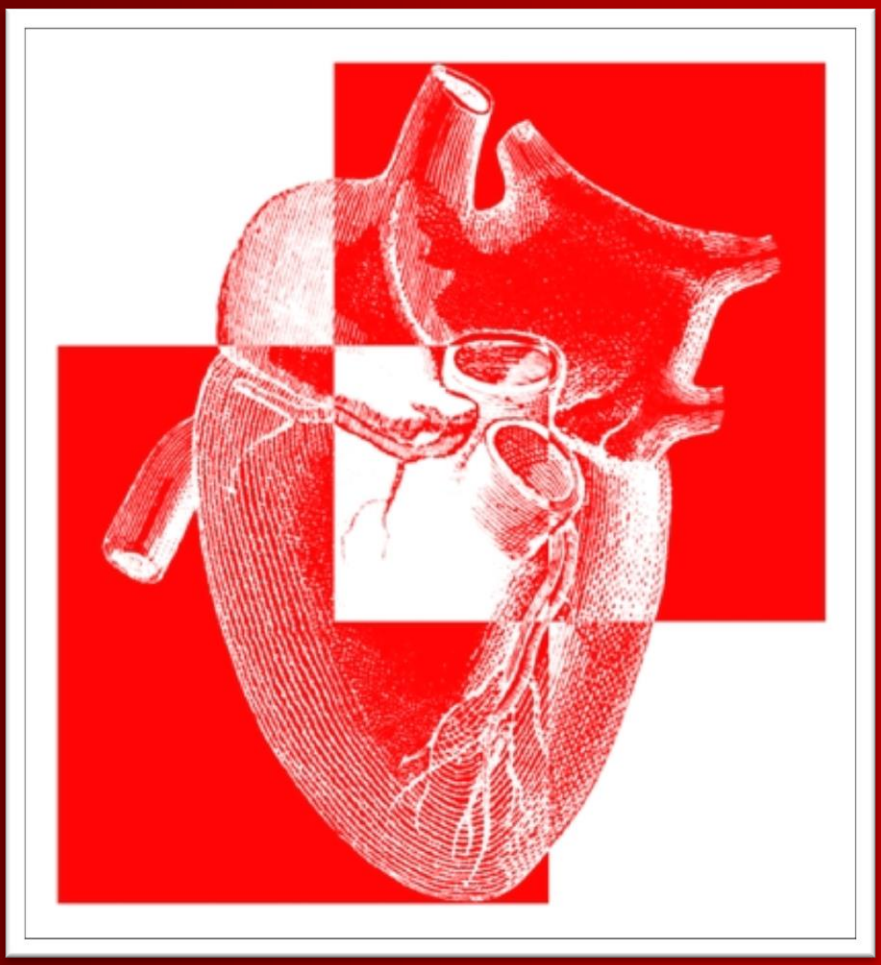
ANZSCTS Cardiac Surgery Database Program



National Annual Report 2013

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

National Cardiac Surgery Database Program

National Annual Report

2013

Authors: Lavinia Tran, Dhenisha Dahya, Nicole Carson, Baki Billah, Gilbert Shardey, Christopher Reid on behalf of the ANZSCTS National Database Program Steering Committee

Foreword

This is the seventh National Report of the ANZSCTS Database Program. That is, the seventh 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.

Statistical analysis of Unit and Surgeon performance for coronary artery surgery is given. Analysis involves CUSUM curves and Funnel Plots. Observed and 'All Procedures Model[1]' risk-adjusted data is presented.

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

[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

TABLE OF CONTENTS

List of Figures

List of Tables

Introduction

ANZSCTS Database Program – 28 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 seventh National report of the Program. It describes the data from surgery performed at 27 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
- 7 NSW Public Hospitals
  - John Hunter Hospital
  - Liverpool Hospital
  - Prince of Wales Hospital
  - Royal Prince Alfred Hospital
  - St George Hospital
  - St Vincent's Hospital
  - Westmead Hospital
- Lake Macquarie Private Hospital
- The Canberra Hospital
- Royal Adelaide Hospital
- Flinders Medical Centre
- Townsville Hospital
- Mater Health Services, Pimlico
- Holy Spirit Northside
- Sir Charles Gairdner
- St John of God Hospital
- Royal Perth Hospital

N.B. Royal North Shore Hospital (NSW public hospital) submitted less than six months' worth of data and has therefore been excluded from this report. It was excluded from the 2012 National Report for a similar reason.

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 2013 calendar year includes all cases performed in participating units from January 1 through December 31, 2013.

Final data related to this report was received by the ANZSCTS Data Management Centre up to April 30th, 2014 so that the data was locked on May 2nd 2014. 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 May 2nd 2014 are not reflected in this report.

Cases with missing data fields for operation status and procedure type are excluded from the analyses. For 2013, 55 cases were excluded for this reason.

Analysed data from previous years (2008-2012) included in this report included all cases from the hospitals outlined below:

Year	Hospitals†	
2008 16 Hospitals	6 VIC Public Hospitals Cabrini Health 6 NSW Public Hospitals	Lake Macquarie Private Hospital Flinders Medical Centre Mater Health Services, Pimlico
2009 21 Hospitals	6 VIC Public Hospitals Cabrini Health *Jessie McPherson Private Hospital* ***8*** NSW Public Hospitals Lake Macquarie Private Hospital	*Canberra Hospital* Flinders Medical Centre *Townsville Hospital* Mater Health Services, Pimlico
2010 23 Hospitals	6 VIC Public Hospitals Cabrini Health Jessie McPherson Private Hospital 8 NSW Public Hospitals Lake Macquarie Private Hospital Canberra Hospital	Flinders Medical Centre Townsville Hospital Mater Health Services, Pimlico *Sir Charles Gairdner Hospital* *Royal Perth Hospital*
2011 25 Hospitals	6 VIC Public Hospitals Cabrini Health Jessie McPherson Private Hospital *Epworth Healthcare* 8 NSW Public Hospitals Lake Macquarie Private Hospital Canberra Hospital	Flinders Medical Centre Townsville Hospital Mater Health Services, Pimlico *Holy Spirit Northside* Sir Charles Gairdner Hospital Royal Perth Hospital
2012 24 Hospitals	6 VIC Public Hospitals Cabrini Health Jessie McPherson Private Hospital Epworth Healthcare 7 NSW Public Hospitals* Lake Macquarie Private Hospital Canberra Hospital	Flinders Medical Centre Townsville Hospital Mater Health Services, Pimlico Holy Spirit Northside Sir Charles Gairdner Hospital Royal Perth Hospital

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

Mortality data

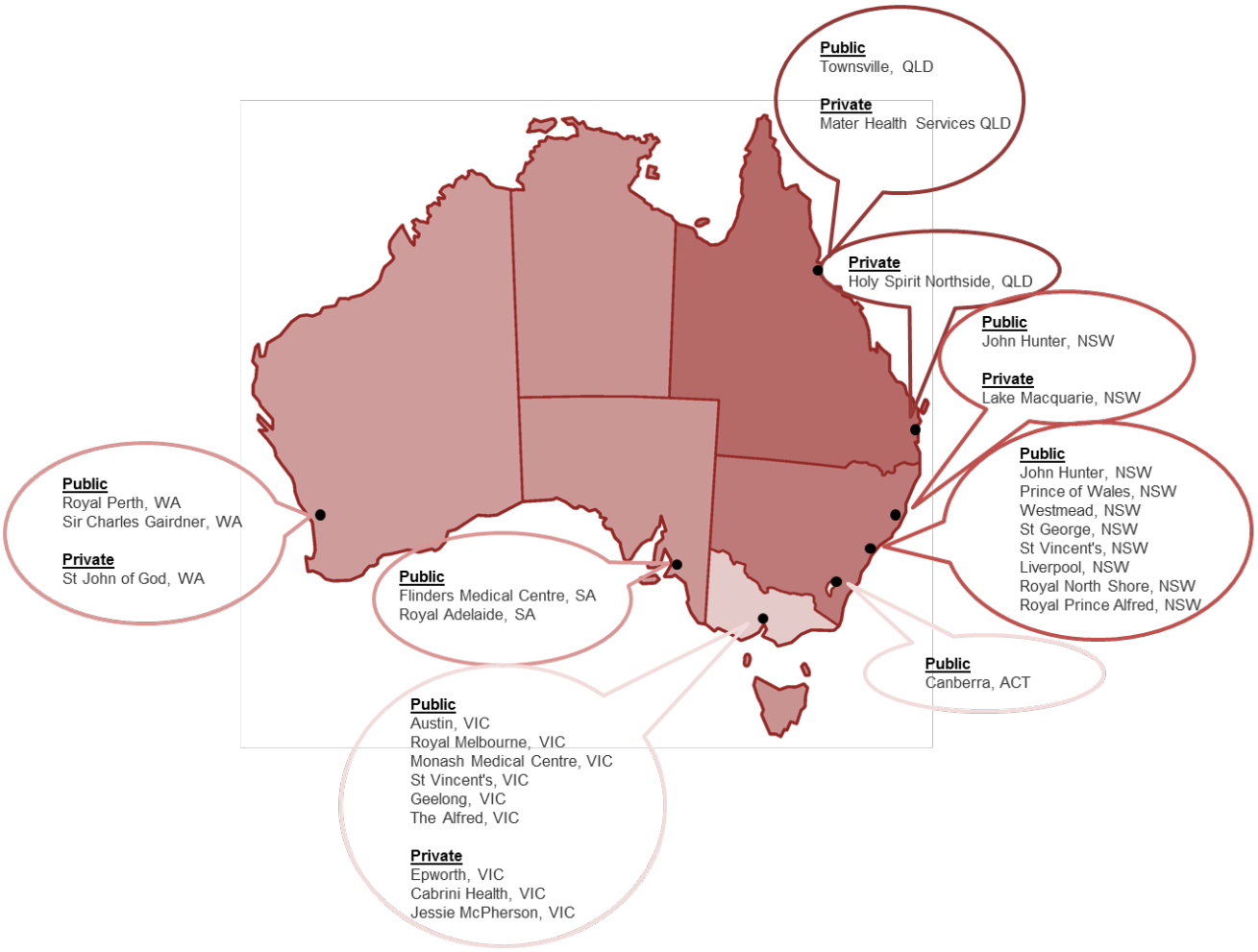
In this report, mortality includes all deaths in hospital prior to discharge at any time plus all deaths occurring after discharge from hospital but within 30 days of the surgical date.

