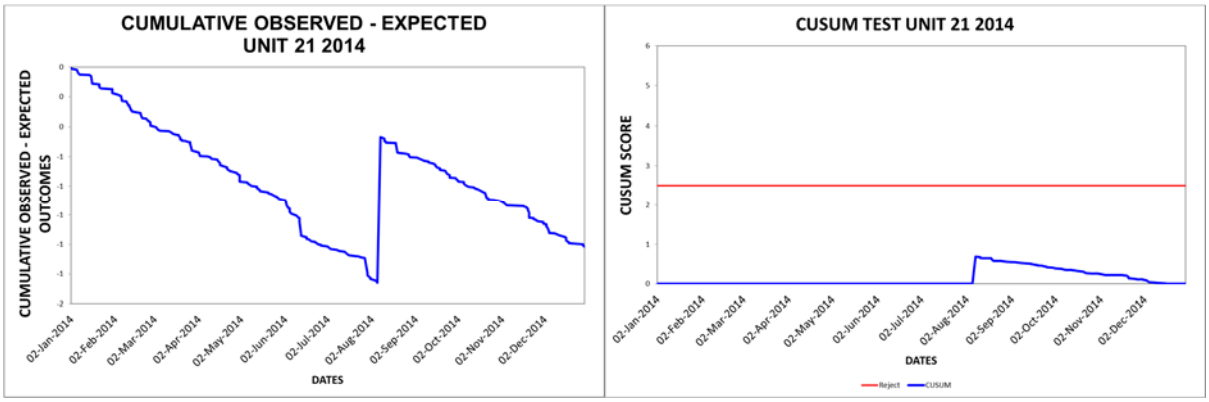


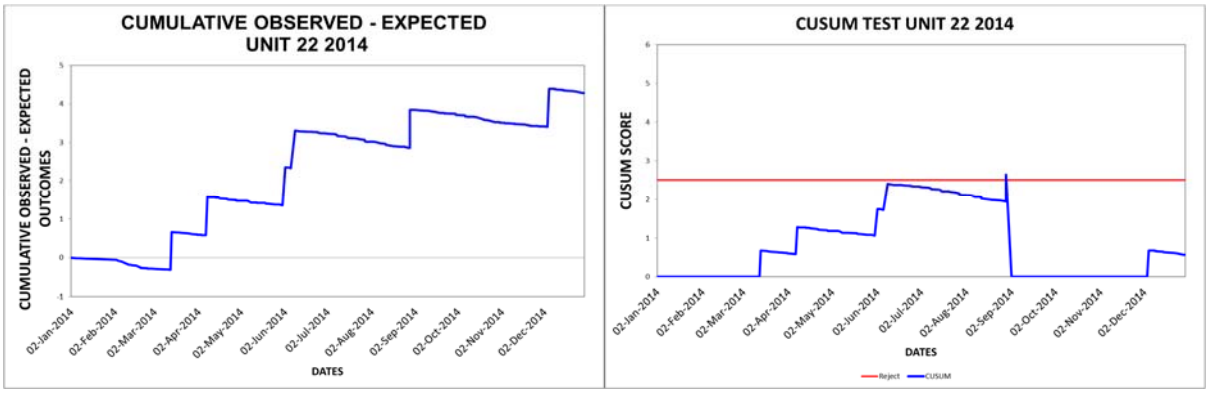






Isolated CABG Surgery





Most Units performed consistently well throughout 2014. Units 15 and 22 had multiple mortalities over a short period of time which triggered the CUSUM line to hit the rejection line. As a group, all hospitals were outside control limits in August 2014 but shortly returned to be within control limits.

Valve Surgery

Table 17a - Single valve operations 2014

NB: The following table displays ONLY Isolated Valve and Valve+CABG procedures. That is, this table does not include procedures entered as 'Other cardiac'.

	Without CABG									WITH CABG		
	Initial			Redo			Total			Total		
	No	Died	%	No	Died	%	No	Died	%	No	Died	%
Aortic												
Replacement	976	19	1.9	72	2	2.8	1048	21	2.0	669	29	4.3
Transapical TAVI	13	2	15.4	2	-	-	15	2	13.3	-	-	-
Transfemoral TAVI	65	-	-	3	-	-	68	-	-	-	-	-
Transaortic TAVI	4	-	-	-	-	-	4	-	-	-	-	-
Repair/Reconstruction without Annuloplasty	3	-	-	2	1	50.0	5	1	20.0	2	-	-
Resuspension Aortic Valve	1	-	-	-	-	-	1	-	-	-	-	-
Resection Sub-Aortic Stenosis	1	-	-	1	-	-	2	-	-	-	-	-
Valvotomy	2	-	-	-	-	-	2	-	-	-	-	-
Inspection Only	-	-	-	-	-	-	-	-	-	1	-	-
Decalcification Only	-	-	-	-	-	-	-	-	-	1	-	-
Aortic Total	**1096**	**21**	**1.9**	**88**	**3**	**3.4**	**1184**	**24**	**2.0**	**681**	**29**	**4.3**
Mitral												
Replacement	173	4	2.3	60	3	5.0	233	7	3.0	81	10	12.3
Annuloplasty	13	-	-	-	-	-	13	-	-	31	-	-
Repair/Reconstruction with Annuloplasty	307	1	0.3	4	-	-	311	1	0.3	93	4	4.3
Repair/Reconstruction without Annuloplasty	13	-	-	3	-	-	16	-	-	4	-	-
Commissurotomy with Annuloplasty Ring	1	-	-	-	-	-	1	-	-	-	-	-
Repair of Paravalvular Leak	1	-	-	-	-	-	1	-	-	1	-	-
Inspection Only	-	-	-	-	-	-	-	-	-	1	-	-
Decalcification Only	1	-	-	1	-	-	2	-	-	-	-	-
Mitral Total	**509**	**5**	**1.0**	**68**	**3**	**4.4**	**577**	**8**	**1.4**	**211**	**14**	**6.7**
Tricuspid												
Replacement	9	1	11.1	8	1	12.5	17	2	11.8	1	-	-
Annuloplasty	3	1	33.3	-	-	-	3	1	33.3	1	1	100
Repair/reconstruction with Annuloplasty	4	-	-	-	-	-	4	-	-	3	-	-
Repair/reconstruction without Annuloplasty	2	-	-	-	-	-	2	-	-	-	-	-
Valvectomy	-	-	-	-	-	-	-	-	-	-	-	-
Tricuspid Total	**18**	**2**	**11.1**	**8**	**1**	**12.5**	**26**	**3**	**11.5**	**5**	**1**	**20.0**
Pulmonary												
Replacement	7	-	-	7	-	-	14	-	-	-	-	-
Pulmonary Total	**7**	**-**	**-**	**7**	**-**	**-**	**14**	**-**	**-**	**-**	**-**	**-**
Total Single Valve	**1630**	**28**	**1.7**	**171**	**7**	**4.1**	**1801**	**35**	**1.9**	**897**	**44**	**4.9**

*1 procedure was incorrectly coded and therefore excluded from the table.

Valve Surgery

Table 17b - Multiple valve operations 2014

Double Valves												
Mitral & Aortic	99	3	3.0	23	4	17.4	122	7	5.7	34	3	8.8
Mitral & Tricuspid	79	5	6.3	14	1	7.1	93	6	6.5	26	2	7.7
Aortic & Tricuspid	9	-	-	3	-	-	12	-	-	4	-	-
Other double valves	7	-	-	2	-	-	9	-	-	-	-	-
Double total	**194**	**8**	**4.1**	**42**	**5**	**11.9**	**236**	**13**	**5.5**	**64**	**5**	**7.8**
Triple total	**27**	**2**	**7.4**	**8**	**2**	**25.0**	**35**	**4**	**11.4**	**6**	**3**	**50.0**
Quats total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Total Multiple	**221**	**10**	**4.5**	**50**	**7**	**14.0**	**271**	**17**	**6.3**	**70**	**8**	**11.4**
Total Single	**1630**	**28**	**1.7**	**171**	**7**	**4.1**	**1801**	**35**	**1.9**	**897**	**44**	**4.9**
Total Valve	**1851**	**38**	**2.1**	**221**	**14**	**6.3**	**2072**	**52**	**2.5**	**967**	**52**	**5.4**

*1 procedure was incorrectly coded and therefore excluded from the table.
Aortic root reconstruction procedure numbers for all procedure types are documented in Table 17c below, but single valve aortic root reconstruction numbers are included in this table's totals.

Table 17c - Aortic Root Reconstruction Procedures 2014

NB; The following table displays ALL aortic root reconstruction procedures including Valve and 'Other cardiac'.

	WITHOUT CABG			**WITH CABG**		
	No.	Died	%	No.	Died	%
Pulmonary Autograft Aortic Root Replacement (Ross)	17	-	-	-	-	-
Aortic Root Replacement with valved conduit	169	8	4.7	38	5	13.2
Root Reconstruction with valve sparing (David)	30	1	3.3	5	-	-

The Aortic Root Reconstruction Procedures in Table 17c refers to all procedures irrespective of whether it was performed in conjunction with a CABG, Valve, or CABG + Valve or other cardiac surgery.

Valve Surgery

Table 18 - Type of valve prosthesis - Single Valve with or without CABG 2014

	Valve Position							
	Aortic		Mitral		Tricuspid		Pulmonary	
n	1849	%	753*	%	29	%	14	%
Mechanical	242	13.1	133	43.5[#]	-	-	-	-
Xenograft	1589	85.9	173	56.5[#]	18	62.1	13	92.9
Allograft	4	0.2	-	-	-	-	-	-
Autograft	11	0.6	-	-	-	-	1	7.1
Annuloplasty Ring/Band	-	-	447	100[##]	11	37.9	-	-
Not specified	3	0.2	-	-	-		-	-

[#]percentage of mitral procedures that had a replacement
[##]percentage of mitral procedures that had a repair
All other percentages shown are out of all procedures for that valve type that utilise a prosthesis. This does not include a root reconstruction that is valve sparing.
*10 procedures incorrectly coded and therefore excluded from the table.

Valve Surgery

Table 19 - Valve aetiology by age - Single Aortic Valve with or without CABG 2014 (% of cases)

Age Group	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	54	78	166	401	718	417	1834*
Rheumatic	7.4	5.1	5.4	1.5	0.8	1.2	1.9
Congenital	42.6	37.2	33.7	15.5	6.3	2.2	12.2
Ischaemic	1.9	-	-	0.7	0.6	-	0.4
Idiopathic Calcific	11.1	15.4	38.0	65.6	80.5	88.7	70.4
Myxomatous degeneration	1.9	1.3	3.6	2.7	2.5	1.4	2.3
Failed prior repair	1.9	3.8	0.6	-	0.1	-	0.3
Prosthetic valve failure	7.4	3.8	3.0	2.0	2.1	1.2	2.2
Peri-prosthetic leak	1.9	-	1.2	-	0.1	0.2	0.3
Prosthetic valve thrombosis	-	-	-	-	0.1	-	0.1
Active infection	14.8	16.7	5.4	4.2	1.4	0.5	3.2
Previous infection	5.6	7.7	1.2	1.5	0.3	0.2	1.1
Marfans	1.9	1.3	-	-	-	-	0.1
Annuloaortic ectasia	1.9	1.3	1.2	2.2	0.7	-	1.0
Other degenerative disease	-	3.8	3.6	1.2	2.4	2.2	2.2
Dissection	-	-	-	-	-	-	-
Tumour	-	-	-	-	-	-	-
Trauma	-	-	-	-	-	-	-
Iatrogenic	-	-	-	-	-	0.2	0.1
Other	-	2.6	2.4	2.0	1.1	0.7	1.4
Unknown	-	-	0.6	0.7	1.0	1.2	0.9

*32 missing cases

Valve Surgery

Table 20 - Valve aetiology by age - Mitral Valve with or without CABG 2014 (% of cases)

Age Group	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	50	52	138	207	224	84	755*
Rheumatic	26.0	13.5	11.6	7.7	8.5	3.6	9.8
Congenital	4.0	5.8	1.4	0.5	0.9	-	1.3
Ischaemic	2.0	5.8	10.1	14.5	15.6	14.3	12.6
Idiopathic Calcific	-	1.9	4.3	6.3	9.4	8.3	6.4
Myxomatous degeneration	34.0	50.0	49.3	48.3	49.6	50.0	48.2
Failed prior Repair	-	-	5.1	3.4	2.7	2.4	2.9
Prosthetic valve failure	2.0	-	-	0.5	0.4	2.4	0.7
Peri-prosthetic leak	-	1.9	0.7	1.4	0.9	-	0.9
Prosthetic valve thrombosis	-	1.9	-	-	0.4	-	0.3
Active infection	24.0	9.6	6.5	7.7	1.8	2.4	6.4
Previous infection	6.0	3.8	1.4	1.9	2.2	-	2.1
Marfans	-	-	-	-	0.4	-	0.1
Other degenerative disease	2.0	1.9	2.9	0.5	2.2	6.0	2.3
Dissection	-	-	-	-	-	-	-
Tumour	-	-	0.7	-	-	-	0.1
Trauma	-	-	-	0.5	-	-	0.1
Iatrogenic	-	-	-	-	0.4	-	0.1
Functional mitral	-	1.9	2.2	5.3	1.3	7.1	3.2
Functional tricuspid	-	-	-	-	0.4	1.2	0.3
Other	-	1.9	2.9	1.4	2.7	2.4	2.1
Unknown	-	-	0.7	-	-	-	0.1

*33 missing cases

Valve Surgery

Please note for the remainder of the report, 'aortic valve replacement' does not include TAVI procedures.

Table 21 - Summary of procedures

Valves Only	Number of Operations	Mortality (n)	Mortality (%)
Aortic Valve Surgery	1184	24	2.0
Aortic Valve Replacement	1048	21	2.0
Mitral Valve Surgery	577	8	1.4
Mitral Valve Replacement	233	7	3.0
Mitral Valve Repair	341	1	0.3
Tricuspid Valve Surgery	26	3	11.5
Pulmonary Valve Surgery	14	-	-
Mitral & Aortic Valve Surgery	122	7	5.7
Mitral & Tricuspid Valve Surgery	93	6	6.5
Aortic & Tricuspid Valve Surgery	12	-	-
Other Double Valve Surgery	9	-	-
Triple Valve Surgery	35	4	11.4
Total Valves Only	**2072**	**52**	**2.5**

Valves & CABG Only	Number of Operations	Mortality (n)	Mortality (%)
Aortic Valve Surgery & CABG	681	29	4.3
Aortic Valve Replacement & CABG	669	29	4.3
Mitral Valve Surgery & CABG	211	14	6.6
Mitral Valve Replacement & CABG	81	10	12.3
Mitral Valve Repair & CABG	128	4	3.1
Tricuspid Valve Surgery & CABG	5	1	20.0
Pulmonary Valve Surgery & CABG	-	-	-
Mitral & Aortic Valve Surgery & CABG	34	3	8.8
Mitral & Tricuspid Valve Surgery & CABG	26	2	7.7
Aortic & Tricuspid Valve Surgery & CABG	4	-	-
Other Double Valve Surgery & CABG	-	-	-
Triple Valve Surgery & CABG	6	3	50.0
Total Valves & CABG Only	**967**	**52**	**5.4**
TOTAL VALVE (with or without CABG)	**3039**	**104**	**3.4**

*1 procedure was incorrectly coded and therefore excluded from the table.