Redo operations

"Redo" operations in this report include any cardiac surgery the patient had undergone prior to their current admission.

National Report 2013

This is the seventh report of the National Program. It describes the data for surgery performed in 2013.
As shown below, at the time of this report, 28 of the 58 Cardiac Surgery Units in Australia had registered with the ANZSCTS Program, including 20 of the 25 Public Units.



Non-Participating Hospitals

VIC	NSW	QLD	SA	WA	TAS	ACT
Private	**Private**	**Public**	**Private**	**Public**	**Public**	**Private**
Melbourne	Royal Northshore Private Hospital	*Prince Charles	Flinders Private	Fremantle	Royal Hobart	National Capital Private
Knox		*Princess Alexandra	Ashford			
Royal Melbourne Private	St Vincent's Private	Gold Coast University	Wakefield	**Private**		
St Vincent's Private	St George		St Andrews	Mount Hollywood		
Warringal Valley Private	Strathfield	**Private**				
	Westmead	Allamanda Private				
	Prince of Wales Private	John Flynn				
	Sydney Adventist	Brisbane Waters				
	Norwest Private	Greenslopes				

*Prince Charles and Princess Alexandra (QLD) are in the process of joining the database

Table 1 - Hospitals contributing to ANZSCTS Cardiac Surgery Program

Hospital	Contributing	Total number of procedures submitted 2001-13*
Austin Hospital, VIC	Yes	4458
Geelong Hospital, VIC	Yes	4971
Monash Medical Centre, VIC	Yes	5175
Royal Melbourne Hospital, VIC	Yes	7905
St Vincent's Hospital, VIC	Yes	5678
The Alfred Hospital, VIC	Yes	6633
Flinders Medical Centre, SA	Yes	3240
Mater Health Services, North Queensland	Yes	1772
Townsville Hospital, QLD	Yes	1920
Lake Macquarie Private Hospital, NSW	Yes	1968
John Hunter Hospital, NSW	Yes	1593
Prince of Wales Hospital, NSW	Yes	2576
St George Hospital, NSW	Yes	1789
St Vincent's Hospital, NSW	Yes	2726
Royal North Shore Hospital, NSW	Yes	1405
Royal Prince Alfred Hospital, NSW	Yes	2953
Liverpool Hospital, NSW	Yes	2252
Westmead Hospital, NSW	Yes	1901
The Canberra Hospital, ACT	Yes	1086
Cabrini Medical Centre, VIC	Yes	4019
Jessie McPherson, VIC	Yes	769
Royal Perth Hospital, WA	Yes	1103
Sir Charles Gairdner Hospital, WA	Yes	1079
Holy Spirit Northside Hospital, QLD	Yes	1338
Epworth Private Hospital, VIC	Yes	1905
Royal Adelaide Hospital, SA	Yes	795
Peninsula Private, VIC	Yes	118
St John of God, WA	Yes	168
Prince Charles Hospital, QLD	No	0
Princess Alexandra Hospital, QLD	No	0
Gold Coast University Hospital, QLD	No	0
Fremantle Hospital, WA	No	0
Royal Hobart Hospital, TAS	No	0
Melbourne Private Hospital, VIC	No	0
Knox Private Hospital, VIC	No	0
Royal Melbourne Private, VIC	No	0
St Vincent's Private Hospital, VIC	No	0
Warringal Private Hospital, VIC	No	0
Valley Private Hospital	No	0
North Shore Private Hospital, NSW	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
National Capital Private Hospital, ACT	No	0
Allamanda Private Hospital, QLD	No	0
John Flynn, QLD	No	0
Brisbane Waters Private 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
Mount Lawley Private Hospital, WA	No	0
Hollywood Private Hospital, WA	No	0
Total contributing hospitals & procedures	**28**	**73295**

*Calendar year, numbers are accurate as of data lock 2nd May 2014.

Comprehensive Surgeon's Report

	Number of patients	Number of procedures
2013	10400	10459

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

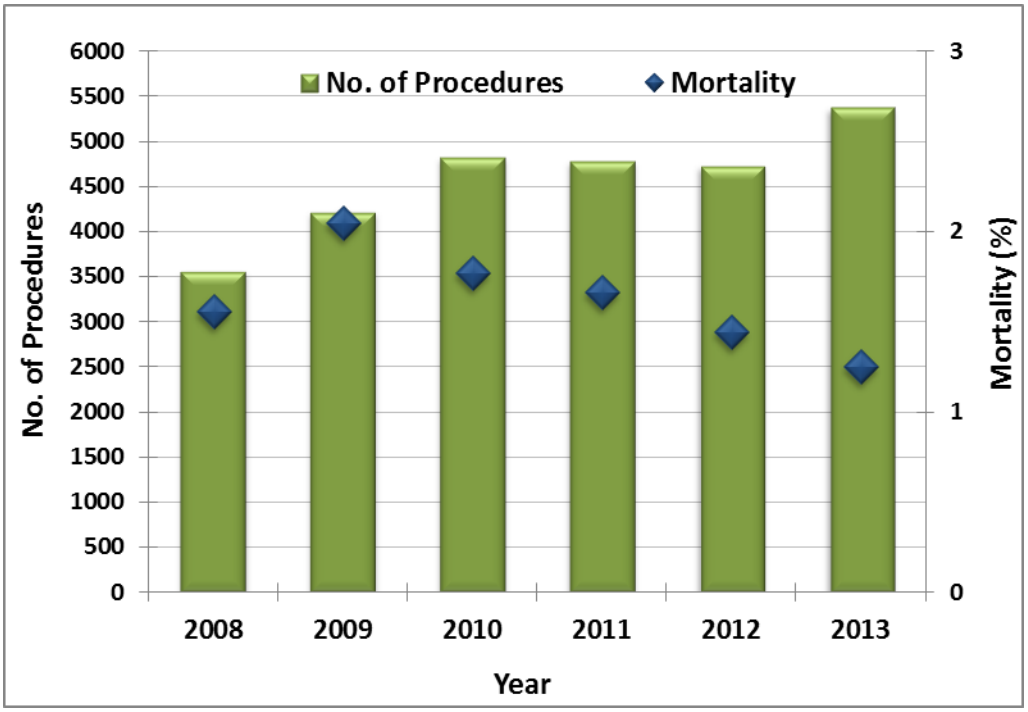


Figure 1: Despite an increase in the average age of the operated population and an associated perceived increase in co-morbid processes, the trend demonstrates a decreasing observed mortality for isolated coronary surgery since 2009.

Table 1a - 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

Isolated CABG Surgery

Table 1b - Number of Procedures for 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	4364	92.3	65	1.5	138	96.5	8	5.8
Isolated CABG Off-Pump	362	7.7	3	0.8	5	3.5	0	-
Total	4726	100	68	1.4	143	100	8	5.6

Table 1c - Number of Procedures for 2009 - 2011

	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	12512	90.8	230	1.8	411	94.7	15	3.6
Isolated CABG Off-Pump	1272	9.2	20	1.6	23	5.3	1	4.3
Total	13784*	100	250	1.8	434**	3.7	16	3.7

*54 missing cases, **2 missing cases

Isolated CABG Surgery

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

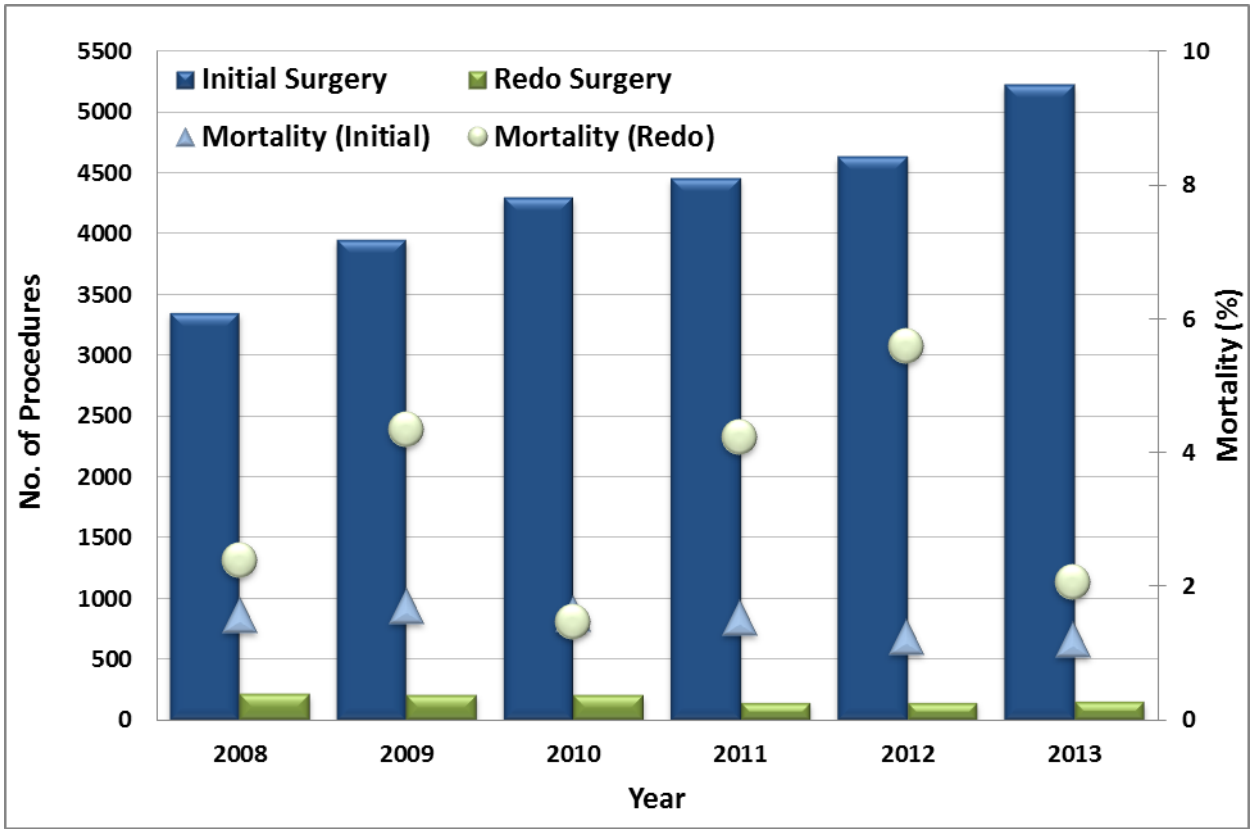


Figure 2: Approximately 3% of isolated CABG operations were redo procedures in 2013. The mortality for redo procedures is variably greater than for the initial procedure.