Valve Surgery

Figure 16: Mortality rate for single valve without CABG procedures by age group and year

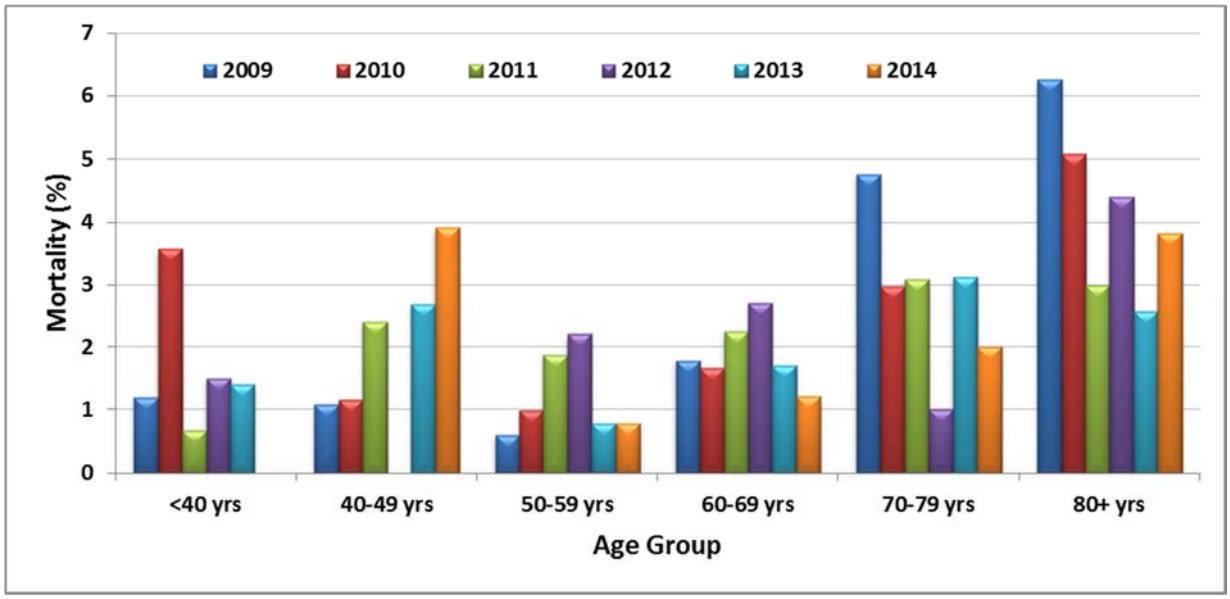


Table 22 - Mortality by age for any single valve procedure without CABG 2014

	Mortality (mortality/n, %)											
	Age Group											
	<40 years		40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs		80+ yrs	
Aortic	0/59	-	3/70	4.3	1/132	0.8	2/264	0.8	7/403	1.7	11/256	4.3
Mitral	0/58	-	0/53	-	1/121	0.8	3/147	2.0	3/141	2.1	1/57	1.8
Tricuspid	0/5	-	2/4	50.0	0/5	-	0/3	-	1/8	12.5	0/1	-
Pulmonary	0/13	-	0/1	-	-	-	-	-	-	-	-	-
Total	0/135	-	5/128	3.9	2/258	0.8	5/414	1.2	11/552	2.0	12/314	3.8

Valve Surgery

Figure 17: Mortality rate for Single Aortic Valve Replacement with CABG procedures by age group and year

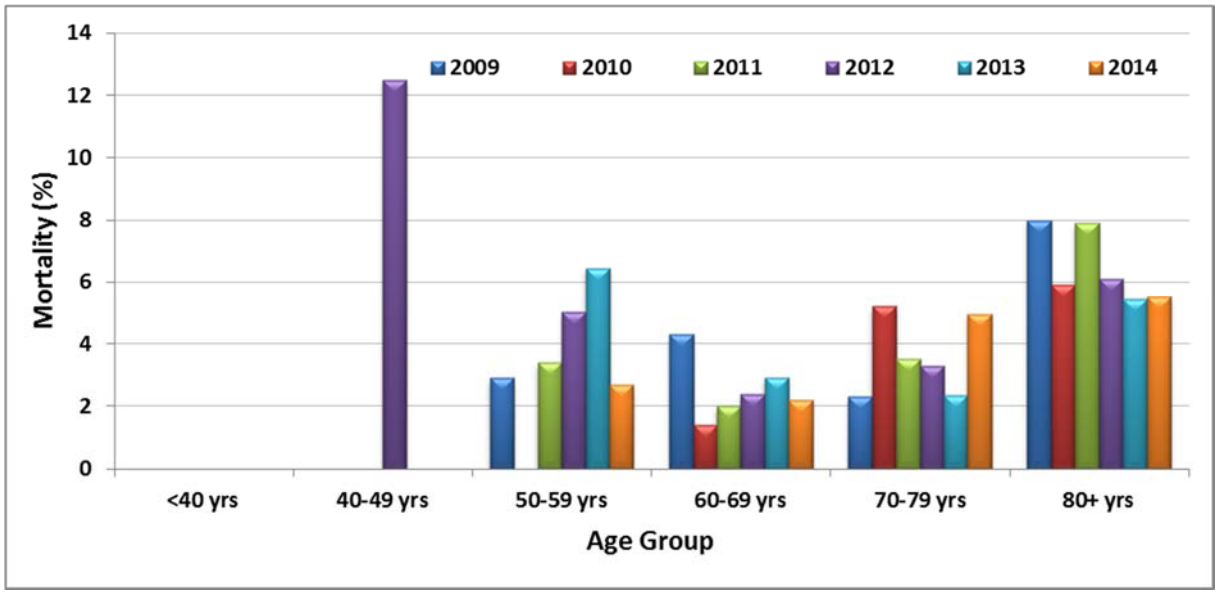
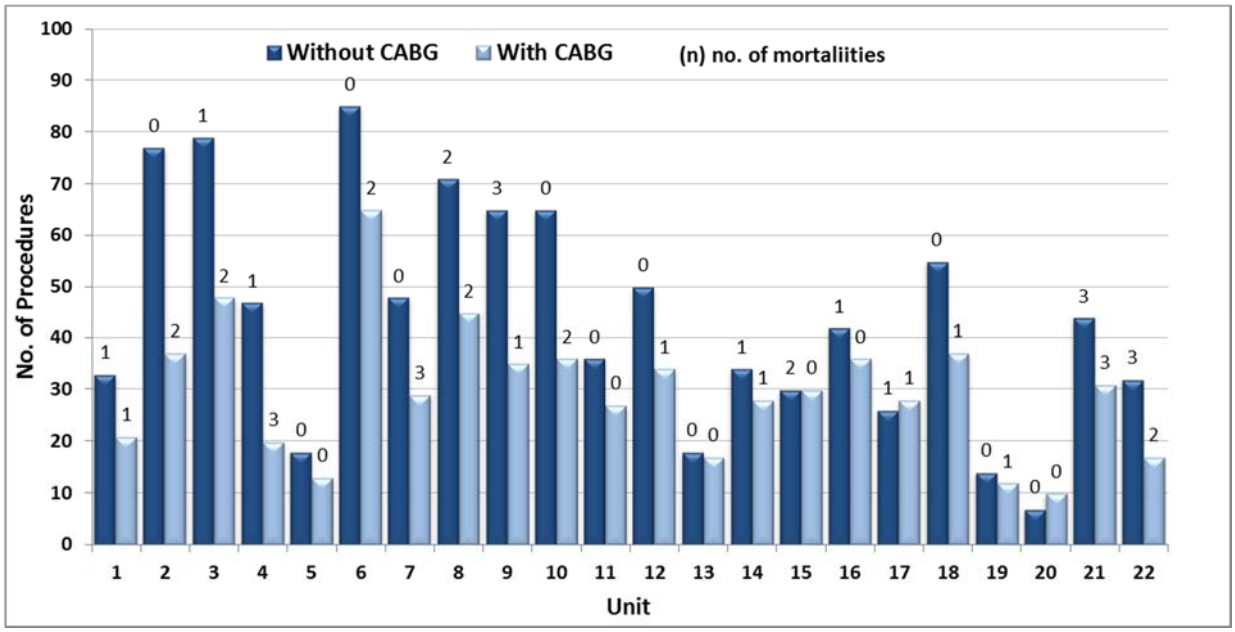


Table 23 - Mortality rate for Single Aortic Valve Replacement with CABG procedures by age group 2009 - 2014

	Mortality (mortality/n, %)											
	Age Group											
	<40 yrs		40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs		80+ yrs	
2014	0/2	-	0/8	-	1/37	2.7	3/136	2.2	16/323	5.0	9/163	5.5
2013	0/2	-	0/7	-	2/31	6.5	5/171	2.9	9/382	2.4	12/221	5.4
2012	0/1	-	1/8	12.5	2/40	5.0	3/125	2.4	10/300	3.3	12/196	6.1
2011	0/1	-	0/5	-	1/29	3.4	3/149	2.0	10/287	3.5	17/215	7.9
2010	0/4	-	0/7	-	0/29	-	2/144	1.4	15/289	5.2	12/205	5.9
2009	-	-	0/4	-	1/35	2.9	5/115	4.3	7/305	2.3	13/162	8.0
Total	0/10	-	1/39	2.6	7/201	3.5	21/840	2.5	67/1886	3.6	75/1162	6.5

Valve Surgery

Figure 18: Mortality for initial Single Aortic Valve Replacement by Unit 2014



Valve Surgery

Figure 19: Mortality rate for Single Aortic Valve Replacement with CABG procedures by year and age group

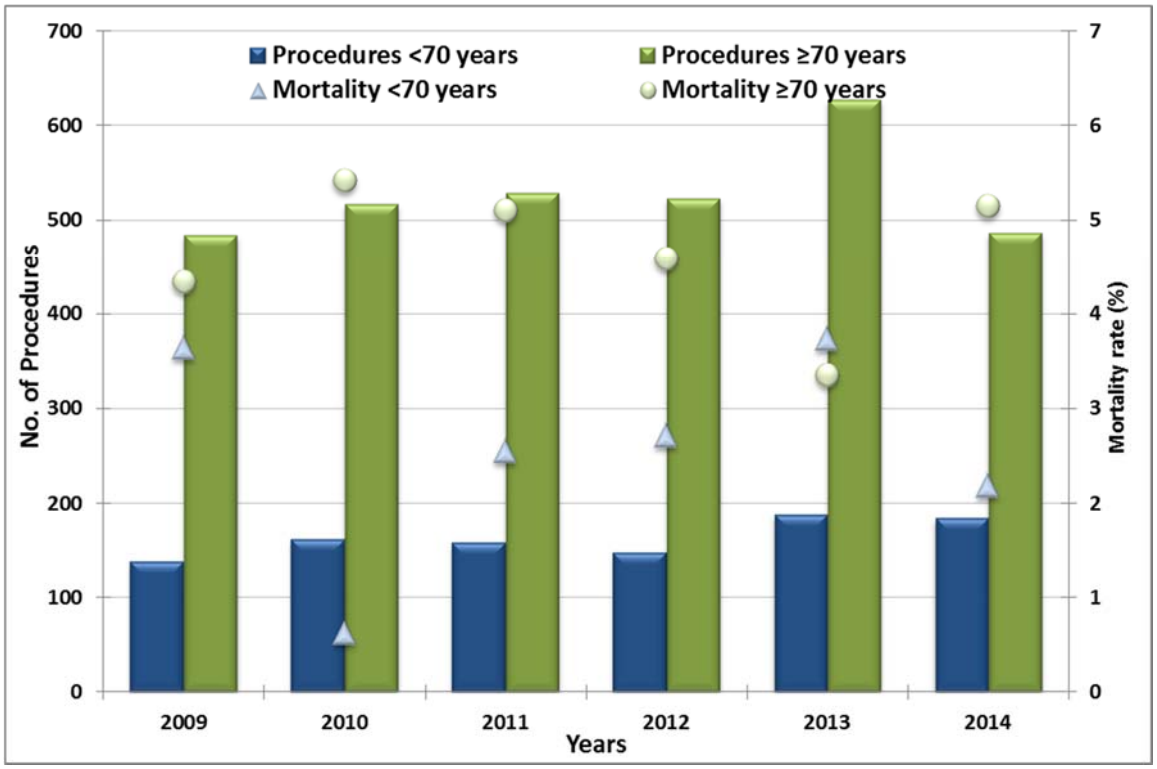
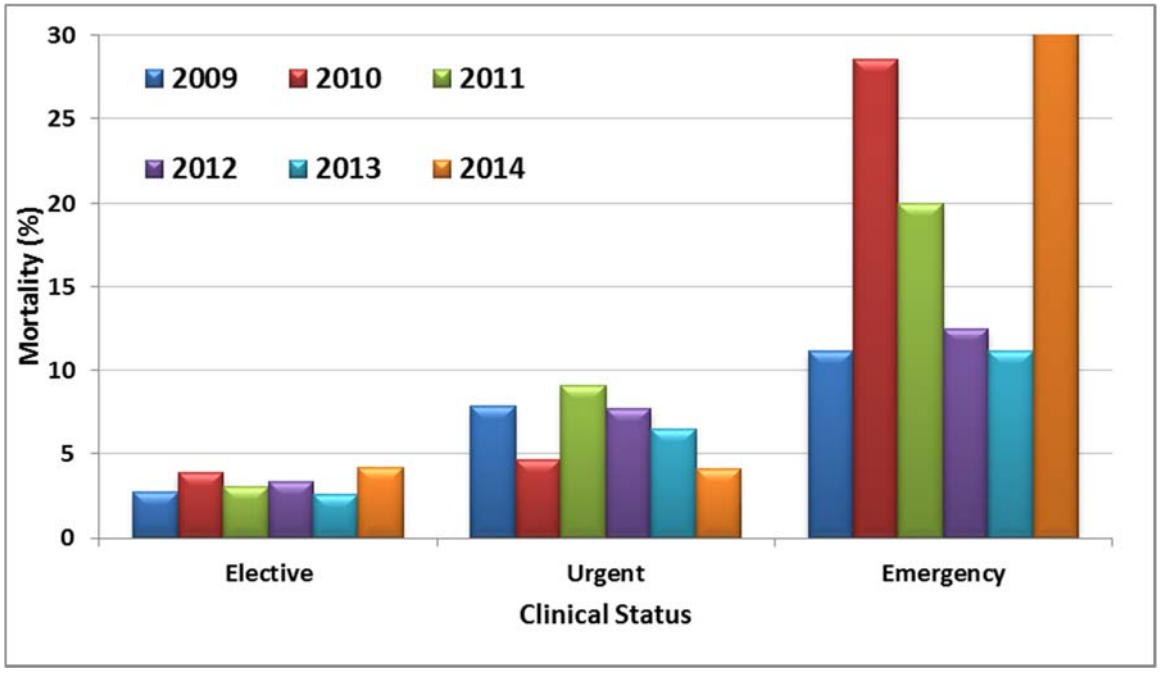


Figure 20: Mortality rate for Single Aortic Valve Replacement with CABG procedures by clinical status and year



Valve Surgery

Table 24a - Mortality rate for Single Aortic Valve Replacement with CABG procedures by clinical status 2009 - 2014

	Mortality (mortality/n, %)					
	Clinical Status					
	Elective		Urgent		Emergency	
2014	26/617	4.2	2/49	4.1	1/2	50.0
2013	17/651	2.6	10/154	6.5	1/9	11.1
2012	18/544	3.3	9/117	7.7	1/8	12.5
2011	17/554	3.1	11/121	9.1	2/10	20.0
2010	22/563	3.9	5/107	4.7	2/7	28.6
2009	13/482	2.7	10/128	7.8	1/9	11.1

Table 24a: In 2014, elective surgery for Aortic Valve Replacement with CABG procedures had an average mortality of 4.2% which is more than the mortality reported for urgent (4.1%) but less than that reported for emergency (50.0%).

Table 24b - Mortality rate for Single Isolated Aortic Valve Replacement by clinical status 2009 - 2014

	Mortality (mortality/n, %)					
	Clinical Status					
	Elective		Urgent		Emergency	
2014	17/981	1.7	3/63	4.8	1/4	25.0
2013	18/1070	1.7	4/109	3.7	1/10	10.0
2012	16/846	1.9	3/116	2.6	1/14	7.1
2011	12/901	1.3	6/81	7.4	0/9	-
2010	18/771	2.3	2/96	2.1	1/5	20.0
2009	11/620	1.8	7/106	6.6	1/3	33.3

Valve Surgery

Table 25a - Mortality rate for Single Aortic Valve Replacement with CABG procedures by redo 2009 - 2014

	Mortality (mortality/n, %)			
	Redo			
	Yes		No	
2014	2/39	5.1	27/630	4.3
2013	3/54	5.6	25/760	3.3
2012	3/36	8.3	25/634	3.9
2011	5/42	11.9	26/644	4.0
2010	2/65	3.1	27/613	4.4
2009	2/53	3.8	24/568	4.2
Total	17/289	5.9	154/3849	4.0

Table 25a shows that in 2014, the overall mortality rate for redo surgery for Single Aortic Valve Replacement and CABG procedures (5.1%) is higher than the mortality reported for first procedure (4.3%).

Table 25b - Mortality rate for Isolated Single Aortic Valve Replacement procedures by redo 2009 - 2014

	Mortality (mortality/n, %)			
	Redo			
	Yes		No	
2014	6/145	4.1	15/903	1.7
2013	7/172	4.1	16/1017	1.6
2012	8/155	5.2	12/821	1.5
2011	4/131	3.1	14/860	1.6
2010	3/131	2.3	18/741	2.4
2009	4/105	3.8	15/624	2.4
Total	32/839	3.8	90/4966	1.8

Although the results vary from year to year, the data for isolated Single Aortic Valve Replacement procedures over the past 6 years shows the average mortality for redo procedures is more than double (3.8%) compared to first procedures (1.8%).

Valve Surgery

Figure 21: Mortality rate for isolated Single Mitral Valve procedures

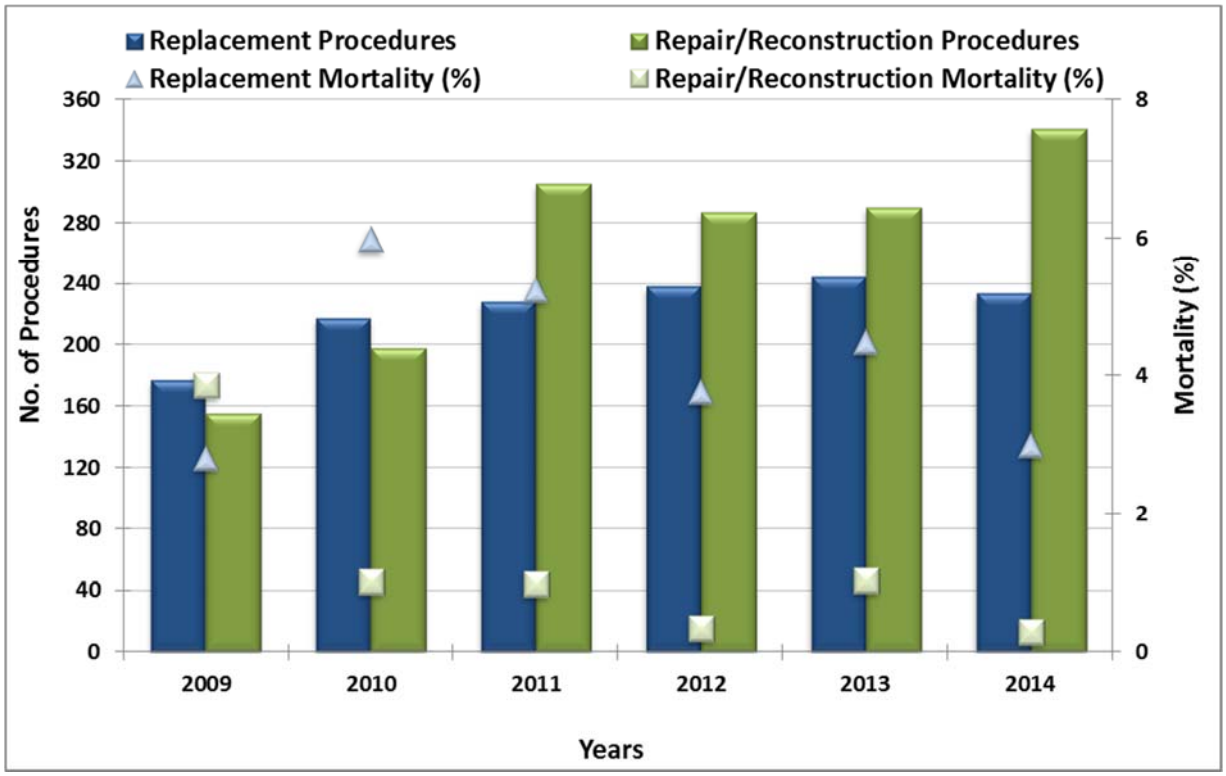
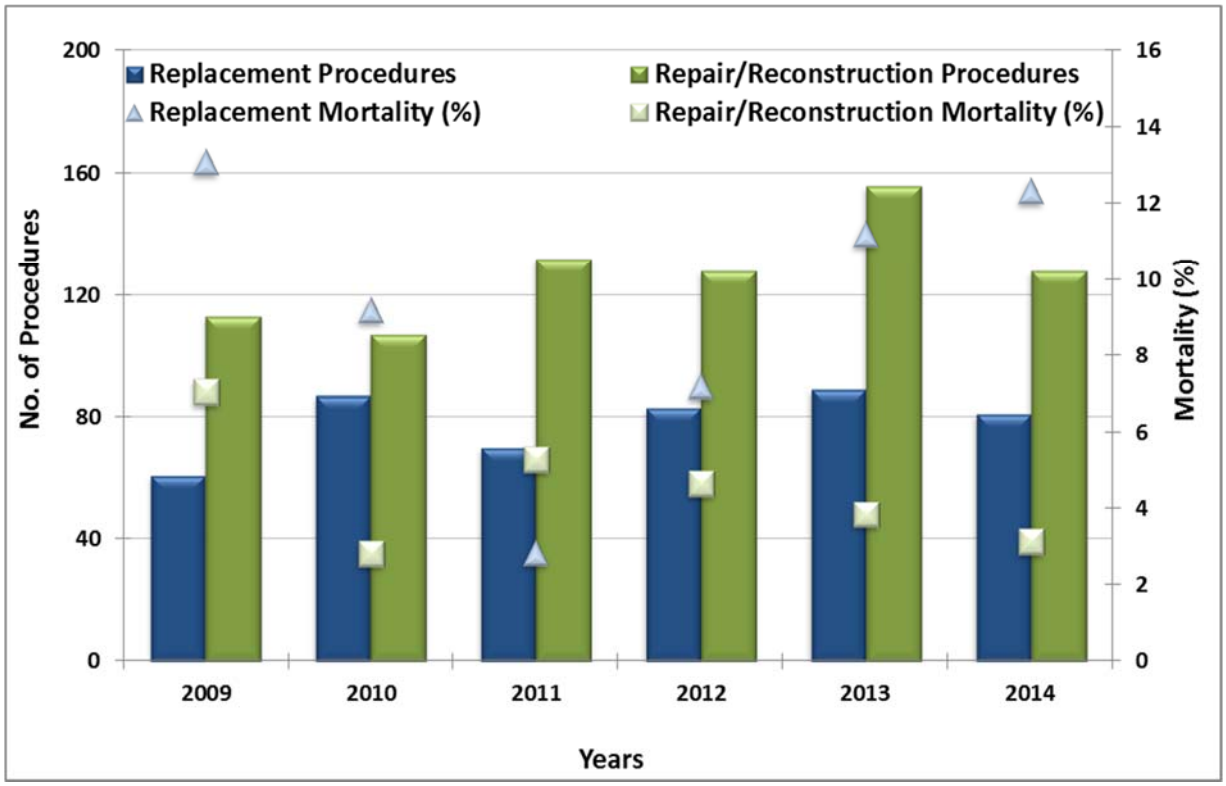
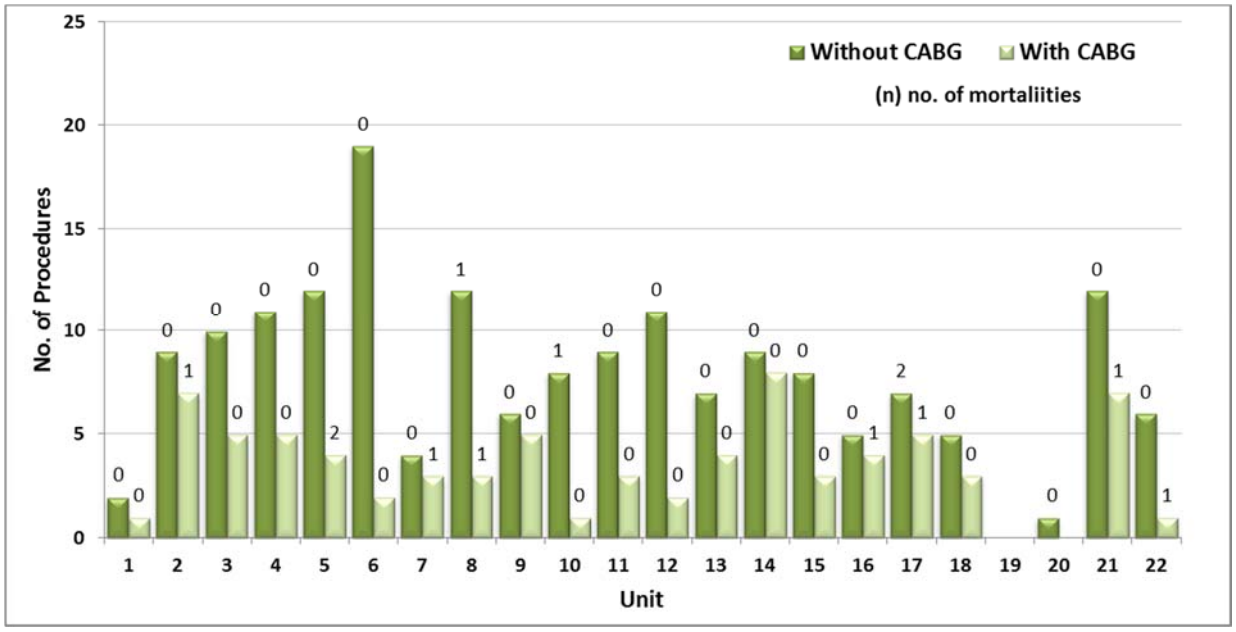


Figure 22: Mortality rate for Single Mitral Valve with CABG procedures



Valve Surgery

Figure 23: Mortality for initial Single Mitral Valve Replacement by Unit 2014



Valve Surgery

Table 26 - Post-operative complications by valve position – isolated single valve 2014 (% of cases)

	Valve Position			
	Aortic	Mitral	Tricuspid or Pulmonary	Total
n	1182	576	40	1798*
New Renal Failure	6.0	5.6	5.0	5.8
Cerebrovascular complication	1.9	2.3	2.5	2.1
Permanent Stroke	1.0	1.6	2.5	1.2
Transient Stroke	0.8	0.3	-	0.6
Continuous coma	0.3	0.3	-	0.3
Deep Sternal Wound Infection (30 days post-op)	0.6	0.5	5.0	0.7
Septicaemia	1.0	0.5	-	0.8
Return to theatre (all cause)	7.5	6.2	10.0	7.2
Re-op for Bleeding	3.3	2.6	2.5	3.1
New Cardiac Arrhythmia	31.1	28.0	17.5	29.8
Pneumonia	3.4	2.8	2.5	3.2
GIT complication	1.3	1.0	5.0	1.3
Multi-system Failure	0.8	1.4	5.0	1.1
Anticoagulant complication	0.7	0.5	-	0.6
Red Blood Cells transfused	30.6	29.3	37.5	30.3
Non-RBC blood products	22.0	21.3	32.5	22.0

*3 missing cases

Valve Surgery

Table 27 - Post-operative complications by valve position – single valve with CABG 2014 (% of cases)

	Valve Position			
	Aortic	Mitral	Tricuspid or Pulmonary	Total
n	681	209	5	895*
New Renal Failure	8.8	12.0	20.0	9.6
Cerebrovascular complication	2.6	3.3	-	2.8
Permanent Stroke	2.2	1.0	-	1.9
Transient Stroke	0.1	2.4	-	0.7
Continuous coma	0.6	-	-	0.4
Deep Sternal Wound Infection (30 days post-op)	1.8	3.8	-	2.2
Septicaemia	0.9	1.4	-	1.0
Return to theatre (all cause)	7.8	10.5	20.0	8.5
Re-op for Bleeding	4.5	4.7	-	4.6
New Cardiac Arrhythmia	36.6	40.7	40.0	37.5
Pneumonia	5.9	7.7	20.0	6.4
GIT complication	2.3	2.4	20.0	2.5
Multi-system Failure	2.1	3.3	20.0	2.5
Anticoagulant complication	1.2	1.9	-	1.3
Red Blood Cells transfused	47.2	50.7	40.0	48.0
Non-RBC blood products	33.3	41.2	80.0	35.4

*3 missing cases

Valve Surgery

Table 28 - Resource utilisation by valve position – isolated single valve (median value)

		Aortic	Mitral	Tricuspid or Pulmonary
Intubation Time (hours)	2014	9.0	9.0	7.0
	2013	10.0	9.0	8.0
	2012	10.0	10.0	7.5
	2011	10.0	10.0	9.0
	2010	11.0	10.5	7.5
Intensive Care Stay (hours)	2014	47.0	48.0	54.0
	2013	46.0	47.0	50.5
	2012	43.0	47.0	47.0
	2011	44.0	45.0	47.5
	2010	44.0	44.0	35.0
Post-op Length of Stay (days)	2014	8.0	8.0	8.0
	2013	8.0	8.0	7.0
	2012	7.8	8.0	8.0
	2011	8.0	7.9	8.0
	2010	8.0	8.0	6.5

Valve Surgery

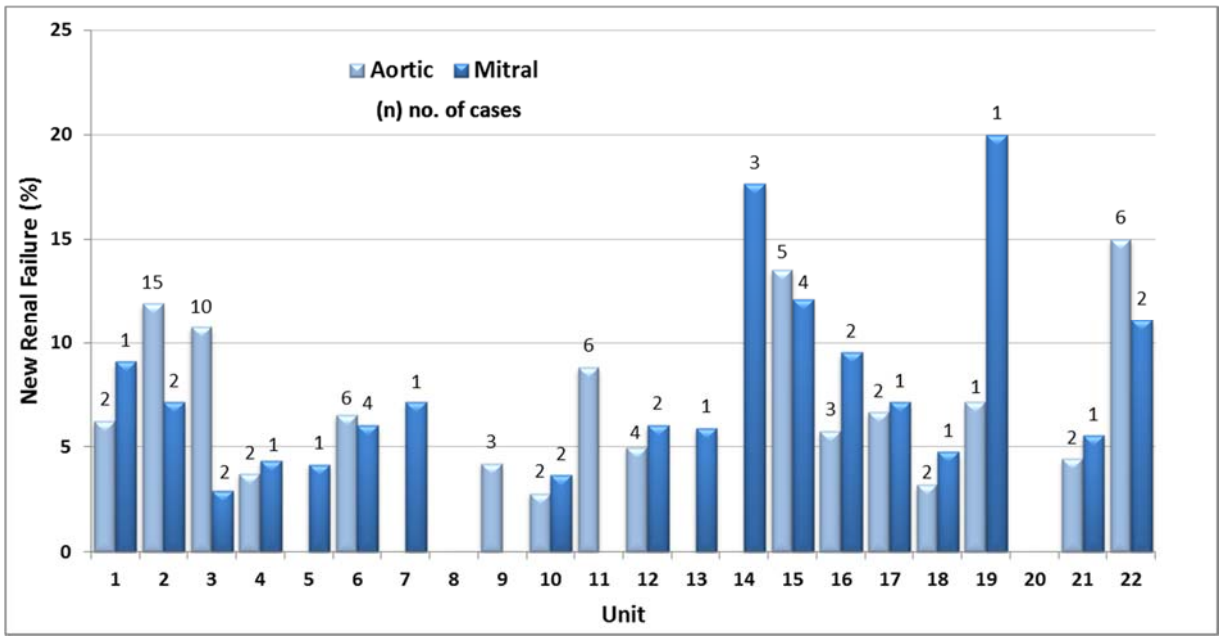
Table 29 - Resource utilisation by valve position – single valve with CABG (median value)

		Aortic	Mitral	Tricuspid or Pulmonary
Intubation Time (hours)	2014	13.0	17.0	19.0
	2013	13.0	16.0	7.0
	2012	13.0	15.0	19.0
	2011	12.0	13.0	9.0
	2010	14.0	18.0	12.0
Intensive Care Stay (hours)	2014	52.0	72.0	70.0
	2013	47.0	71.0	47.0
	2012	48.0	67.0	114.0
	2011	48.0	52.0	73.5
	2010	48.0	91.0	35.0
Post-op Length of Stay (days)	2014	8.6	10.6	12.0
	2013	9.0	10.0	7.0
	2012	9.0	10.0	12.0
	2011	9.0	10.0	13.5
	2010	9.0	10.0	12.0