Isolated CABG Surgery

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

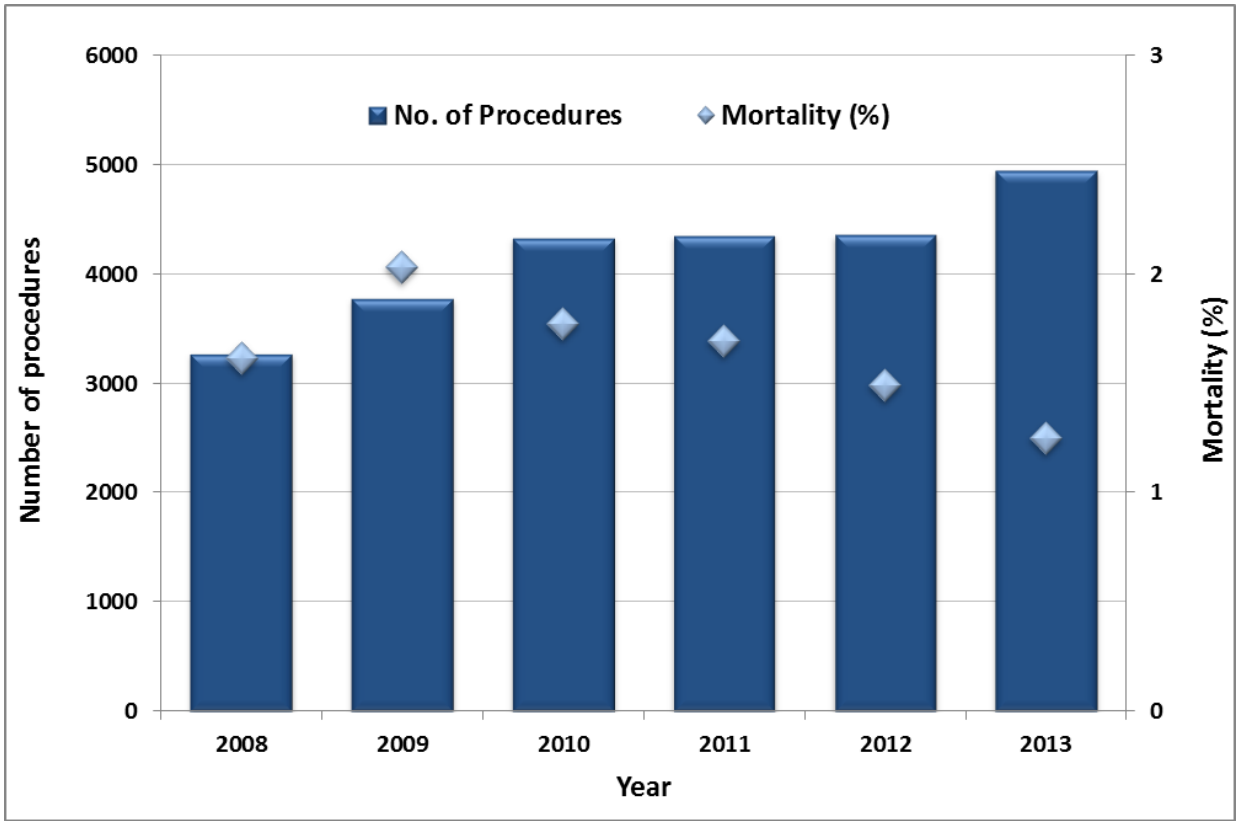
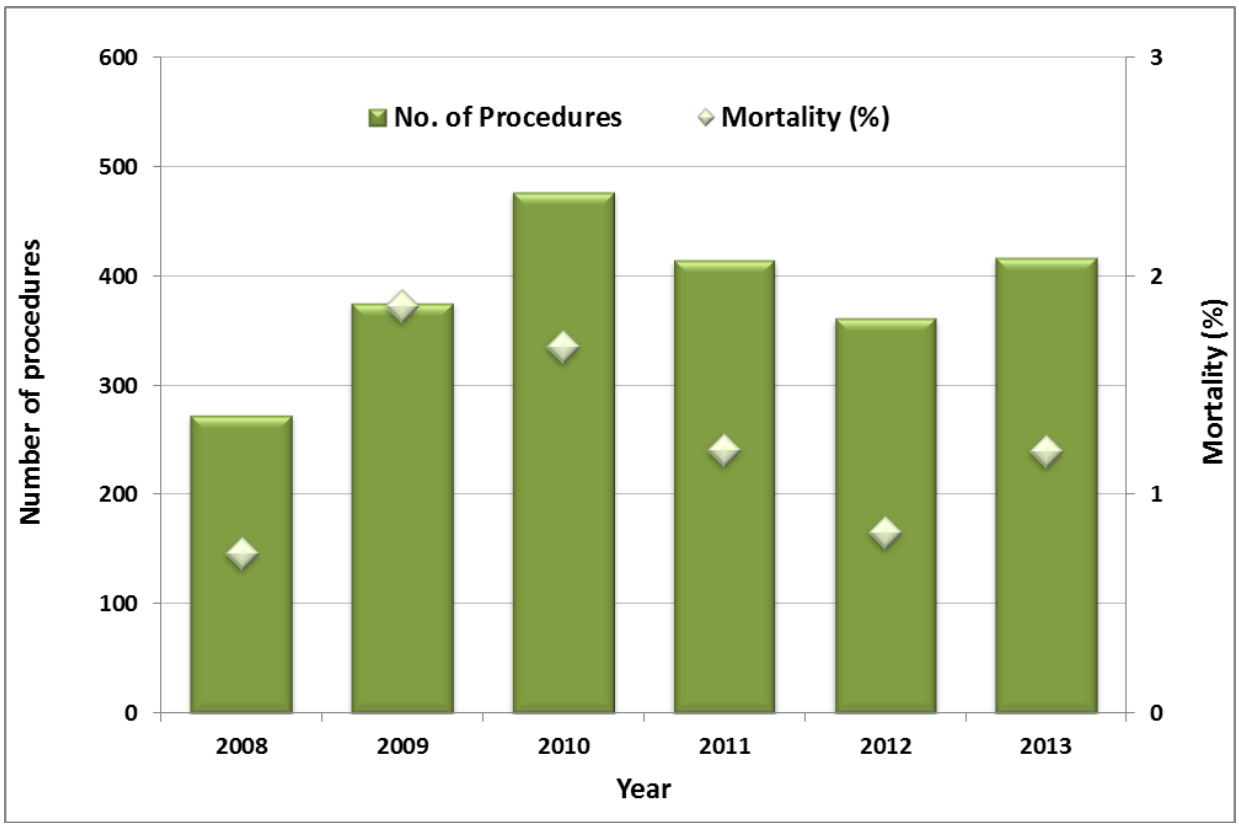


Figure 4: Observed mortality rate for isolated CABG Off-Pump



Isolated CABG Surgery

Table 2a - Number of distal anastomoses for 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 2b - Number of distal anastomoses for 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	4364	127	886	1763	1174	355	49	5	3.2
Isolated CABG Off-Pump	362	108	133	76	31	12	0	0	2.2
Total	4726	235	1019	1839	1205	367	49	5	3.1

Table 2c - Number of distal anastomoses for 2009 – 2011

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	12206	370	2271	4922	3350	1051	177	31	3.2
Isolated CABG Off-Pump	987	280	323	229	118	31	2	0	2.3
Total	13183*	650	2594	5151	3468	1082	179	31	3.2

*60 missing cases

Table 2: Over the last 6 years of ANZSCTS data collection, the average number of grafts has been approximately 3.2-3.3 for on-pump procedures and 2.2–2.4 for off-pump. In 2013, approximately 20% of on-pump and 55% of off-pump procedures had one or two grafts.