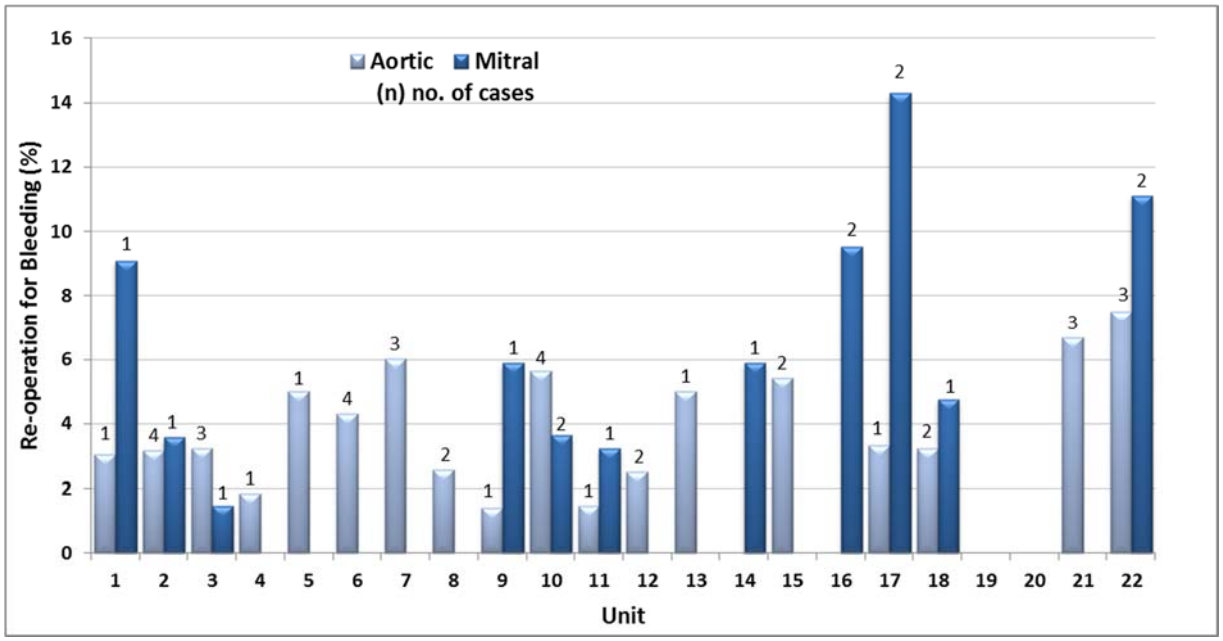
Valve Surgery

Figure 24: Morbidity of isolated single valve procedures (any)

a) New renal failure rate by valve position and Unit 2014



b) Re-operation for bleeding by valve position and Unit 2014



Valve Surgery

Table 30 - Post-operative complications by age – any single valve procedure with CABG 2014 (% of cases)

	Age Group (%)						
	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	4	13	62	210	413	193	895*
New Renal Failure	-	-	11.3	8.1	9.7	11.4	9.6
Cerebrovascular complication	-	-	3.2	2.4	2.7	3.6	2.8
Permanent Stroke	-	-	1.6	1.0	1.9	3.1	1.9
Transient Stroke	-	-	1.6	1.0	0.5	0.5	0.7
Continuous Coma	-	-	-	1.0	0.5	-	0.4
Deep Sternal Wound Infection (30 days post-op)	-	-	1.6	2.4	2.2	2.6	2.2
Septicaemia	-	-	-	1.4	1.2	0.5	1.0
Return to theatre (all cause)	-	15.4	8.1	5.7	9.2	9.8	8.5
Re-op for Bleeding	-	15.4	8.1	1.9	5.1	4.6	4.6
Peri-operative AMI	-	-	4.8	0.5	0.2	1.0	0.8
New Cardiac Arrhythmia	25.0	7.7	37.1	38.6	38.7	36.3	37.5
Pneumonia	25.0	-	6.5	3.8	8.0	5.7	6.4
GIT complication	-	7.7	3.2	2.4	1.9	3.1	2.5
Multi-system Failure	-	-	1.6	1.4	2.9	3.1	2.5
Anticoagulant complication	-	-	1.6	1.9	1.0	1.6	1.3
Red Blood Cells transfused	25.0	46.2	32.3	41.0	48.1	61.0	48.0
Non-RBC blood products	50.0	46.2	22.6	35.2	33.8	42.1	35.4

*3 missing cases

Valve Surgery

Table 31 - Resource utilisation by age - single valve with CABG (median value)

		Age Group (years)					
		<40	40-49	50-59	60-69	70-79	80+
Intubation Time (hours)	2014	52.5	10.0	11.0	13.0	13.0	15.0
	2013	9.5	9.0	15.0	14.5	13.0	14.0
	2012	7.0	17.0	14.0	13.5	13.0	14.0
	2011	27.0	11.0	10.0	11.0	13.0	11.0
	2010	28.0	13.0	13.0	15.0	14.0	14.0
Intensive Care Stay (hours)	2014	68.5	94.0	66.5	63.5	53.0	68.0
	2013	93.0	43.0	64.0	48.0	49.0	66.0
	2012	60.5	43.0	48.0	54.0	48.0	50.0
	2011	45.0	52.0	45.0	46.0	51.0	50.0
	2010	74.5	80.0	48.0	52.0	48.0	62.0
Post-op Length of Stay (days)	2014	11.5	8.0	8.0	8.1	9.0	10.0
	2013	10.5	8.0	8.0	8.0	8.4	11.0
	2012	8.0	9.0	8.0	8.0	9.0	10.0
	2011	6.5	8.0	8.0	8.0	9.0	10.1
	2010	9.5	7.5	7.0	8.0	9.0	11.0

The effect of age on post-operative complications and Resource Utilisation after single valve and CABG surgery is illustrated in Tables 30 and 31.

Valve Surgery

Table 32 - Resource utilisation by age - multiple valves (median value)

		Age Group (years)					
		<40	40-49	50-59	60-69	70-79	80+
Intubation Time (hours)	2014	19.0	14.0	12.0	14.0	16.0	17.0
	2013	17.0	20.0	17.0	12.0	16.0	15.5
	2012	16.0	15.0	10.0	17.0	16.0	18.5
	2011	9.5	18.0	11.0	14.0	17.0	14.5
	2010	13.0	8.0	12.0	13.0	13.0	18.0
Intensive Care Stay (hours)	2014	74.5	76.0	71.0	69.0	65.0	71.5
	2013	67.0	68.5	52.0	69.0	73.0	57.5
	2012	48.0	69.0	48.0	65.0	70.0	96.0
	2011	45.5	49.5	48.0	47.0	64.0	68.5
	2010	47.0	42.0	39.0	56.0	45.0	94.0
Post-op Length of Stay (days)	2014	8.5	11.0	11.5	10.0	9.25	12.0
	2013	9.0	10.5	10.0	9.0	12.0	11.6
	2012	9.8	11.0	8.0	10.5	11.0	13.5
	2011	8.0	13.0	8.0	9.0	12.0	12.0
	2010	8.5	13.0	9.5	10.0	9.0	17.0

Other Cardiac Surgery

Table 33 - Other surgery types 2014

Surgery type (NOT mutually exclusive)	Total number of procedures	Mortality by procedure 2014	
		n (mort)	%
Left Ventricular Aneurysm	11	2	18.2
Acquired VSD	18	6	33.3
Aortic Procedure*	646	38	5.9
Aneurysm – Asc only	410	14	3.4
– Asc + Arch	77	2	2.6
– Arch only	13	-	-
– Desc	6	1	16.7
– Thor/Abd only	4	1	25.0
– Arch + Desc	2	-	-
– Desc + Thor	1	1	100
– Asc Arch + Desc	3	1	33.3
– Asc Arch + Desc + Thor	-	-	-
– Others	2	-	-
Dissection – Asc – Acute	88	18	20.5
– Asc – Chronic	1	-	-
– Desc – Acute	3	-	-
– Desc – Chronic	-	-	-
Acute Traumatic Aortic Transection	-	-	-
Cardiac Trauma	6	2	33.3
LVOT Myectomy for HOCM	81	1	1.2
LV Rupture Repair	7	1	14.3
Pericardiectomy	20	1	5.0
Pulmonary Thrombo-endarterectomy	16	1	6.2
Carotid Endarterectomy	10	-	-
Left Ventricular Reconstruction	4	-	-
Pulmonary Embolectomy	10	2	20.0
Cardiac Tumour	73	2	2.7
Cardiac Transplant	30	-	-
Congenital – ASD	148	-	-
– Other	97	1	1.0
Permanent LV Epicardial Lead	74	2	2.7
Atrial Arrhythmia Surgery	278	10	3.6

*Some units did not submit Aortic Procedure Type data despite answering yes to Aortic Procedure

Data for the entire cardiac surgical population

The following illustrates aspects of the effect of age, procedure type, left ventricular function, clinical urgency, redo-procedures and some pre-operative co-morbidities on post-operative outcomes and Resource Utilisation.

Table 34a - Post-operative complications by age 2014 (% of cases)

	Age Group (years)						
	<40	40-49	50-59	60-69	70-79	80+	Total
n	388	631	1631	2849	2847	1066	9412
New Renal Failure	2.8	4.4	5.3	6.3	7.2	9.2	6.5
Cerebrovascular complication	1.3	1.9	1.2	1.8	2.0	2.7	1.9
Permanent Stroke	1.3	1.3	0.7	1.2	1.2	1.6	1.2
Transient Stroke	-	0.3	0.4	0.5	0.5	0.3	0.4
Continuous Coma	0.3	0.5	0.2	0.4	0.4	0.8	0.4
Deep Sternal Wound Infection (30 days post-op)	1.3	0.5	0.9	0.8	1.1	1.1	1.0
Re-op for Bleeding	4.4	4.6	3.4	2.7	3.3	3.8	3.3

Table 34b - Resource utilisation by age 2014 (median value)

	Age Group (years)					
	<40	40-49	50-59	60-69	70-79	80+
Intubation Time (hours)	8.0	9.0	9.0	10.0	12.0	13.0
Intensive Care Stay (hours)	48.0	46.0	47.0	48.0	50.0	52.0
Post-op Length of Stay (days)	7.0	7.0	7.0	7.0	8.0	9.0

Data for the entire cardiac surgical population

Table 35a - Post-operative complications by procedure type 2014 (% of cases)

	Procedure Type				
	Isolated CABG	Valve(s) only	Valve(s) + CABG	Other	Total
n	4723	2068	964	1630	9385*
New Renal Failure	5.0	6.3	9.9	8.8	6.5
Deep Sternal Wound Infection (30 days post-op)	0.9	0.6	2.1	0.8	1.0
Re-op for Bleeding	2.4	3.3	4.6	5.3	3.3
Red Blood Cells transfused	28.4	32.9	48.7	40.1	33.5
Non-RBC blood products transfused	17.6	25.4	36.2	41.0	25.3

*27 missing cases

Table 35b - Resource utilisation by procedure type 2014 (median value)

	Procedure Type			
	Isolated CABG	Valve(s) only	Valve(s) + CABG	Other
Intubation Time (hours)	10.0	10.0	14.0	12.0
Intensive Care Stay (hours)	47.0	48.0	66.5	58.0
Post-op Length of Stay (days)	7.0	8.0	9.0	9.0

Data for the entire cardiac surgical population

Table 36a - Post-operative complications by LV dysfunction 2014 (% of cases)

	LV Dysfunction				
	Normal	Mild	Moderate	Severe	Total
n	5279	2470	1126	329	9204*
New Renal Failure	5.4	6.0	9.7	15.2	6.4
Cerebrovascular complication	1.5	1.8	2.4	4.8	1.8
Permanent Stroke	0.9	1.2	1.9	1.8	1.1

*23 missing cases

Table 36b - Resource utilisation by LV dysfunction 2014 (median value)

	LV Dysfunction			
	Normal	Mild	Moderate	Severe
Intubation Time (hours)	9.0	11.0	13.0	20.0
Post-op Length of Stay (days)	7.0	7.1	8.0	10.1

Data for the entire cardiac surgical population

Table 37 - Post-operative complications by diabetes 2014 (% of cases)

	Diabetes		
	Yes	No	Total
n	2846	6566	9412
New Renal Failure	8.6	5.6	6.5
Cerebrovascular complication	2.2	1.7	1.9
Permanent Stroke	1.5	1.0	1.2
Deep Sternal Wound Infection (30 days post-op)	1.4	0.8	1.0

Table 38 - Post-operative complications by pre-operative renal function 2014 (% of cases)

	Pre-op EGFR		
	> 60 mL/min/1.73m^2	≤ 60 mL/min/1.73m^2	Total
n	7110	2302	9412
New Renal Failure	4.9	11.3	6.5
Deep Sternal Wound Infection (30 days post-op)	0.9	1.2	1.0
Re-op for Bleeding	3.0	4.5	3.3

Table 39 - Post procedural length of stay by renal function 2014 (median value)

	Pre-op EGFR		
	> 60 mL/min/1.73m^2	≤ 60 mL/min/1.73m^2	Total
Post-op Length of stay (days)	7.0	9.0	7.8

Data for the entire cardiac surgical population

Table 40a - Post-operative complications by clinical status 2014 (% of cases)

	Clinical Status				
	Elective	Urgent	Emergency	Salvage	Total
n	8067	1150	168	27	9412
New Renal Failure	5.9	7.8	20.6	37.5	6.5
Cerebrovascular complication	1.5	2.3	11.9	14.8	1.9
Permanent Stroke	1.0	1.1	7.3	8.3	1.2
Re-op for Bleeding	3.0	4.5	9.5	11.1	3.3

Table 40b - Post procedural length of stay by clinical status 2014 (median value)

	Clinical Status			
	Elective	Urgent	Emergency	Salvage
Post-op Length of Stay (days)	7.1	8.0	11.0	10.0

Table 41 - Post-operative complications by redo procedure 2014 (% of cases)

	1st Proc	Redo	Total
n	8631	781	9412
New Renal Failure	6.2	9.4	6.5
Cerebrovascular complication	1.8	2.9	1.9
Permanent Stroke	1.1	2.1	1.2
Deep Sternal Wound Infection (30 days post-op)	0.9	1.3	1.0
Re-op for Bleeding	3.1	5.8	3.3

Data for the entire cardiac surgical population

Table 42a - Post-operative complication by respiratory disease 2014 (% of cases)

	Respiratory Disease				
	No	Mild	Moderate	Severe	Total
n	8254	863	246	49	9412
Deep Sternal Wound Infection (30 days post-op)	0.9	1.6	1.2	-	1.0

Table 42b - Intubation time by respiratory disease in 2014 (median value)

	Respiratory Disease				
	No	Mild	Moderate	Severe	Total
Intubation Time (hours)	10.0	12.0	13.0	18.0	10.0

Data for the entire cardiac surgical population

Table 43a - Post-operative complications by previous cerebrovascular disease and atrial arrhythmia 2014 (% of cases)

	Previous Cerebrovascular Disease			Atrial Arrhythmia		
	Yes	No	Total	Yes	No	Total
n	848	8536	9384*	1330	8054	9384*
Cerebrovascular complication	4.0	1.6	1.9	2.8	1.7	1.9
Permanent Stroke	2.9	1.0	1.2	1.7	1.1	1.2
Transient Stroke	0.6	0.4	0.4	0.5	0.4	0.4
Continuous Coma	0.9	0.4	0.4	0.8	0.4	0.4

*28 missing cases

Table 43b - Post-operative complications by CPB time 2014 (% of cases)

	CPB time			
	≤1 hrs	>1 to ≤3 hrs	>3 hrs	Total
n	1179	6762	794	8735*
Cerebrovascular complication	0.6	1.7	5.3	1.9
Permanent Stroke	0.4	1.1	2.9	1.2
Transient Stroke	0.2	0.4	1.4	0.4
Continuous Coma	0.1	0.3	1.6	0.4

*26 missing cases

Table 44 - Deep Sternal Wound Infection within 30 days of surgery – BITA – Obesity – Return to theatre 2010 - 2014 (% of cases)

	BITA (%)			Obesity (%)			Return to theatre – all cause (%)		
Deep Sternal Wound Infection (30 days post-op)	Yes	No	Total	Yes	No	Total	Yes	No	Total
2014	2.4	0.9	1.0	1.2	0.8	1.0	7.5	0.5	1.0
2013	1.6	0.9	1.0	1.4	0.8	1.0	6.9	0.6	1.0
2012	1.2	1.1	1.1	1.5	0.9	1.1	10.7	0.4	1.1
2011	1.1	0.9	0.9	2.0	0.7	1.1	7.9	0.6	1.1
2010	1.5	1.1	1.1	1.7	0.9	1.1	7.9	0.6	1.1

In-House reporting module - report from all units combined

The ANZSCTS online web system contains an In-House reporting module that provides a report on case numbers and outcomes for the individual unit as required. The following pages display a copy of that report generated by the same software, but with combined data of all 22 units for the 2014 Calendar year. As St Vincent's Sydney Hospital, St George Hospital, Prince of Wales Hospital, Lake Macquarie Private Hospital and Canberra Hospital were excluded from this report, they have also been excluded from the web report.

PLEASE NOTE: Minor discrepancies may exist between the National Report and this Reporting Module and are due to differences in filtering processes prior to analysis.

MONASH University
Medicine, Nursing and Health Sciences

Web Report for Surgeon or Cardiac unit by date range

Report By All Hospital

Selected Date Range 01/01/2014 to 31/12/2014

Note: Incomplete data will affect the overall data pesented in this report. Cases with missing procedure types or urgency status details have been excluded from this report. Only the first procedure in cases with mortality have been included.

Summary

Number of patients	9355	**Salvage**	27
Number of procedures (number of procedures includes double mortality)	9421	**Day of Surg Admission**	2651
		Redo	781
Average Age	65.82	**Second procedure**	391
Male / Female	6822 / 2533	**Total Mortality**	252
Elective	7067	**Hospital Mortality**	240
Urgent	1933	**30-day Mortality**	225
Emergency	385	**Readmission**	881

Table 1 Surgery Type

	Total number of procedures		Total Mortality by procedure	
Surgery type (mutually exclusive)	**Number of procedures**	**% of total procedures**	**Number of patients**	**% of Surgery Type**
Isolated CABG	4726	50.21 %	63	1.33 %
Valve(s) only	2073	22.03 %	52	2.51 %
Valve(s) + CABG	968	10.28 %	52	5.37 %
Other (COTH,NCOTH,AO)	1645	17.48 %	85	5.17 %
All Procedures	9412	100.00 %	252	2.68 %

Age

	Number of procedures				Total Mortality (exclude double mort)			
Surgery type (mutually exclusive)	**Number of procedures**		**% of total procedures**		**Number of patients**		**% of Age Group**	
	Isolated CABG	**ALL**	**Isolated CABG**	**ALL**	**Isolated CABG**	**ALL**	**Isolated CABG**	**ALL**
<40 years	33	388	0.70 %	4.12 %	0	7	0.00 %	1.80 %
40 - 59 years	1294	2262	27.38 %	24.03 %	8	43	0.62 %	1.90 %
60 - 69 years	1704	2849	36.10 %	30.27 %	15	55	0.88 %	1.93 %
70 - 79 years	1328	2847	28.10 %	30.25 %	26	87	1.96 %	3.10 %
80 + years	367	1066	7.77 %	11.33 %	14	60	3.81 %	5.63 %
All Procedures	4726	9412	50.21 %	100.00 %	63	252	1.33 %	2.68 %

Isolated Coronary artery surgery

Number of patients	4718	Total Radial Anastomoses	1915
Number of procedures	4726	Single Radials	1646
Male / Female	3835 / 883	Double Radials	269
Stable/Unstable Angina	3068 / 1010	GEPA Anastomoses	17
Clinical Status: Elective	3204	Graft Numbers:	
Urgent	1367	6-graft	69
Emergency/Salvage	155	5-graft	367
Total CABG Mortality	63	4-graft	1313
Offpump / Mort	484 / 7	3-graft	1710
Onpump / Mort	4242 / 56	2-graft	1009
Redo / Mort	103 / 5	1-graft	230
Total no. of arterial grafts	1373	30-day Mortality	50
Mean no. of grafts	3.16	30-day Mortality by elective	19
LIMA	3915	30-day Mortality by urgent	20
RIMA	25	30-day Mortality by emerg/sal	11
BIMA	591		
Total IMA conduits	5122		
Total SVG Anastomoses	3340		

Isolated Coronary artery surgery - Complications

Return to theatre	216	Pulmonary:	
Valve dysfunction	1	Prolonged Vent	381
Graft occlusion	7	Re-intubation	101
Reop Deep sternal inf	18	Pneumonia	231
Bleeding	114	Neurologic:	
Other cardiac	44	Stroke Permanent	35
Other non-cardiac	54	Stroke Transient	9
Deep Sternal Infections	44	Septicaemia	31
Renal failure	238	Anticoagulant complications	15
Haemofiltration	57	GIT complications	55
Peri-op AMI	51	Multi system failure	34
Peri-op Cardiogenic Shock	128	Inotrope use:	
New Cardiac Arrhythmia	1168	> 4 hrs	2374
Heartblock	12	low CO	1088
Cardiac arrest	43	low SVR	1257
Atrial Arrythmia	1071		
Ventricular tachycardia	72		

Isolated Coronary artery surgery - Performance Indicators

Length of Stay (mean)	12.14	**30-Day Sternal Infection**	0.93 %
Post-procedure Length of Stay (mean)	8.76	**Reop for bleeding**	2.41 %
ICU hours (mean)	65.69	**30 Day Mortality**	1.06 %
Ventilation hours (mean)	17.32	**Total Mortality**	1.33 %

Isolated Valve(s) surgery

Number of patients	2053	**30-day Mortality**	48
Number of procedures	2073	**Total Mortality**	52
Male / Female	1196 / 857		
Redo	372		

Isolated Valve Surg & Prosthesis

	Total number of procedures		Total Mortality by procedure		
Surgery type (mutually exclusive)	Number of procedures	% of total procedures	Number of patients	% of Surgery Type	Total number of prosthesis
Aortic Valve replacement (AVR) Only	1048	50.58 %	21	2.00 %	Mechanical 183
					Bioprosthesis 860
					Homo/Allograft 2
					Autograft 0
Other Aortic Valve Procedure (Only)	136	6.56 %	3	2.21 %	
Mitral Valve Replacement (Only)	233	11.25 %	7	3.00 %	Mechanical 115
					Bioprosthesis 116
					Homo/Allograft 0
Mitral Valve Repair (Only)	341	16.46 %	1	0.29 %	Ring 322
Aortic and Mitral Valve Procedure (Only)	122	5.89 %	7	5.74 %	Mechanical 78
					Bioprosthesis 121
					Homo/Allograft 0
					Autograft 0
					Ring 29
Mitral and Tricuspid Valve Procedure (Only)	93	4.49 %	6	6.45 %	Mechanical 14
					Bioprosthesis 35
					Homo/Allograft 0
					Ring 135
Aortic, Mitral and Tricuspid Valve Procedure (Only)	35	1.69 %	4	11.43 %	Mechanical 16
					Bioprosthesis 42
					Homo/Allograft 0
					Autograft 0
					Ring 42
Other Valve Procedures	64	3.09 %	3	4.69 %	
Total	2072	100.00 %	52	2.51 %	

Isolated Valve(s) surgery - Complications

Return to theatre	161	**Pulmonary:**	
Valve dysfunction	3	**Prolonged Vent**	198
Graft occlusion	0	**Re-intubation**	41
Reop Deep sternal inf	4	**Pneumonia**	74
Bleeding	68	**Neurologic:**	
Other cardiac	54	**Stroke Permanent**	23
Other non-cardiac	41	**Stroke Transient**	12
Deep Sternal Infections	13	**Septicaemia**	18
Renal failure	131	**Anticoagulant complications**	16
Haemofiltration	42	**GIT complications**	26
Peri-op AMI	14	**Multi system failure**	28
Peri-op Cardiogenic Shock	60	**Inotrope use:**	
New Cardiac Arrhythmia	636	**> 4 hrs**	979
Heartblock	62	**low CO**	502
Cardiac arrest	19	**low SVR**	503
Atrial Arrythmia	531		
Ventricular tachycardia	34		

Isolated Valve(s) - Performance Indicators

Length of Stay (mean)	13.11	**30-Day Sternal Infection**	0.63 %
Post-procedure Length of Stay (mean)	10.45	**Reop for bleeding**	3.28 %
ICU hours (mean)	77.73	**30 Day Mortality**	2.32 %
Ventilation hours (mean)	21.78	**Total Mortality**	2.50 %

Valve Surgery and CABG

	Total number of procedures		Total Mortality by procedure			
Surgery type (mutually exclusive)	Number of procedures	% of total procedures	Number of patients	% of Surgery Type	Total number of prostheses	
Aortic Valve replacement (AVR) + CABG	669	69.11 %	29	4.33 %	Mechanical	40
					Bioprosthesis	629
					Homo/Allograft	0
					Autograft	0
Other Aortic Valve Procedure + CABG	13	1.34 %	0	0.00 %		
Mitral Valve Replacement + CABG	81	8.37 %	10	12.35 %	Mechanical	18
					Bioprosthesis	57
					Homo/Allograft	0
Mitral Valve Repair + CABG	128	13.22 %	4	3.13 %	Ring	124
Aortic and Mitral Valve Procedure + CABG	34	3.51 %	3	8.82 %	Mechanical	15
					Bioprosthesis	36
					Homo/Allograft	0
					Autograft	0
					Ring	10
Mitral and Tricuspid Valve Procedure + CABG (Only)	26	2.69 %	2	7.69 %	Mechanical	1
					Bioprosthesis	9
					Homo/Allograft	0
					Ring	41
Aortic, Mitral and Tricuspid Valve Procedure + CABG (Only)	6	0.62 %	3	50.00 %	Mechanical	2
					Bioprosthesis	6
					Homo/Allograft	0
					Autograft	0
					Ring	5
Other Valve Procedures + CABG	11	1.14 %	1	9.09 %		
Total	968	100.00 %	52	5.37 %		

CABG and Valve(s) Surgery

Number of patients		963		
Number of procedures		968	CABG and MVR	81
Male / Female	747 /	216	CABG and AVR and MVR	19
Redo		64	CABG and MV repair	128
CABG and AVR		669	30-day Mortality	47

CABG and Valve(s) Surgery - Complications

Return to theatre	86	Pulmonary:	
Valve dysfunction	0	Prolonged Vent	151
Graft occlusion	0	Re-intubation	33
Reop Deep sternal Inf	7	Pneumonia	66
Bleeding	45	Neurologic:	
Other cardiac	28	Stroke Permanent	18
Other non-cardiac	17	Stroke Transient	7
Deep sternal infection	20	Septicaemia	13
Renal failure	95	Anticoagulant complications	15
Haemofiltration	41	GIT complications	24
Peri-op AMI	7	Multi system failure	27
Peri-op Cardiogenic Shock	46	Inotrope use:	
New Cardiac Arrhythmia	365	> 4 hrs	586
Heartblock	20	low CO	325
Cardiac arrest	16	low SVR	287
Atrial Arrythmia	306		
Ventricular tachycardia	21		

CABG and Valve(s) Surgery - Performance Indicators

Length of Stay (mean)	49.80	30-Day Sternal Infection	2.07 %
Post-procedure Length of Stay (mean)	46.44	Reop for bleeding	4.65 %
ICU hours (mean)	102.99	30 Day Mortality	4.86 %
Ventilation hours (mean)	32.63	Total Mortality	5.37 %

Table 16 AVR Surgery and Aortic Procedures (+/-CABG)

	Total number of procedures		Total Mortality by procedure		
Surgery type (mutually exclusive)	Number of procedures	% of total procedures	Number of patients	% of Surgery Type	Procedure Types
AVR + Aortic Aneurysm	134	76.57 %	0	0.00 %	Arch 14 Ascending 129 Thoracic/Abdominal % 0 Descending 1
AVR + Aortic Dissection	6	3.43 %	1	16.67 %	Ascending 5 Descending 0
AVR + Acute Traumatic Aortic Transection	0	0.00 %	0	0.00 %	
AVR + CABG + Aortic Aneurysm	33	18.86 %	1	3.03 %	Arch 4 Ascending 29 Thoracic/Abdominal % 0 Descending 0
AVR + CABG + Aortic Dissection	2	1.14 %	0	0.00 %	Ascending 1 Descending 1
AVR + CABG + Acute Traumatic Aortic Transection	0	0.00 %	0	0.00 %	
Total	175	100.00 %	2	1.14 %	

Other surgery

Number of patients	1621
Number of procedures	1645
Male / Female	1044 / 577

Table 3 Other surgery types

Surgery type (mutually exclusive)		Number of procedures	Total Mortality
Aortic Procedure		646	38
Aneurysm	- Asc	492	17
	- Arch	97	3
	- Desc	14	3
	- Thor/Abd	7	2
Dissection	- Asc - Acute	88	18
	- Asc - Chronic	1	0
	- Desc - Acute	3	0
	- Desc - Chronic	0	0
Acute Traumatic Aortic Transection		0	0
Carotid Endarterectomy		10	0
Lung Resection		25	0
Left Ventricular Aneurysm		11	2
Acquired VSD		18	6
Congenital ASD		148	0
Cardiac Trauma		6	2
LVOT Myectomy for HOCM		81	1
LV Rupture Repair		7	1
Pericardiectomy		20	1
Pulmonary Thrombo-endarterectomy		16	1
Left Ventricular Reconstruction		4	0
Pulmonary Embolectomy		10	2
Cardiac Tumour		73	2
Cardiac Transplant		30	0
Congenital Other		97	1
Permanent LV Epicardial Lead		74	2
Atrial Arrhythmia Surgery		278	10

Other surgery - Complications

Return to theatre	193	Pulmonary:	
Valve dysfunction	1	Prolonged Vent	287
Graft occlusion	1	Re-intubation	60
Reop Deep sternal inf	10	Pneumonia	109
Bleeding	87	Neurologic:	
Other cardiac	67	Stroke Permanent	33
Other non-cardiac	48	Stroke Transient	11
Deep Sternal Infection	13	Septicaemia	32
Renal failure	143	Anticoagulant complications	21
Haemofiltration	71	GIT complications	35
Peri-op AMI	13	Multi system failure	37
Peri-op Cardiogenic Shock	89	Inotrope use:	
New Cardiac Arrhythmia	444	> 4 hrs	922
Heartblock	39	low CO	541
Cardiac arrest	36	low SVR	468
Atrial Arrythmia	356		
Ventricular tachycardia	33		

Other - Performance Indicators

Length of Stay (mean)	14.21	30-Day Sternal Infection	0.79 %
Post-procedure Length of Stay (mean)	11.79	Reop for bleeding	5.29 %
ICU hours (mean)	99.54	30 Day Mortality	4.86 %
Ventilation hours (mean)	30.91	Total Mortality	5.17 %

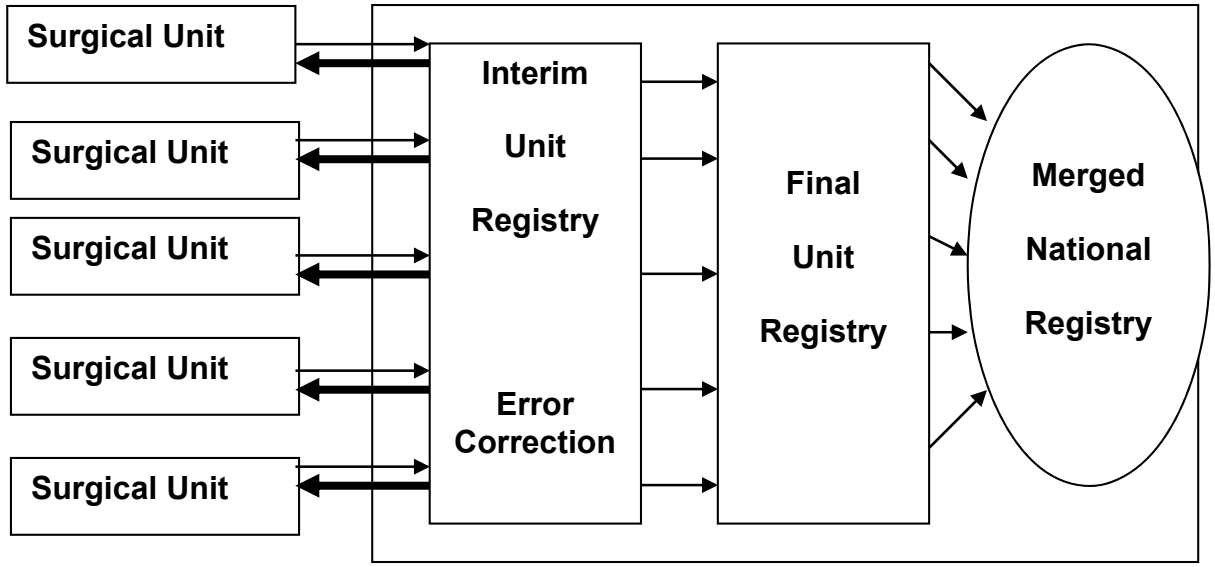
Processes

The following pages outline formal processes relating to the conduct of the project. These include:

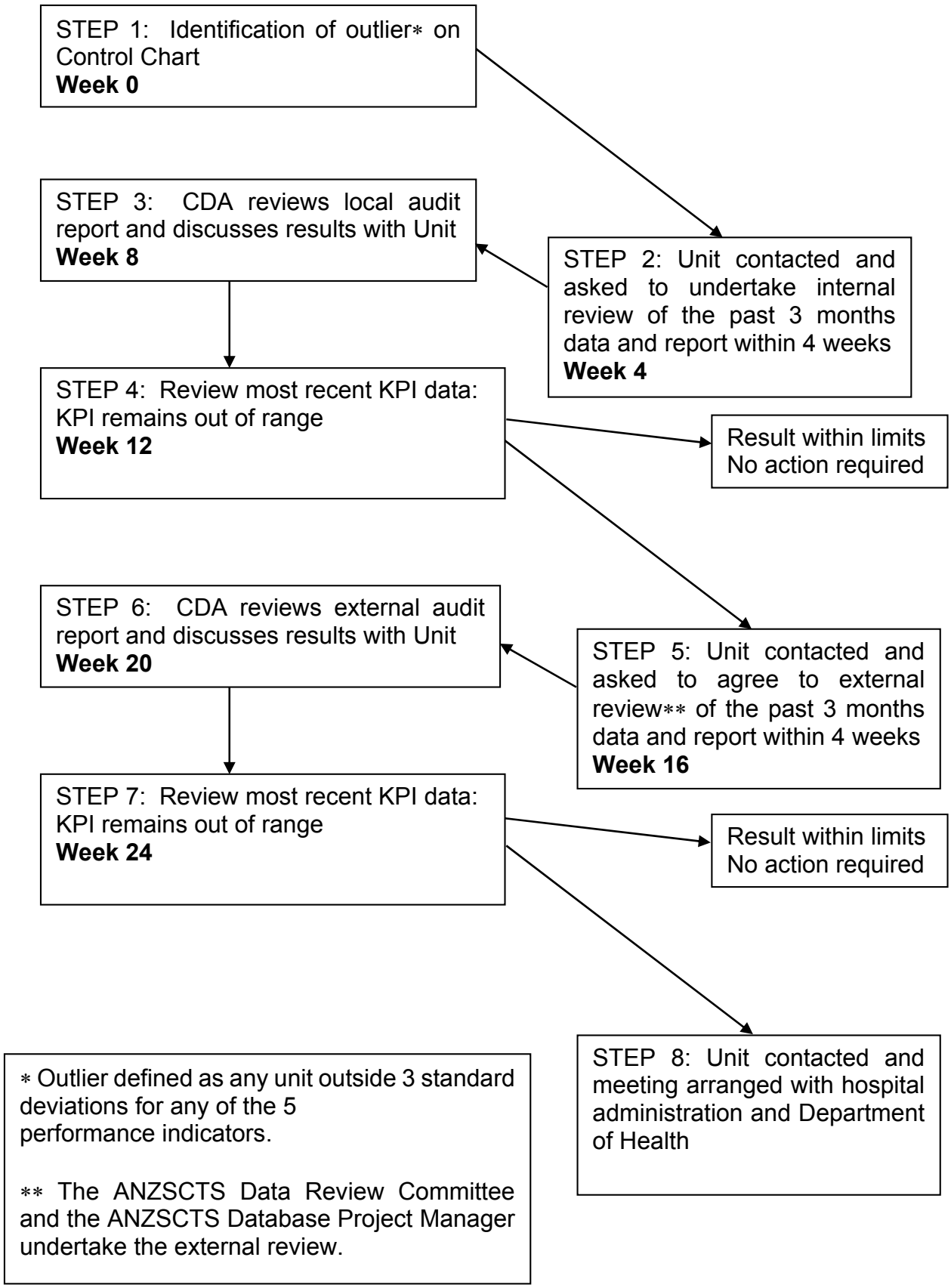
- Data management
- Peer Review mechanism
- Data collection form
- Patient Information Sheet
- Opt-off procedure

Data Management

All data collected as part of the ANZSCTS project is forwarded to the Department of Epidemiology and Preventive Medicine, Monash University. The flow of information into the data centre is outlined in the following figure.



Current Peer Review Mechanism for identification of Unit Outliers



Data Collection Form

General Description

The following pages show the ANZSCTS Data Collection Form. This form contains only the ANZSCTS Minimum Dataset. Individual hospitals may have a slightly different form depending on the type and amount of additional data each hospital wishes to collect.

The ANZSCTS data collection form consists of 3 parts: Pre-operative, Intra-operative and Post-operative.

Pre-operative:

We recommend that this section of the form be completed by the Resident.
This part of the form contains information on the patient's demographics, risk factors, pre-operative cardiac status and previous interventions.

Intra-operative:

We recommend that this section of the form be completed by the Surgeon.
This part of the form contains information on the patient's haemodynamic data, clinical status, and information directly related to the procedure performed.

Post-operative:

We recommend that this section of the form be completed by the Registrar.
This part of the form contains information on post-operative complications and mortality.

We also recommend that the Data Manager check all parts of the form for completeness make any amendments as required and notify the Data Management Centre at Baker Heart Research Institute.

Each part is contained on separate pages from the other parts. They can therefore be separated from each other for the purposes of data collection if required.

Submission of data to the ANZSCTS Data Management Centre

When all 3 parts of the form have been completed and checked this should be indicated on the top of the first page. The data is then entered on the onsite database. When entry is completed, it is then sent to the Department of Epidemiology and Preventive Medicine via secure file transfer protocol (SFTP).

Data Collection Form

7734

UPDATE JUNE 2008

Medical Record No. (first character here ↓)

PRE OPERATIVE PAGE 1

The National Cardiac Surgery Database Program Data Collection

Generic Hospital

Section 1. Patient Demographics

Surname

First name

Middle name

Date of Birth (d d / m m / y y y y)

Address

Postcode

Phone No 1 ____ – ____

Phone No 2 ____ – ____

Gender ○ Male ○ Female

Medicare No. OR ○ Patient does not have a Medicare No. registered

Race — Is patient Aboriginal or Torres Strait Is. ○ YES ○ NO

Which racial groups (select all that apply) ○ Aboriginal ○ Torres Strait Is.

Insurance ○ Private ○ DVA ○ Medicare ○ Self Insured ○ Overseas ○ Other

Elective Day of Surgery Admit (DOSA) patient: ○ YES ○ NO

Admission Date (d d / m m / y y y y)

Surgery Date (d d / m m / y y y y)

Operation Number of the day for this patient: (1-6)

Discharge Date (d d / m m / y y y y)

Section 2. Patient Risk Factors

Smoking History	○ YES ○ NO	*if YES*	Current Smoker	○ YES ○ NO	
Family History of CAD	○ YES ○ NO ○ Undiscovered				
Diabetes	○ YES ○ NO	*if YES*	Control	○ None ○ Diet ○ Oral ○ Insulin	
Hypercholesterolaemia	○ YES ○ NO				
Renal — Last Pre-Op Creatinine:	µmol/l (For conversion from mmol see overleaf)				
Renal — Dialysis	○ YES ○ NO	Transplant	○ YES ○ NO		
Hypertension	○ YES ○ NO				
Cerebrovascular Disease	○ YES ○ NO	*if YES*	Type: When:	○ Coma ○ CVA ○ RIND/TIA ○ Carotid>75% ○ CVA <=2wks ○ CVA >2wks	
Peripheral Vascular Disease	○ YES ○ NO				
Respiratory Disease	○ Yes ○ No	*if YES*	Type:	○ Mild ○ Moderate ○ Severe	
Infective Endocarditis	○ YES ○ NO	*if YES*	Type	○ Active ○ Treated	
Immunosuppressive Rx	○ YES ○ NO				

DEFINITIONS OVERLEAF ⇒

7734

Section 1. Patient Demographics	
Medicare Number	The full Medicare number of the patient (i.e. family number plus person number) if the patient is registered with Medicare.
DOSA Patient	Patient admitted for **scheduled elective procedure on same day as procedure**.
Admission Date	Date patient admitted/transferred to hospital where surgery performed.
Surgery Date	Date on which the first surgical incision was made for the current cardiac surgical procedure.
Discharge Date	Date Patient discharged from being an inpatient at the hospital where the procedure was performed. Discharge to Hospital in the Home, rehabilitation hospital or unit or to a local referring hospital is considered as discharge from hospital.
Operation Number	Number of operation(s) done on the day for this patient.

Section 2. Patient Risk Factors	
Smoking History	A history confirming any form of tobacco use in the past.
Current Smoker	Smoked within one month of surgery.
Family History of CAD	Direct blood relatives having following at **age <55.** a.) angina; b.) myocardial infarct; c.) sudden cardiac death without obvious cause (presume Ischaemic Heart Disease); d.) Previous coronary intervention.
Diabetes	A history of diabetes, regardless of duration of disease or need for anti-diabetic agents.
Hypercholesterolaemia	History of fasting cholesterol > 5.0 mmol/L, HDL <1.0 mmol/L or triglycerides >2.0 mmol/L or on treatment.
Creatinine	Enter creatinine in µmol/L. To convert from mmol/L multiply by 1000 (ie move decimal point 3 spaces to the right).
Hypertension	Blood pressure exceeding 140/90 mmHg or a history of high blood pressure, or the need for anti-hypertensive medications.
Cerebrovascular Disease	Documentation by any of the following; Unresponsive coma >24hrs or CVA or RIND (recovery within 72hrs) or TIA or non-invasive carotid test with 50% diameter stenosis (equivalent to 75% cross-sectional area stenosis).
Peripheral Vascular Disease	Any of the following; claudication or amputation for arterial insufficiency or vascular reconstruction or documented aortic aneurysm or renal artery stenosis or positive non-invasive testing.
Respiratory Disease	Specify if any, and severity of chronic lung disease. **Mild** = on chronic inhaled or oral bronchodilator therapy. **Moderate** = chronic oral steroid therapy aimed at lung disease **Severe** = room air pO2<60 or Room air pCO2>50 or mechanical ventilation for chronic lung disease
Infective Endocarditis	A patient presenting with valvular disease of infectious aetiology with past or present positive blood culture or postop pathology confirmation. Active = currently being treated for endocarditis
Immunosuppressive Rx	Use of any form of immunosuppressive therapy within 30 days or less preceding the operative procedure (eqv. to Prednisolone dosage ≥ 5mg).

Medical Record No. | | | | | | | | | | |

Section 3. Preoperative Cardiac Status

Myocardial infarction ○ YES ○ NO *if YES* **When** ○ <=6 Hrs ○ >6 - <24 Hrs ○ 1 - 7 Days ○ 8 - 21 Days ○ >21 Days

Type ○ NSTEMI ○ STEMI

Angina CCS Class (see definition overleaf) [ ] (0 - 4)

Treatment of Angina (during current admission & continuing to surgery)

i-v GTN ○ YES ○ NO

i-v Heparin ○ YES ○ NO

Full dose Low MW heparinoids (eg s.c. Clexane, s.c.Fragmin) ○ YES ○ NO

History of Congestive Heart Failure (CHF) ○ YES ○ NO *if YES* **CHF at current admission** ○ YES ○ NO

Dyspnoea NYHA Class (see definition overleaf) [ ] (I - IV)

Cardiogenic Shock ○ YES ○ NO

Resuscitation (within 1 hour pre-op) ○ YES ○ NO

Arrhythmia ○ YES ○ NO *if YES* **Type** ○ Atrial ○ HeartBlock ○ Ventricular ○ Other

if ATRIAL **type** ○ Paroxysmal ○ Persistent ○ Permanent

Permanent Pacemaker In Situ ○ YES ○ NO

Medications at time of Surgery

Inotropes ○ YES ○ NO

IV nitrates ○ YES ○ NO

Anticoagulation therapy ○ YES ○ NO

Steroids ○ YES ○ NO

Aspirin or other antiplatelet therapy within 7 days of surgery

Aspirin	○ YES	○ NO	*if YES* **When**	○ =<2days	○ 3 - 7 days
Clopidogrel	○ YES	○ NO		○ =<2days	○ 3 - 7 days
IIb/IIIa (Abciximab)	○ YES	○ NO		○ =<2days	○ 3 - 7 days
Aggrostat (Tyrofiban)	○ YES	○ NO		○ =<2days	○ 3 - 7 days
Other	○ YES	○ NO		○ =<2days	○ 3 - 7 days

DEFINITIONS OVERLEAF ⇒

7734

Section 3. Preoperative Cardiac Status

Myocardial Infarction	History hospitalisation for a MI in the medical record. Specify if MI is either NSTEMI or STEMI:

1. Non ST Elevation MI (NSTEMI)	2. ST elevation MI (STEMI)
A. BIOCHEMICAL indicators of myocardial necrosis. 1. Troponin T or I > the institutional decision limit on at least one occasion during the first 24 hrs after the index event. 2. CKMB >**2x** the upper limit of normal on one occasion during the first 24 hrs. 3. CKMB > upper limit of normal on 2 successive samples. **AND one of the following:** **B**. ECG CHANGES - either ST segment depression OR T-wave abnormalities **OR** C. CLINCAL ISCHAEMIC SYMPTOMS such as: 1. Unexplained nausea or vomiting, &/or 2. Persistent SOB secondary to LVF, &/or 3. Unexplained weakness, dizziness or syncope	**A**. BIOCHEMICAL indicators as for NSTEMI **AND** **B**. ECG CHANGES 1. ST segment elevation: New or presumed new ST elevation at the J-point in two or more contiguous leads with cut-off points => 0.2 mV in leads V1, V2 or V3 OR => 0.1mV in other leads. OR 2. Development of any new Q wave in leads V1 through V3 OR a new Q wave with duration =>0.03 sec and => 1mm deep in any other two contiguous leads.

History of Congestive Heart Failure	A history of CHF diagnosed by one of the following; paroxysmal nocturnal dyspnoea (PND), Dyspnoea on exertion due to HF, or X-ray showing pulmonary congestion, OR medication prescribed to treat CHF.
Cardiogenic Shock	A clinical state of hypoperfusion characterised by hypotension (systolic pressure < 90 mmHg &/or OR CI <0.2 for at least 30 mins or the need for supportive measures to maintain a systolic pressure > or = 90 mmHg or a CI >2.0.
Resuscitation	CPR or initiation of treatment for cardiogenic shock within 1 hr of procedure.
Arrhythmia	The presence of AF/flutter requiring therapy, heart block, VT or VF, or other arrhythmia.
Aspirin or other antiplatelet therapy within 7 days of surgery	Patient has taken aspirin or other antiplatelet agent within the last seven days.

Classification Key

CCS Class	CCS (Canadian Cardiovascular Class)
0	No Angina.
1	Ordinary physical activity, such as walking or climbing the stairs does not cause angina. Angina may occur with strenuous, rapid or prolonged exertion at work or recreation.
2	There is slight limitation of ordinary activity. Angina may occur with moderate activity such as walking or climbing stairs rapidly, walking uphill, walking or stair climbing after meals or in the cold, in the wind, or under emotional stress, or walking more than two blocks on the level, and climbing more than one flight of stairs at normal pace under normal conditions.
3	There is marked limitation of ordinary physical activity. Angina may occur after walking one or two blocks on the level or climbing one flight of stairs under normal conditions at a normal pace.
4	There is inability to carry on any physical activity without discomfort; angina may be present at rest.

NYHA Class	NYHA (New York Heart Association functional class)
I	Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnoea.
II	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitations, or dyspnoea.
III	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary physical activity results in fatigue, palpitations, or dyspnoea.
IV	Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of cardiac insufficiency may be present even at rest. If any physical activity is undertaken, discomfort is increased.