Isolated CABG Surgery

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

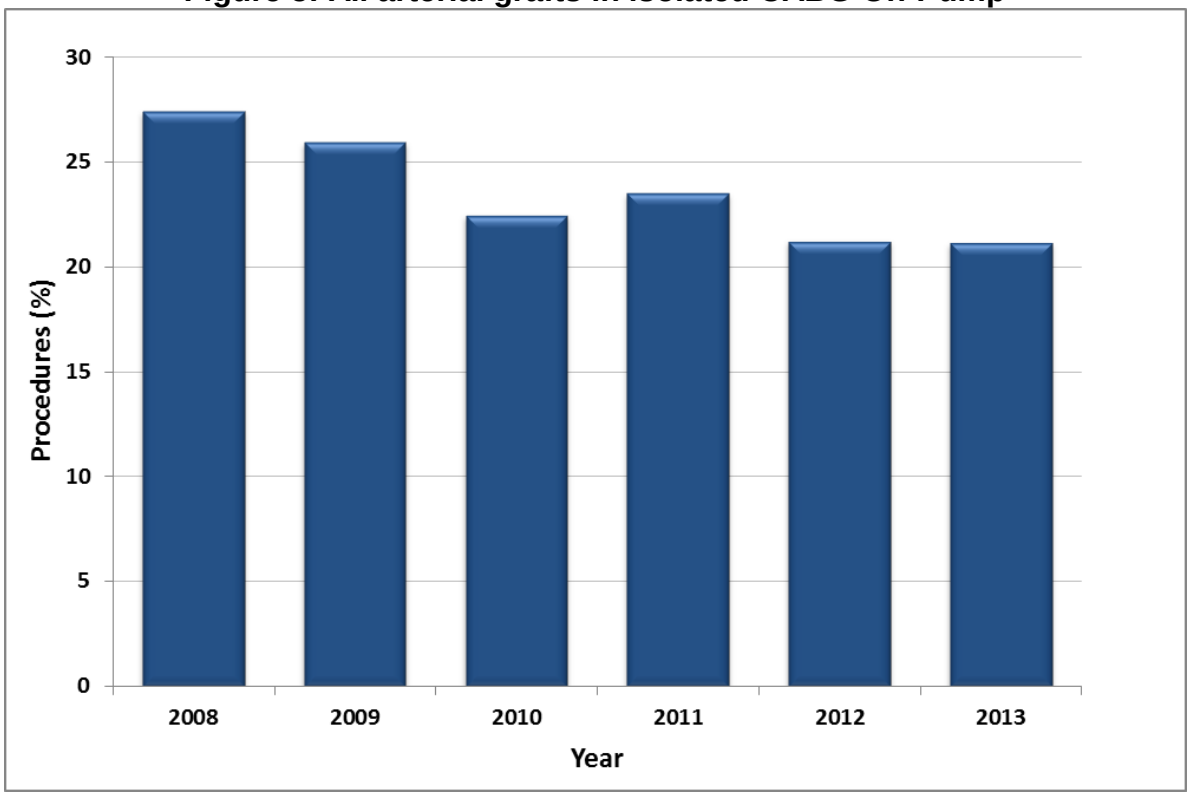


Figure 5: The general decrease in the proportion of patients having all arterial grafts reflects the practice of a large group of Units that joined after 2007.

Table 3a - 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

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 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	4364	927	21.2	280	6.4
Isolated CABG Off-Pump	362	248	68.5	82	22.7
Total	4726	1175	24.9	362	7.7

Table 3c - Arterial grafts for 2009 - 2011

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	12206	2938	24.1	797	6.5
Isolated CABG Off-Pump	987	645	65.3	262	26.5
Total	13193*	3583	27.1	1059	8.0

*60 missing cases

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

Isolated CABG Surgery

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

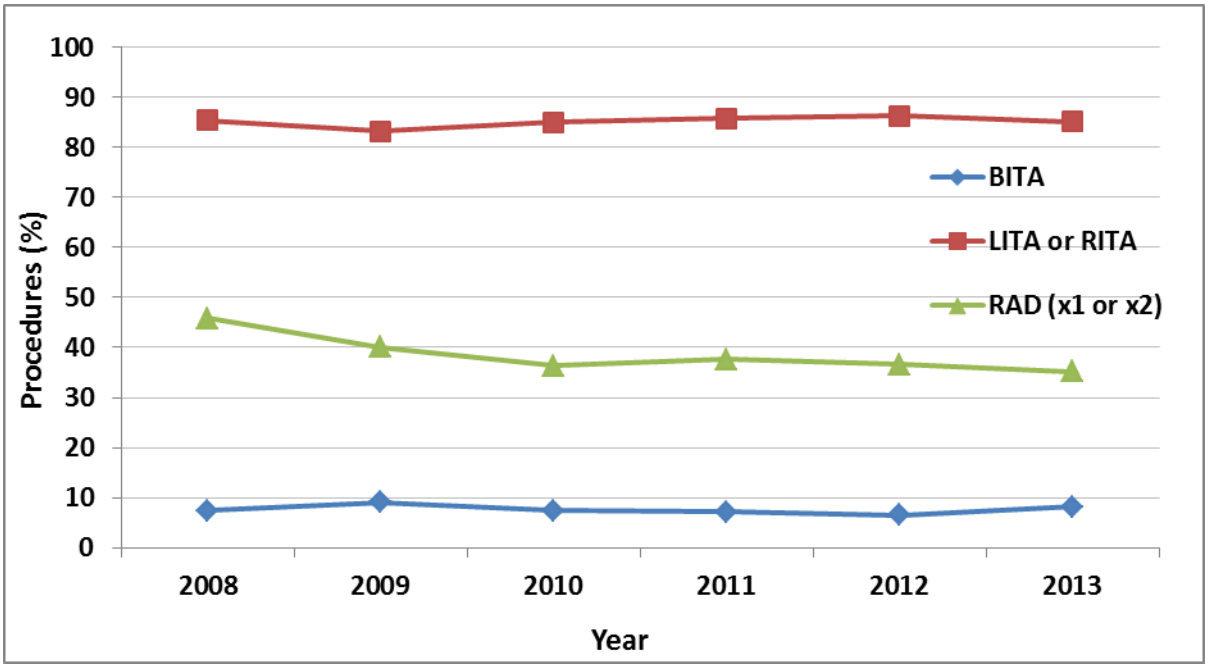
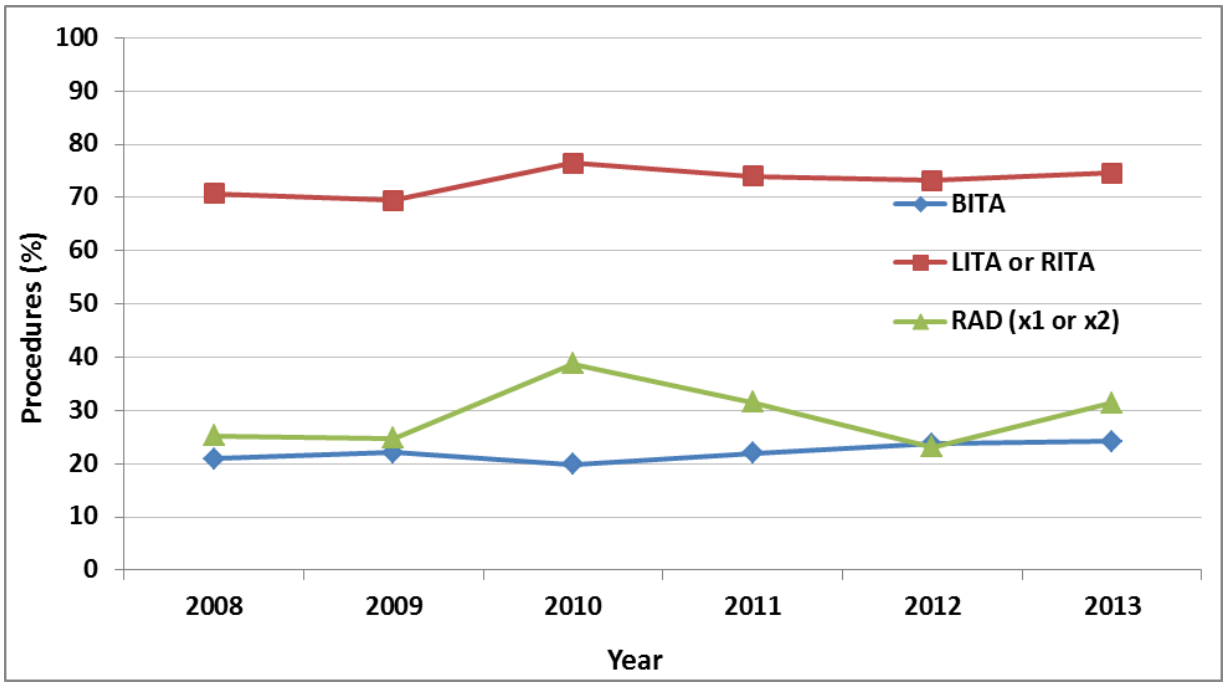


Figure 7: Arterial conduits used in isolated CABG Off-Pump



In 2013, on- and off-pump procedures had a similar use of ITA in total, being 93.2% and 98.8% respectively. However, there was a marked difference in BITA use, being 8.1% and 24.2% respectively. GEPA procedures, used in 0.6% of patients, are not indicated on these graphs.