7734

first character here ↓ INTERVENTION & HAEMODYNAMIC

Medical Record No. | | | | | | | | | | |

Section 4. Previous Intervention

Previous Cardiothoracic Intervention (surgical or percutaneous) ○ YES ○ NO *if YES*

No. Prior cardiac operations with cardiopulmonary bypass | |

No. Prior cardiac operations without cardiopulmonary bypass | |

Types of Previous surgery (select all that apply) ○ CABG ○ OFF PUMP CABG ○ Valve ○ OTHER Cardiac
(Any other previous cardiac surgery, including operation on the ascending aorta and /or aortic arch, including pericardiectomy)

Previous Percutaneous Intervention

PTCA/Stent ○ YES ○ NO in which admission? ○ PriorAdmission ○ ThisAdmission

if YES on this Admission, then Interval | | | hrs

Thrombolysis (if same admission) ○ YES ○ NO *if YES* Interval (if same admission) | | | hrs

Non Surgical Balloon Valvuloplasty ○ YES ○ NO

ASD Device Closure ○ YES ○ NO

VSD Device Closure ○ YES ○ NO

Percutaneous SVT/VT Ablation ○ YES ○ NO

Section 5. Haemodynamic Data

Patient Height | | | cm
Patient Weight | | | kg
} *Perfusionist to complete*

Catheter: ○ YES ○ NO *if YES* Date d d / m m / y y y y

LVEF Method ○ No ○ LVgram ○ Radionuclide ○ ECHO ○ MRI

EF: | | %

If Estimate: ○ Normal(>60%) ○ MildImpairment(46-60%) ○ Mod(30-45) ○ Severe(<30%)

Left Main Stenosis >50%: ○ YES ○ NO

No. Diseased Systems: (0,1,2,3) | | (left main=2, or=3 if left dominant)

DEFINITIONS OVERLEAF ⇒

7734

Section 4. Previous Intervention

Previous Cardiothoracic Intervention	Has the patient undergone any previous cardiovascular intervention, either surgical or non-surgical, which may include those done during the current admission. This includes all forms of percutaneous angioplasty and thrombolytic therapy for cardiac indications.
ASD Device Closure	Closure by percutaneous technique of Atrial Septal Defect
VSD Device Closure	Closure by percutaneous technique of Ventricular Septal Defect

Section 5. Haemodynamic Data

LVEF Method	Was the Left Ventricular Ejection Fraction measured, and how was this information obtained? 1 = None of the following were done 2 = Left Ventriculogram 3 = Radionuclide 4 = Echocardiogram 5 = Magnetic Resonance Imaging
Left Main Stenosis > 50%	Any stenosis that involves any parts of the Left Main. Left Main Coronary stenosis is present when there is > 50% compromise of vessel diameter in any angiographic view.
Number of Diseased Coronary System	The number of major coronary systems (LAD system, Circumflex system, and/or Right System) with > 50% narrowing in any angiographic view. The number of diseased systems should be the number of systems requiring surgical approach at that operation. NOTE: Left main disease (>50%) is counted as TWO systems (LAD and Circumflex). For example, left main and RCA would count as THREE in total. Dominant circumflex counts as TWO systems.

7734

first character here ↓

INTRA OPERATIVE PAGE 1

Medical Record No. | | | | | | | | | | |

Section 6. Operation Status/Category

Consultant Surgeon | | | | (code)

Operating Surgeon ○ Consultant ○ Senior Registrar ○ Trainee Registrar ○ Overseas Fellow ○ Oversight

Status: ○ Elective ○ Urgent ○ Emergency ○ Salvage

Direct transfer from cathlab to theatre (see definition overleaf) ○ YES ○ NO

Category:

Coronary Artery Bypass	○ YES	○ NO		
Valve	○ YES	○ NO		
Other Cardiac	○ YES	○ NO	***if YES*** ○ LV Aneur. ○ acq.VSD ○ ASD ○ Trauma ○ Other ○ LVOT Myectomy for HOCM ○ LV Rupture Repair	○ Pericardiectomy ○ Pulm.Thrombo-Endarterectomy ○ LV Reconstruction ○ PulmonaryEmbolectomy ○ Cardiac Tumour ○ Cardiac Transplant ○ Other Congenital ○ Permanent LV epicardial lead ○ Atrial Arrhythmia Surgery *(complete section below)*
Atrial Arrhythmia Surgery ***if YES*** *to Other Cardiac-Atrial Arrhythmia Surgery, Indicate the PREDOMINANT Lesion Set and Technique*	**Lesion Set**		(1 - 8)	**Energy Source** (1 - 8)
Aortic Procedure	○ YES	○ NO		
Aortic aneurysm	○ YES	○ NO	***if YES***	Type: ○ Asc ○ Arch ○ Desc ○ Thor/Abd
Aortic dissection	○ YES	○ NO	***if YES***	Type: ○ Asc ○ Desc (only) When: ○ Acute(<=2weeks) ○ >2weeks
Acute Traumatic Aortic Transection: (within 2 weeks of trauma)	○ YES	○ NO		
Other Non Cardiac Procedure	○ YES	○ NO		
Carotid Endarterectomy	○ YES	○ NO		
Lung Resection	○ YES	○ NO		
Other Vascular	○ YES	○ NO		
Other Thoracic	○ YES	○ NO		
Other	○ YES	○ NO		

7734

Section 6. Operation Status/Category

Status

Elective	The procedure could be deferred without increased risk of compromised cardiac outcome.
Urgent	Not routine - **medical reasons for operating this admission** - a) Within **72 hours from angiography** if on the same admission that angiography was performed (in this case,"same admission"includes the situation when angiogprahy is performed at another hospital and the patient is transferred directly to the hospital where surgery is to be performed) or 2) Within **72 hours after an unplanned admission** (in a patient who had a previous angiogram and was scheduled for surgery but was admitted acutely).
Emergency	**Unscheduled surgery required in next available theatre on same day** due to refractory angina or cardiac compromise.
Salvage	**The patient is undergoing CPR en route** to the operating room prior to surgical incision.

Direct Transfer from Cathlab to Theatre

As a result of a cardiac catheter lab complication, in the opinion of the operator or the responsible physician, the patient needed to be moved directly to surgery from the cath lab or hospital ward. Typically due to indications such as ongoing ischaemia, rest angina despite maximal treatment, pulmonary oedema requiring intubation, or shock.

Other Cardiac

LVOT Myectomy for HOCM	This procedure is performed for either hypertrophic obstructive cardiomyopathy or left ventricular muscular dynamic LVOT obstruction, or in cases of tunnel stenosis in the left ventricular outflow tract. This procedure involves excision of left ventricular endocardial muscle out of the left ventricular outflow tract.
LV Rupture Repair	This is ischaemic rupture of the free wall of the left ventricle. Therefore does not include traumatic rupture.
Pulm. Thrombo-Endarterectomy	Operation performed for chronic pulmonary thrombo-embolic disease. It involves cardiopulmonary bypass, and mostly hypothermic circulatory arrest, and incisions are made in the right and left (or both) pulmonary arteries, and an endartectomy performed out into the distal branches.
LV reconstruction	Reshaping of the left ventricle by lateral excision (Batista) or antero-septal reconstruction (Dor). Does **not** include resection and repair of left ventricular aneurysm, by whatever technique.
Permanent LV epicardial lead	Insertion of a permanent LV Epicardial Lead **in association with a cardiac procedure.**
Atrial Arrhythmia surgery	Current surgical procedure is for paroxysmal, persistent or permanent atrial tachy arrhythmia.

Atrial Arrhythmia surgery

Lesion Set:	**Technique or Energy Source:**
1=Cox-Maze III	1=Cut & Sew
2=Radial	2=Unipolar RF
3=Mini-Maze	3=Bipolar RF
4=Left Atrial Reduction	4=Cryoblation
5=Pulmonary Vein Isolation	5=Microwave
6=Left Arial Only	6=Laser
7=Right Atrial Only	7=Ultrasound
8=Other	8=Other

Section 7. Minimally Invasive

Minimally Invasive Technique Attempted (non-standard incision) ○ YES ○ NO *if YES* Indication ○ Surgeon/Patientchoice ○ ContraindStdApproach ○ CombCathIntervention

Operation performed Off Pump ○ YES ○ NO

Robotically Assisted ○ YES ○ NO

Section 8. Cardiopulmonary Bypass and Support Data

Cardiopulmonary Bypass used ○ YES ○ NO

Cardioplegia ○ YES ○ NO

Cumulative cross-clamp time [ ][ ][ ] min

Cumulative cardiopulmonary bypass time [ ][ ][ ] min

IABP ○ YES ○ NO When ○ Preop ○ Intraop ○ Postop

Indication ○ Haemodynamicinstability ○ CBP Wean ○ PTCA support ○ Prophylactic ○ UnstableAngina

Rota-pump ○ YES ○ NO When ○ Preop ○ Intraop ○ Postop

Indication ○ Haemodynamicinstability ○ CBP Wean ○ PTCA support ○ Prophylactic ○ UnstableAngina

Other mechanical support (VAD/ECMO etc) ○ YES ○ NO When ○ Preop ○ Intraop ○ Postop

Indication ○ Haemodynamicinstability ○ CBP Wean ○ PTCA support ○ Prophylactic ○ UnstableAngina

Intra-Operative TOE ○ YES ○ NO *if YES* Type: ○ ElectiveInsertion ○ Non-ElectiveInsertion

Intra-Operative antifibrinolytic use ○ YES ○ NO *if YES* Type: ○ Trasylol ○ Tranexamic ○ Other

Section 9. Coronary Bypass Data

Intraoperative decision to graft coronary artery ○ YES ○ NO

IMA used ○ YES ○ NO *if YES* LIMA ○ YES ○ NO RIMA ○ YES ○ NO

No. of Distal Arterial grafts [ ]

No. of IMA Distal Anastomoses [ ]

No. of RA Conduits harvested [ ]

No. of Radial Distal Anastomoses [ ]

No. of Vein Distal Anastomoses [ ]

No. of GEPA Distal Anastomoses [ ]

Were Arterial T or Y grafts used ○ YES ○ NO

Total No. Distal Anastomoses [ ]

DEFINITIONS OVERLEAF ⇒

7734

Section 7. Minimally Invasive	
Minimally Invasive Technique Attempted	Was a non-standard incision used to minimise trauma, either as a beating heart off-pump coronary artery procedure or as an on-pump cardiac procedure, utilising any form of cardiopulmonary bypass.
Robotically Assisted	Any procedure performed with the assistance of a robot (e.g. DaVinci, AESOP)

Section 8. Cardiopulmonary Bypass and Support Data	
Cross Clamp Time	Total number of minutes the aorta is completely cross-clamped and the heart was ischaemic during bypass. Enter zero if no cross clamp was used.
Cumulative Cardiopulmonary Bypass Time	Total number of minutes on cardiopulmonary bypass. Enter zero if no cardiopulmonary bypass was used.
Intra-Operative TOE	**Elective Insertion** = Routine Insertion of TOE, planned before commencement of operation. **Non-Elective Insertion** = Unplanned insertion of TOE, for whatever reason.

Section 9. Coronary Bypass Data	
IMA used	Was an Internal Mammary Artery Used for Coronary Bypass?

Section 10. Valve Surgery Data

	Procedure	Prosthesis				
Aortic		Implant	Model No		Serial	Size
		Explant	Model No		Serial	Size
Mitral		Implant	Model No		Serial	Size
		Explant	Model No		Serial	Size
Tricuspid		Implant	Model No		Serial	Size
		Explant	Model No		Serial	Size
Pulmonary		Implant	Model No		Serial	Size
		Explant	Model No		Serial	Size

Procedure codes:

1 No
2 Annuloplasty Only
3 Replacement
4 Repair/Reconstruction with Annuloplasty
5 Repair/reconstruction without Annuloplasty
6 Root Reconstruction with Valve Conduit
7 Root Reconstruction with Valve Sparing
8 Resuspension Aortic Valve
9 Resection Sub-Aortic Stenosis
10 Commissurotomy with annuloplasty ring
11 Commissurotomy without annuloplasty ring
12 Repair Paravalvular leak
13 Valvectomy (no replacement)
14 Valvotomy
15 Ross procedure
16 Inspection only
17 Decalcification of valve only

Valve Pathophysiology

Valve Data	Aortic	Mitral	Tricuspid	Pulmonary
Stenosis	○ YES ○ NO	○ YES ○ NO	○ YES ○ NO	○ YES ○ NO
Insufficiency (0-4) (see definition overleaf)				
Aetiology (see definition overleaf)				

7734

Section 10. Valve Data

Code	Insufficiency
0	None
1	Trivial
2	Mild
3	Moderate
4	Severe

Code	Aetiology
1	Rheumatic
2	Congenital
3	Ischaemic
4	Idiopathic Calcific
5	Myxomatous degen.
6	Failed prior repair
7	Prosthetic valve failure
8	Peri-prosthetic leak
9	Prosthetic valve thrombosis
10	Active Infection
11	Previous Infection
12	Marfans
13	Annuloaortic ectasia
14	Other degen. disease
15	Dissection
16	Tumour
17	Trauma
18	Iatrogenic
19	Functional (mitral valve)
20	Functional (tricuspid valve)
99	Other

Section 11. Postoperative Data

Blood Bank Products:

RBC ○ YES ○ NO

Non RBC ○ YES ○ NO

PERIOPERATIVE TRANSFUSION (not autologous)

Bank RBC (units)

Platelets (units)

Novo 7 (units)

FFP (units)

Cryo (units)

ICU Admission - Date/Time d d / m m / y y y y hrs

Extubation - Date/Time d d / m m / y y y y hrs

ICU Discharge - Date/Time d d / m m / y y y y hrs

Readmitted to ICU ○ YES ○ NO

Reintubation ○ YES ○ NO

Reintubation - Date/Time d d / m m / y y y y hrs

Reextubation - Date/Time d d / m m / y y y y hrs

ICC LOSS (First 4 hours post surgery): mls

Complications

Return to theatre ○ YES ○ NO *if YES*

- Reop Valve Dysfunction ○ YES ○ NO
- Reop Bleeding or Tamponade ○ YES ○ NO
- Reop Graft Occlusion ○ YES ○ NO
- Reop Deep Sternal Infection ○ YES ○ NO
- Reop Other Cardiac ○ YES ○ NO
- Reop Other Non Cardiac ○ YES ○ NO

New Renal Failure ○ YES ○ NO *if YES*

- Haemofiltration ○ YES ○ NO
- **Highest post-op Creatinine level** µmol/l

Peri-Operative AMI ○ YES ○ NO

Peri-op Cardiogenic Shock ○ YES ○ NO

Cardiac (Mark all that apply) *Inotrope use*

- for longer than 4 hours post-operatively ○ YES ○ NO
- for Low Cardiac Output Syndrome ○ YES ○ NO
- for Low SVR Syndrome ○ YES ○ NO

New Cardiac Arrhythmia ○ YES ○ NO *if YES*

- Heart Block (requiring PPM) ○ YES ○ NO
- Other Brady-arrhythmia (requiring PPM) ○ YES ○ NO
- Cardiac Arrest ○ YES ○ NO
- Atrial Arrhythmia (requiring Rx) ○ YES ○ NO
- Ventricular Tachycardia ○ YES ○ NO

New Neurologic →

- Stroke Permanent (>72hrs) ○ YES ○ NO
- Stroke Transient ○ YES ○ NO
- Continuous Coma > 24 hrs ○ YES ○ NO

New Pulmonary →

- Ventilation Prolonged >24 hrs ○ YES ○ NO
- Pulmonary Embolism ○ YES ○ NO
- Pneumonia ○ YES ○ NO
- Reintubation & Ventilation ○ YES ○ NO

New Infection →

- Sternal Deep ○ YES ○ NO
- Thoracotomy ○ YES ○ NO
- Septicaemia ○ YES ○ NO

New Vascular →

- Aortic Dissection ○ YES ○ NO
- Acute Limb Ischaemia ○ None ○ UpperLimb ○ LowerLimb

New Other →

- Anticoagulant Complications ○ YES ○ NO
- GIT Complications ○ YES ○ NO
- Multi-system Failure ○ YES ○ NO

7734

Section 11. Postoperative Data

Blood Products: RBC	Were red blood cell products transfused intra and/or postoperatively? Do **not** include pre-donated blood, pump residual blood, cellsaver blood or chest tube recirculated blood.
Blood Products: Non RBC	Was a transfusion of blood products other than RBC (eg. FFP, Platelets) given intra and/or post-operatively? (Exclude Albumin)
Perioperative Transfusion Units	Indicate the number of units of Bank RBC, Platelets, Novo 7, FFP and Cryo units used.
ICU Admission - Date/Time	Indicate the date and time of admission to ICU from OR.
Extubation - Date/Time	Indicate the date post-operation when the patient was extubated.
ICU Discharge - Date/Time	Indicate the date and time of discharge from ICU to HDU or General Ward or death.
Readmitted to ICU	Was patient readmitted to ICU following transfer to the HDU or General Ward?
Reintubation	Indicate whether the patient was reintubated during hospital stay after the initial extubation.
Reintubation - Date/Time	Indicate the date and time when the patient was reintubated.
Reextubation - Date/Time	Indicate the date and time when the patient was extubated following the reintubation.
ICC loss	Indicate the fluid loss in mls from the Pericardial/mediastinal drains in the first 4hrs postoperation.
New Renal Failure	**At least two** of the following: a.) creatinine increased to > 0.2mmol/l; b.) a doubling or greater increase in creatinine over pre-op value; c.) a new requirement for dialysis/haemofiltration
Haemofiltration	Acute institution of haemofiltration for renal failure. Excludes haemofiltration for removal of fluid with normal serum urea and creatinine
Perioperative Cardiogenic Shock	A clinical state of hypoperfusion characterised by hypotension (systolic pressure < 90 mmHg &/or OR CI <0.2 for at least 30 mins or the need for supportive measures to maintain a systolic pressure > or = 90 mmHg or a CI >2.0.
Return to Theatre	Did patient return to the operating theatre for management of complications. Includes operative procedures done in the ICU that normally would be performed in the operating theatre.
Perioperative MI	Diagnosed by finding **at least two** of the following criteria: a.) **Enzyme level elevation**: either 1)CK-MB>30; or 2) troponin >20.0 micrograms /L , or established level at own institution; b.) **New wall motion abnormalities**; c.) Serial ECG (at least two) showing **New Q waves**.
Cardiac- Inotrope Use for Low Cardiac Output Syndrome	When an inotrope is administered with the intent to improve cardiac output, irrespective of the reasons for that decision.
Cardiac- Inotrope Use for Low SVR Syndrome	When a primarily alpha adrenergic agonist is given with the intent to increase SVR. This is usually in presence of high cardiac output. Does not include Noradrenalin given with Milrinone.
Heart Block	**New** heart block requiring implantation of permanent pacemaker.
Other Brady-Arrhythmia	**New** other Brady-arrhythmia requiring implantation of PPM.
Cardiac Arrest	Either a.) VF; b.) VT with haemodynamic instability; c.) asystole.
New Atrial Arrhythmia	**New** onset atrial fibrillation/flutter requiring treatment.
New Ventricular Tachycardia	**New** onset of ventricular tachycardia (> 6 beat run) requiring treatment.
Stroke Permanent	A central neurological deficit persisting for > 72 hours.
Stroke Transient	A transient neurological deficit (TIA, RIND).
Continuous Coma > 24hrs	**New** postoperative coma that persists for at least 24 hours.
Intubation Prolonged > 24hrs	Pulmonary insufficiency requiring ventilatory support > 24hrs (cumulative).
Pulmonary Embolism	Diagnosed by study such as V/Q scan or angiogram.
Pneumonia	Diagnosed by **positive cultures** and c/w clinical findings.
Infection - Sternal Deep	Involves muscle and bone, with or without mediastinal involvement, as demonstrated by surgical exploration. Must have wound debridement and **one of** following: a.) positive culture; b.) treatment with antibiotics.
Infection - Thoracotomy	Involving thoracotomy or parasternal site (Conditions as above).
Infection - Septicaemia	Septicaemia requires positive blood cultures supported by at least two of the following indeces of clinical infection: a.) Fever; b.) Elevated granulocyte cell counts; c.) Elevated and increasing CRP, d.) Elevated and increasing ESR, post-operatively.
Aortic Dissection	Dissection occuring in any part of the aorta.
Acute Limb Ischaemia	Any complication producing limb ischaemia.
Anticoagulation comps.	Bleeding, hemorrhage, and /or embolic events related to anticoagulant therapy.
GI complications	Postop occurrence of any GI complication including: a.) GI bleeding requiring transfusion; b.) pancreatitis requiring nasogastric suction; c.) cholecystitis requiring cholecystectomy or drainage; d.) mesenteric ischaemia requiring exploration; e.) other GI comps.
Multi-system failure	**Two or more** of the following major organ systems fail concurrently for at least 48 hours: a.) Renal - New renal failure (defined previously); b.) Respiratory - Requires endotracheal intubation for respiratory dysfunction; c.) Cardiac - the use of inotropes and/or IABP to treat low cardiac output.

Section 12. Mortality / Discharge/ Readmission

Discharge: ○ Home ○ Hospital in the Home ○ Rehabilitation Unit/Hospital ○ Local or Referring Hospital ○ Hospital Mortality

Mortality:

Post Discharge within 30 days of surgery: ○ YES ○ NO

Mortality Date: | | / | | / | | | | | (d d / m m / y y y y)

Provide date of death in hospital during the index admission at any time after the procedure, or death after discharge from hospital within thirty days of the procedure

Mortality Location: ○ Operating Room ○ Hospital ○ Home (incl. hospital in the home) ○ Other Care facility

Mortality Primary Cause: (choose one of the following)

- ○ Cardiac — If yes → ○ Ischaemic ○ Other
- ○ Neurologic
- ○ Renal
- ○ Vascular
- ○ Multisystem failure
- ○ Infection — If yes → ○ Septicaemia ○ Endocarditis ○ Other
- ○ Respiratory Failure
- ○ Valvular
- ○ Other
- ○ Unknown
- ○ Pulmonary Embolism
- ○ Aortic Dissection

Cognisant patient elected to withdraw from treatment (see definition) ○ YES

Readmission:

Readmitted <=30 Days from procedure: ○ YES ○ NO
(Does not include planned transfer to Rehabilitation facility)

Readmitted reason: (choose one of the following)

- ○ Anticoagulant Complication
- ○ Arrhythmia
- ○ Congestive Heart Failure (CHF)
- ○ Valve Dysfunction
- ○ Pericardial Effusion
- ○ Cardiac Tamponade
- ○ Deep sternal Infection
- ○ Other Incisional Complication
- ○ Pneumonia or other Respiratory Complication
- ○ Myocardial Infarction (MI)
- ○ Recurrent Angina
- ○ Other readmission unrelated to Cardiac Surgery
- ○ Other Complication related to Cardiac Surgery (e.g. renal, hepatic, GI etc)

Definitions

Discharge	**1 = Home:** Discharged to home, with no planned contact before routine review. **2 = Hospital in the home:** Discharged to home, with planned visits to home by medical or paramedical staff. **3 = Rehabilitation Hospital:** Discharged for inpatient rehabilitation. **4 = Local or referring hospital:** Discharged for continuing acute care. **5 = Hospital Mortality**
Mortality Post-discharge	Specify whether the patient died after discharge from hospital.
Mortality - Cardiac complication	Specify whether the patient died from cardiac ischaemia or from another cardiac complication.
Mortality - Infection complication	Specify whether the patient died from septicaemia, endocarditis or other infection.
Cognisant patient withdraws from treatment	Patient who was aware of the consequences to his/her actions, elected to withdraw treatment in circumstances where they would survive if treatment was continued. NOTE: Completing "yes" to this field implies automatic review of patient's hospital file and permission for ASCTS personnel to review their case.
Congestive heart failure	Readmitted within 30 days from the date of surgery for CHF, diagnosed by one of following; paroxysmal nocturnal dyspnoea (PND), dyspnoea on exertion due to HF, X-ray showing pulmonary congestion, OR medication prescribed to treat CHF - ACE inhibition, diuretics, Carvedilol or digoxin.
Recurrent angina	Objective confirmation that chest pain is due to ischaemia by exercise test (nuclear, echo, treadmill or angiography).
Pneumonia or other respiratory complication	Diagnosed by one of the following; **positive cultures** of sputum or trans-tracheal aspirate and consistent with clinical findings of pneumonia.

Opt-off procedure

ANZSCTS CARDIAC SURGERY DATABASE
Information for Data Managers

In order to "Opt-off" from the ANZSCTS Cardiac Surgery Program, the patient, or their representative must call the 1800 number provided to him/her on the Patient Information Sheet.

An "Opt-off" cannot be done by staff at the hospital where the patient is undergoing the cardiac procedure.

The following procedure will be followed by the Project Manager when a patient rings the 1800 number to request that they not be included in the ANZSCTS Cardiac Surgery Program. This is provided here in case the patient wishes to have more information about the Opt-off procedure prior to calling the 1800 number.

The Data Manager Centre (DMC) will not retain the patient's identifying details, but will retain the Procedural and Outcome information. The DMC will also record the information that a patient who underwent a surgical procedure at that hospital in the calendar month of the Date of Surgery withdrew their data from the database, and the reasons for withdrawal.

Project Manager's Procedure For Processing Opt-Off Requests

1. Obtains Name, date of birth, Hospital where surgery was performed, approximate date that surgery was performed and contact phone number (in order to identify the record to be deleted).

2. Asks if the patient has any questions about the database or would like any further explanation of how and why the data is collected.

3. Asks the Patient "Would you like me to not add your information to the Register?"

4. Asks the patient "You do not have to tell me, but may I ask you why you would not like your information to be included in the database?"

5. After receiving the answer to the above question, the Project manager will not offer any more explanations or try to change the patient's mind – the patient's decision is final.

6. Thanks the patient – notifies them that if they undergo a new surgical procedure they will need to Opt-off again.

7. Check the database for the appropriate record. If a near match is found but not sure then contact the patient to confirm. If a match is not found then retain the information until the record arrives (records will not be received until at least 1 month post-surgery).

Appendix A

All Procedures Model Risk Adjustment

The All Procedures Score[1] is a validated preoperative risk prediction model and used for risk-adjustment for 30-day mortality for Cardiac Surgery (include isolated CABG surgery) in Australia. The model has been developed on a large number of procedures using standardised data collection methodology and the subsequent validation of the model shows that it is a good fit for Australian data and correctly classified a large number of procedures. The Risk Adjusted Mortality takes into account a number of risk factors, selected as independent predictors of mortality, which includes age, procedure type, sex, ejection fraction estimate, NYHA class, urgency of procedures, previous cardiac surgery, hypercholesterolemia, preoperative dialysis, previous vascular disease, inotropic medication, and BMI. The ratio of the actual mortality to the expected mortality indicates the relative performance adjusted for the severity of illness or risk: a ratio of 1 indicates results as expected; less than 1 indicates results better than expected and greater than 1 indicates results worse than expected. This ratio is then multiplied by the Observed Average Mortality Rate to yield a Risk Adjusted Mortality Rate (RAMR) which normalises the individual unit to the case mix.

The Risk Adjusted Mortality Rate (RAMR) is calculated as follows:

$$\text{RAMR} = \left[\frac{\text{Observed Mortality Rate}}{\text{Predicted Mortality Rate}} \right] \text{X Average Observed Mortality Rate}$$

The Risk Adjusted Mortality Rate is therefore, a predictor of mortality for a given patient set which takes into account the risks for those patients.

[1] Billah, B, Reid CM, Shardey GS, & Smith JA. A preoperative model for 30-day mortality following cardiac surgery in an Australian cohort. European Journal of Cardio-thoracic Surgery (2010). 37;1086-1092

Appendix B

Analysis of 95% Confidence Intervals for Risk Adjusted Data used in this report.

An example of 95% Confidence Interval (CI) representation is shown in Figure 8B, describing the risk-adjusted mortality rate for 2014 for each unit for Isolated CABG. The green horizontal line represents the risk adjusted mortality rate national average (%) and the blue horizontal line represents the observed mortality rate national average (%). The black dot represents the Risk Adjusted Mortality Rate (RAMR) for each unit with a vertical red line striking through, representing the 95% CI. There are upper and lower intervals (the vertical red line) for each unit which are above and below each black dot, respectively. To compare each unit's mortality rate (%) to the national average one would interpret the upper and lower intervals as follows: if the upper interval is below the national average than the hospital would be deemed to have performed better than the national average. Alternatively, if the lower interval is above the national average, than the hospital would be deemed to have performed poorer than the national average. If the interval includes the national average, there is no difference between the unit and the national performance.

Appendix C

CUSUM Test

The CUSUM analysis presented in this report indicates the performance of all units' or of individual unit's 30-day Risk-adjusted mortality for Isolated CABG procedures. The CUSUM score represents the acceptable level of performance based on risk adjusted mortality. All cases are monitored for a given period of time and compared to the acceptable level of performance. The CUSUM charts have a rejection line (represented as the red line) and a performance (blue) line. If there are no deaths, the performance line progressively declines from the rejection line. If a death occurs, the performance line inclines toward the rejection line. Subsequent mortality causes a cumulative incline towards the rejection line, however the occurrence of non-deaths cause the performance line to decline towards 0.
Consistent breach of the rejection line represents unsatisfactory performance.

Appendix D

Funnel Plots

Funnel plots are an alternative approach to compare performance standards of hospital units or individual surgeons. They are especially useful in this situation as there is usually a difference in the numbers of procedures (sample size) included in the data plot. For example, the figure below demonstrates the risk adjusted 30-day mortality after coronary artery bypass surgery in New York between 1997 and 1999. The solid line represents the average mortality, the two-dotted lines are the 95% confidence intervals and the two-dashed lines are the 99% confidence intervals. The funnel plot allows the confidence intervals to narrow as the number of procedures increases. The value of this representation lies in illustrating the invalidity of ranking all of those units from "best" to "worst" as only 8 were worse and 2 better than the majority, which statistically, had similar outcomes.

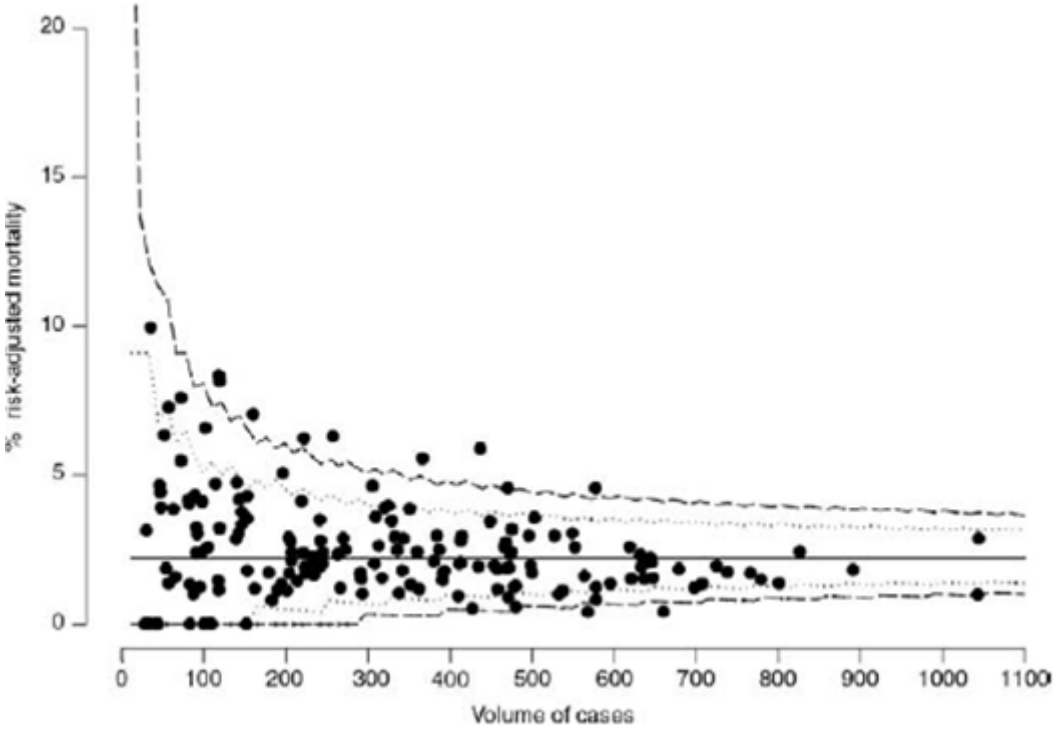


Figure take from: Spiegelhalter DJ. League Tables. IN Armitage P, Colton T, eds. Encyclopedia of Biostatistics. Chicester, UK: John Wiley & Sons: 2005: 2478 – 751.