Isolated CABG Surgery

Table 4a - 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 4b - Conduits used for 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	4364	3743	20	283	1316	284	18	3433
Isolated CABG Off-Pump	362	259	6	86	80	4	0	113
Total	4726	4002	26	369	1396	288	18	3546

Table 4c - Conduits used for 2009 - 2011

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	12206	10275	77	954	3537	1127	29	9249
Isolated CABG Off-Pump	987	747	20	168	251	33	1	336
Total	13183*	11022	97	1122	3788	1160	30	9585

*60 missing cases

Isolated CABG Surgery

Patient Characteristics by Unit 2013

Figure 8a: Total number of isolated CABG by Unit

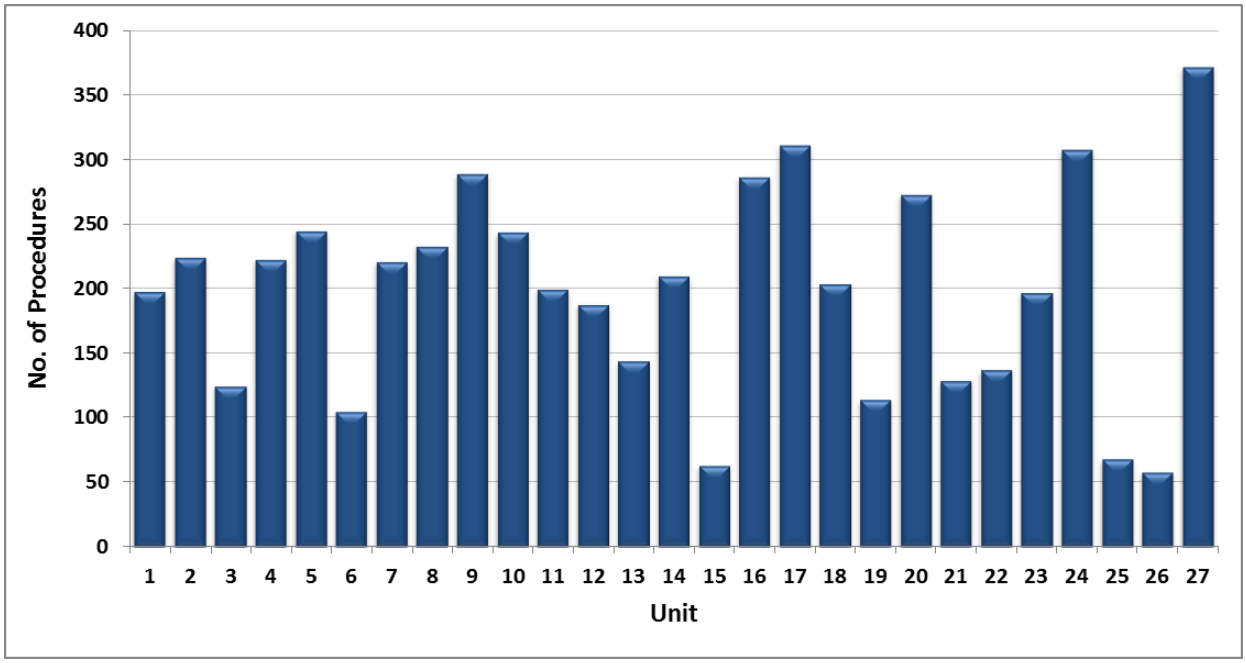
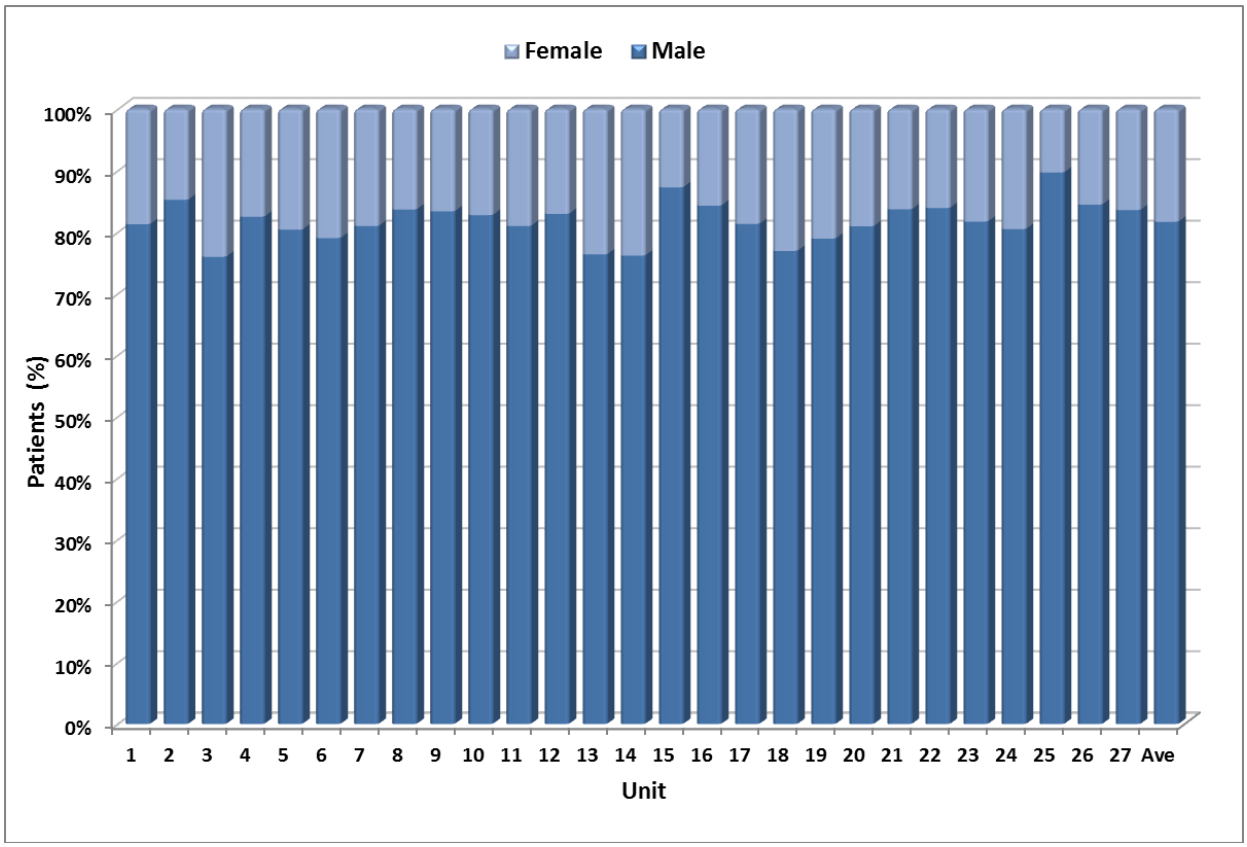


Figure 8b: Patients by gender and Unit



Isolated CABG Surgery

Figure 8c: Percentage of patients >70yrs old by Unit 2013

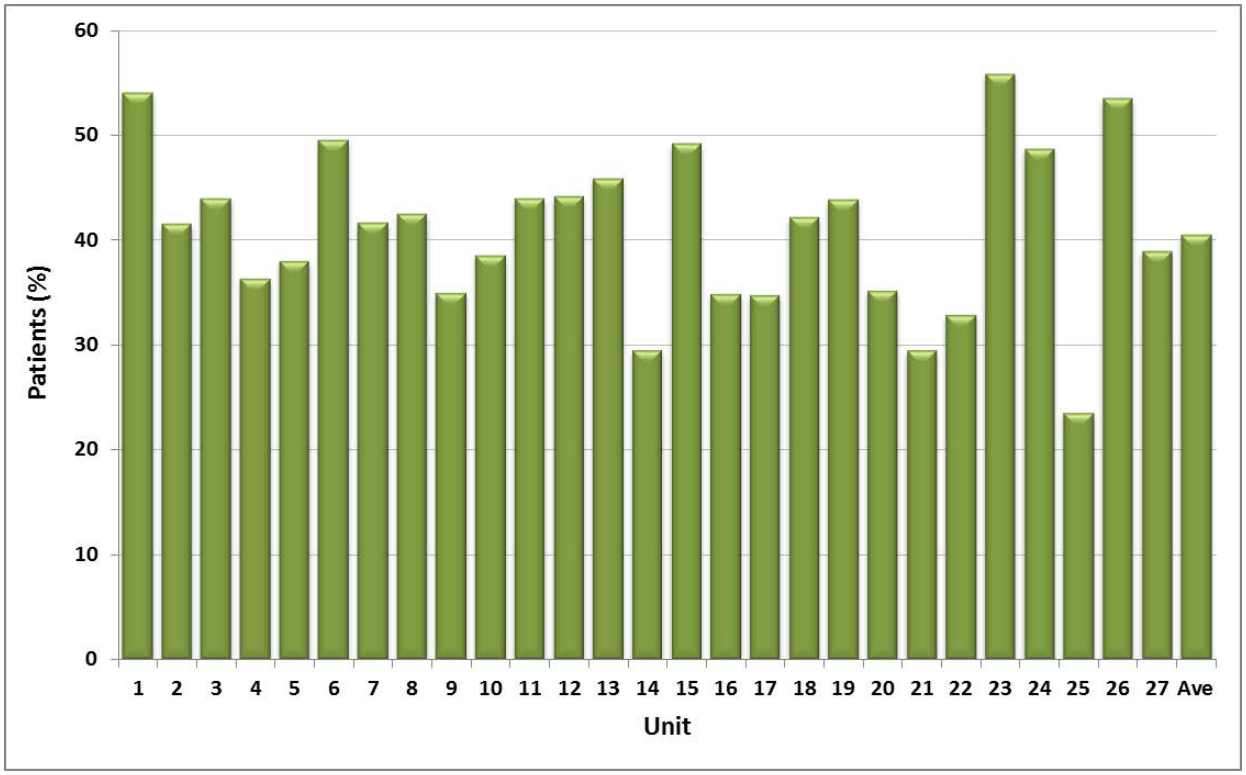
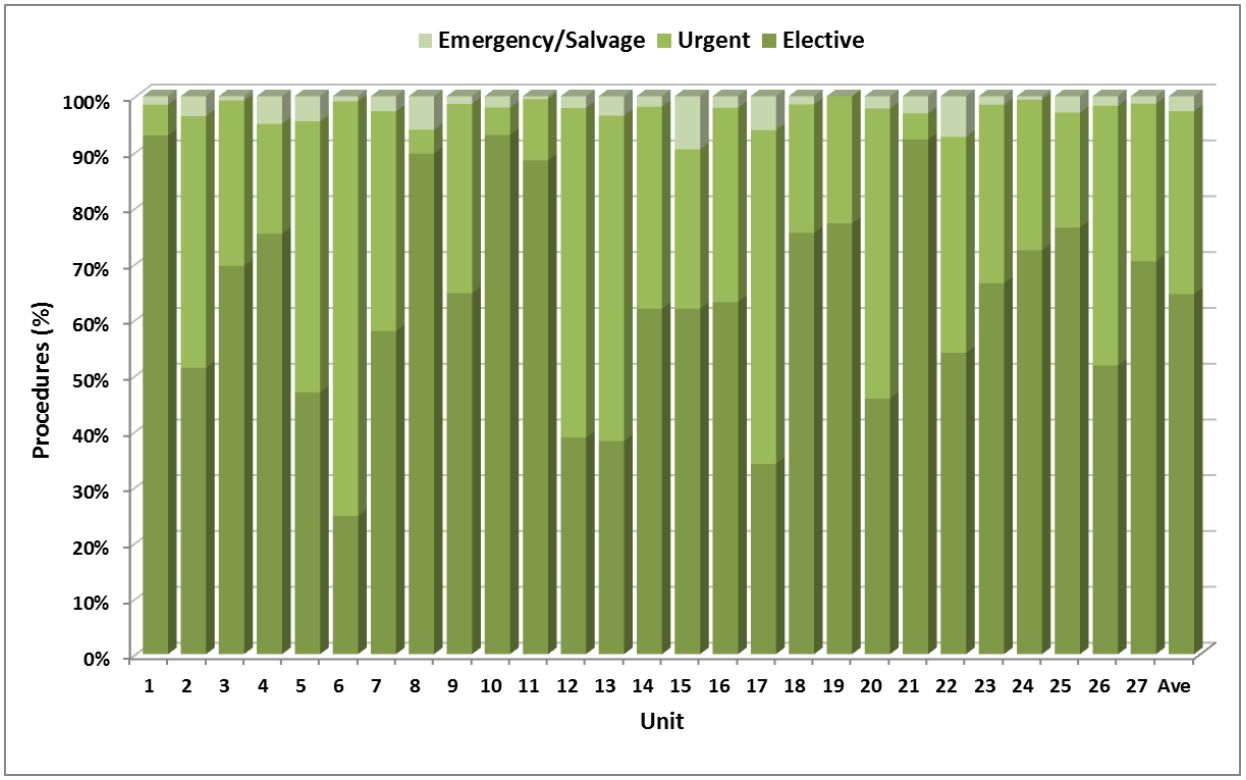
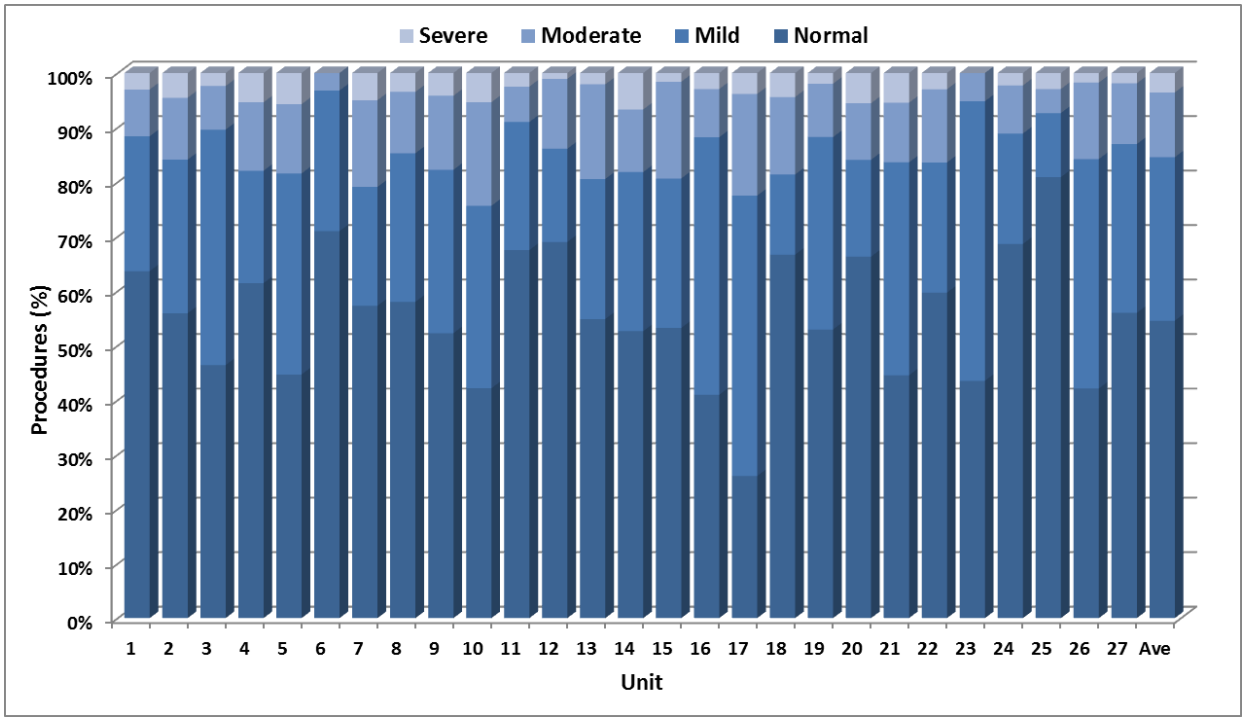


Figure 8d: Patients by clinical status and Unit 2013



Isolated CABG Surgery

Figure 8e: LV function by Unit 2013



Isolated CABG Surgery

Risk Adjusted Mortality

Figure 9a: Mortality after isolated CABG by Unit 2013

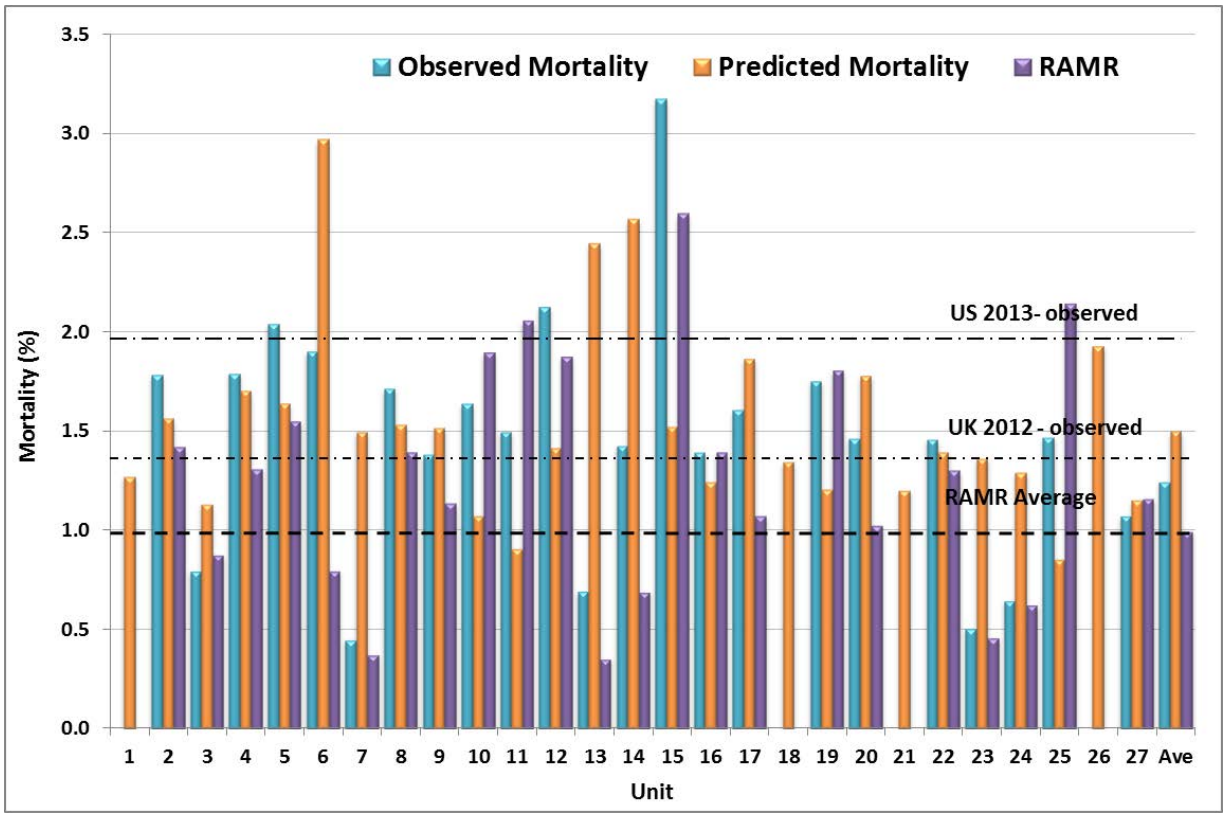


Figure 9a includes both "observed or actual" and "predicted" and "risk-adjusted" mortality. Since the degree of risk associated with the operation varies widely for different patients who undergo cardiac surgery and patient characteristics will differ between hospitals, risk-adjustment is necessary to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

In 2013, 12/27 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, their performances are not significantly different from the group mean.

Isolated CABG Surgery

Figure 9b: Confidence intervals for RAMR following isolated CABG during 2013

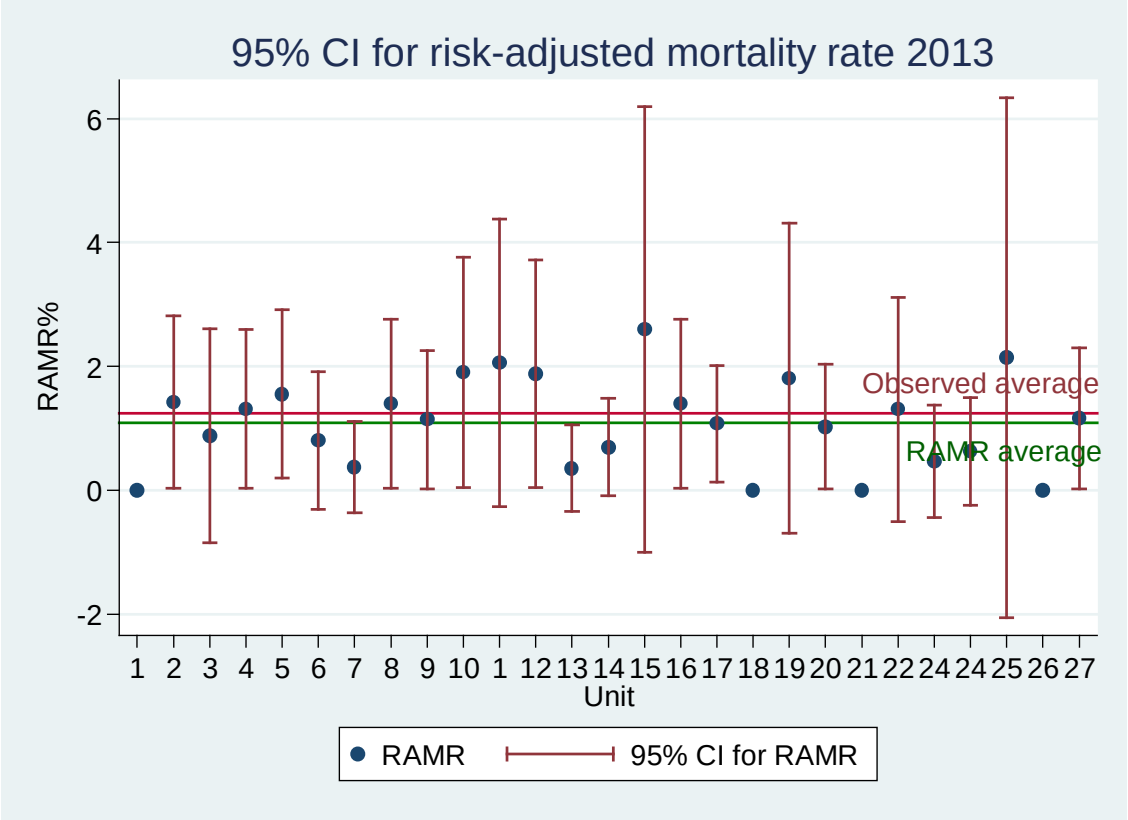
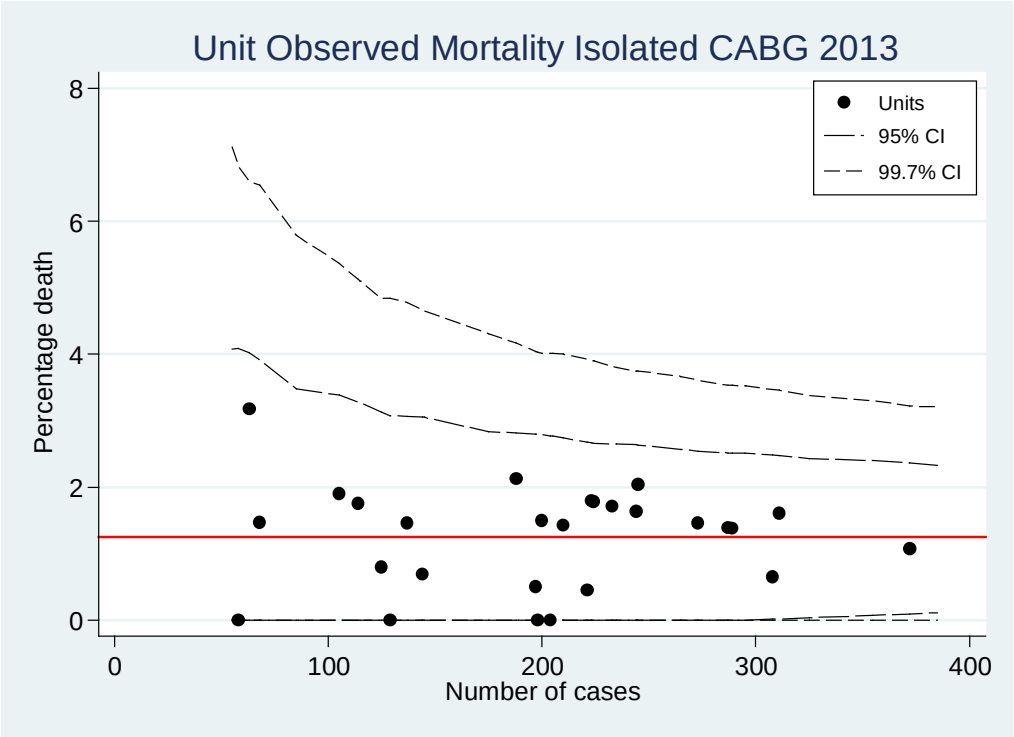
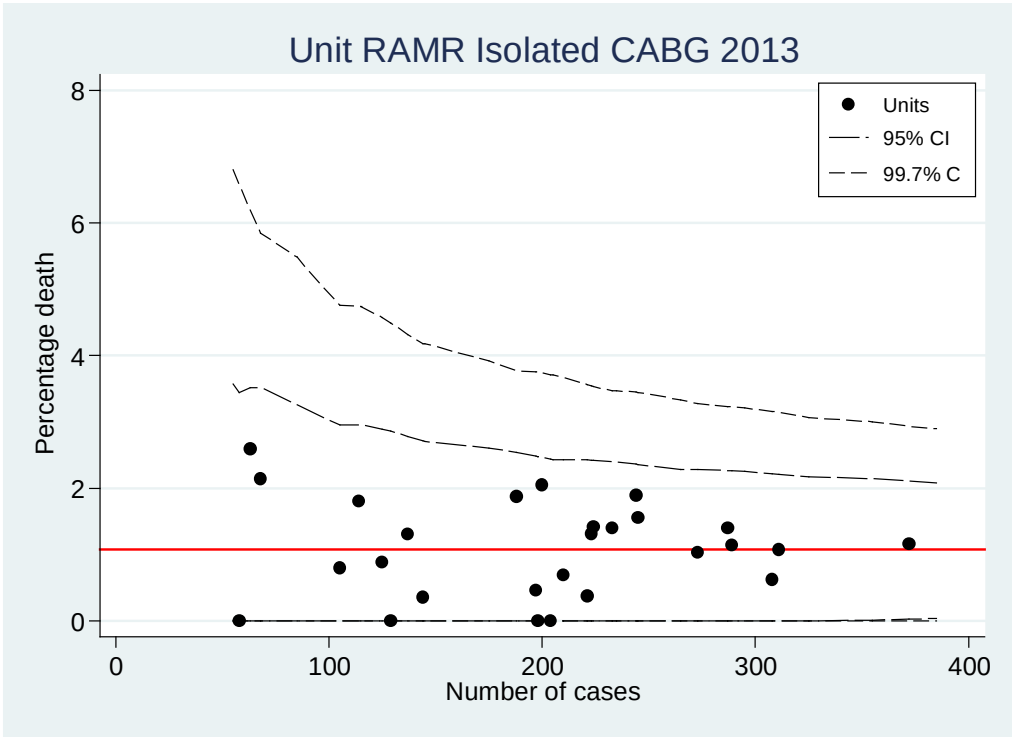


Figure 9B: The 95% CI for risk-adjusted mortality rate for each unit suggests that at that level, no units have significantly higher mortality than the group average. However, six units (Units 1, 13, 18, 21 and 26) had significantly lower mortality. (See Appendix B)

Isolated CABG Surgery

Funnel Plots 2013 by Unit





In 2013, all units were well within the 95% confidence intervals.

Isolated CABG Surgery

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

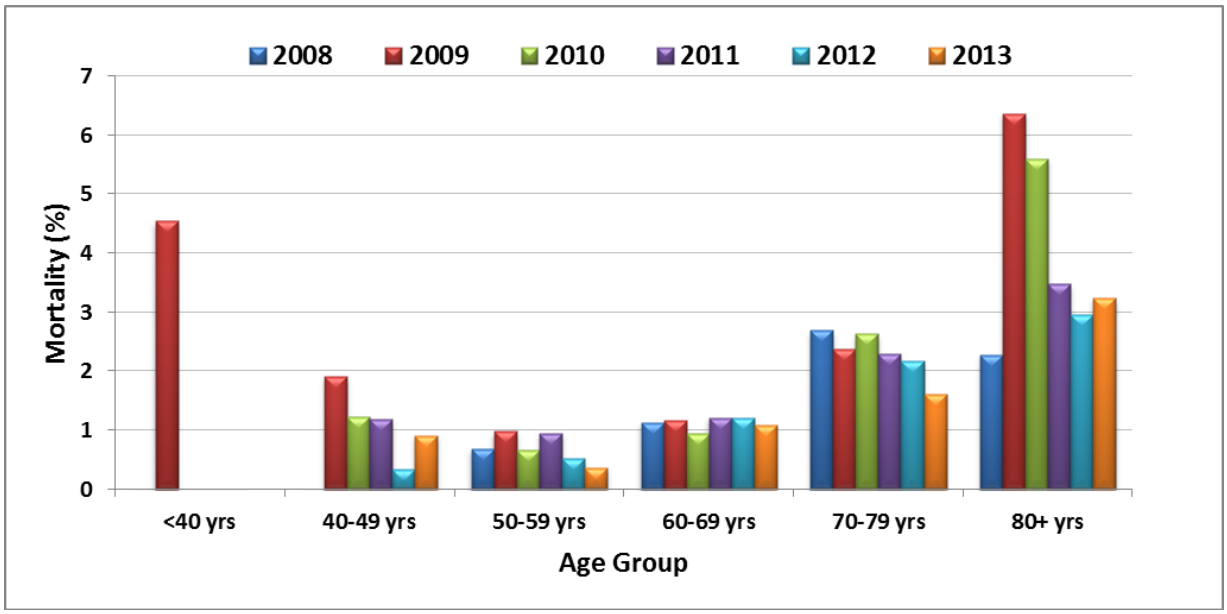


Table 5 - Mortality rate by age 2008 - 2013

	Mortality (mortality/n, %)					
	<40yrs	**40-49yrs**	**50-59yrs**	**60-69yrs**	**70-79yrs**	**80+yrs**
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
2008	0/35, -	0/238, -	5/718, 0.7	13/1149, 1.1	31/1149, 2.7	6/263, 2.3
Total	2/283, 0.7	18/1840, 1.0	38/5540, 0.7	105/9352, 1.1	186/8184, 2.3	91/2255, 4.0

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 around 3% over the past three years.

Isolated CABG Surgery

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

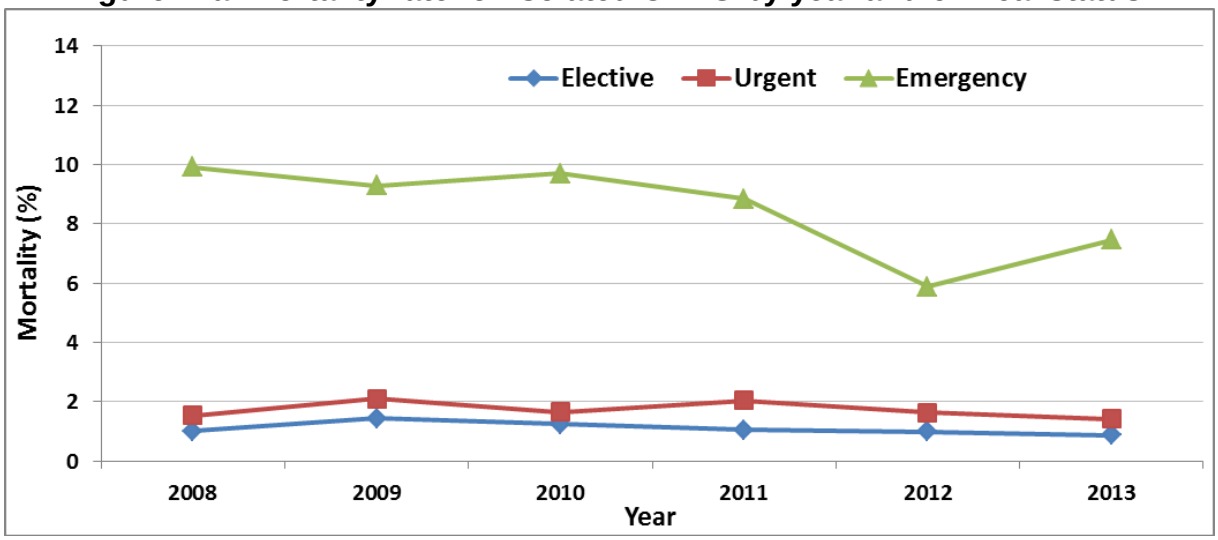
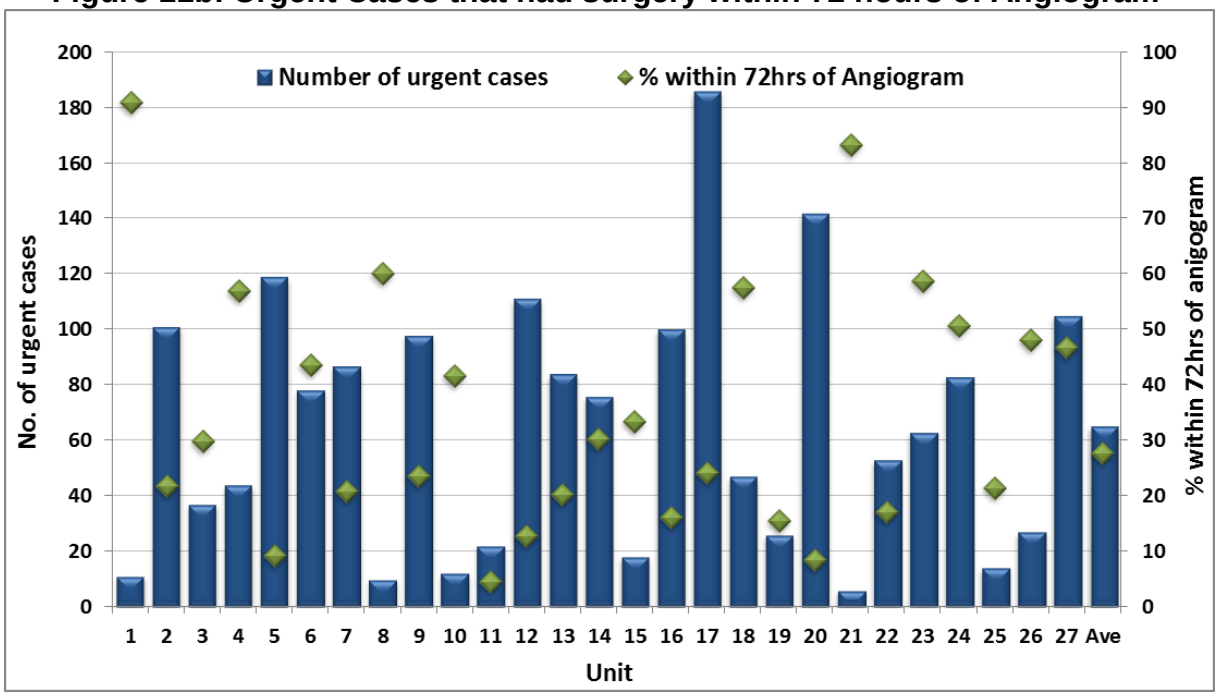


Figure 11a: Clinical urgency also significantly influences mortality so that it was approximately 1% for elective, 1.4% for urgent and 7.5% for emergency surgery in 2013.

Figure 11b: Urgent Cases that had surgery within 72 hours of Angiogram



The ANZSCTS Database definition of 'Urgent' includes the requirement that the procedure is performed within 72 hours of angiography. It appears that a majority of patients are incorrectly classified as 'Urgent' by most Units. This discrepancy should be considered when interpreting outcomes in which clinical status is a factor.

Isolated CABG Surgery

Table 6 - Mortality rate by clinical status 2008 - 2013

	Mortality (mortality/n, %)			
	Elective	**Urgent**	**Emergency**	**Salvage**
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
2008	20/1987, 1.0	22/1430, 1.5	13/131, 9.9	0/4, 0.0
Total	186/17117, 1.1	161/9319, 1.7	83/971, 8.5	10/48, 20.8

Figure 12a: Mortality rate for isolated CABG by pre-operative MI 2008 - 2013

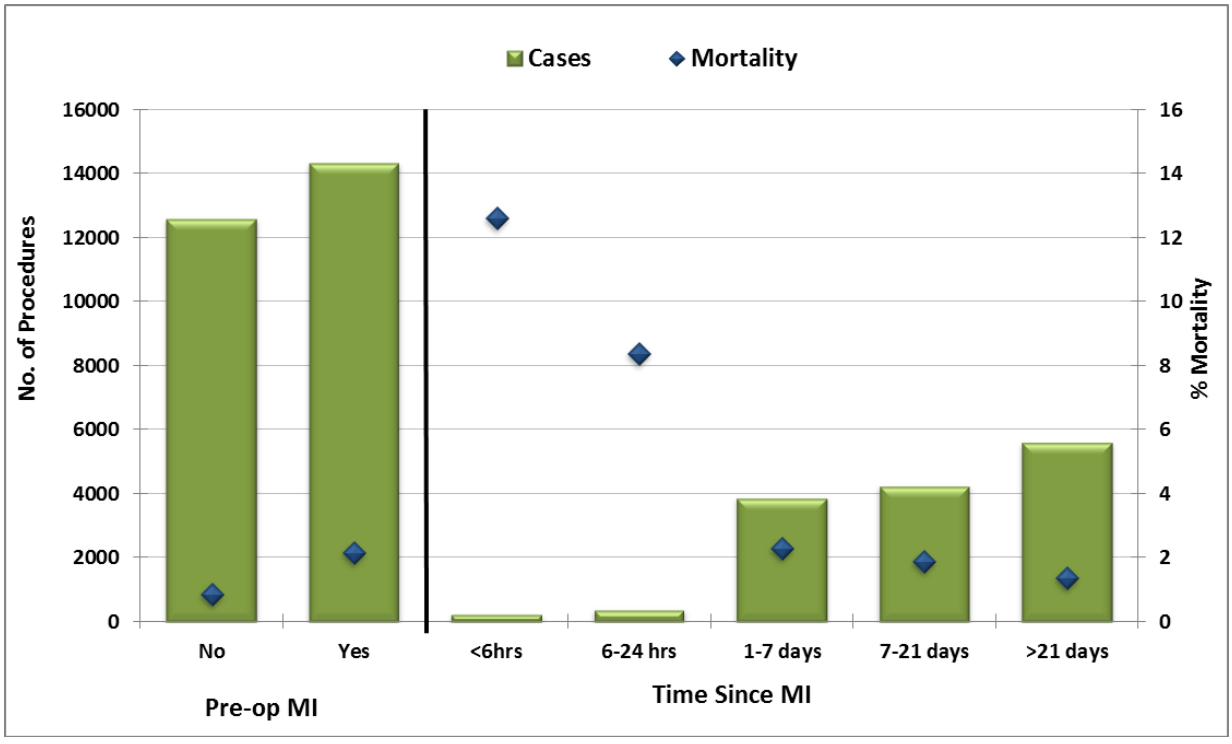
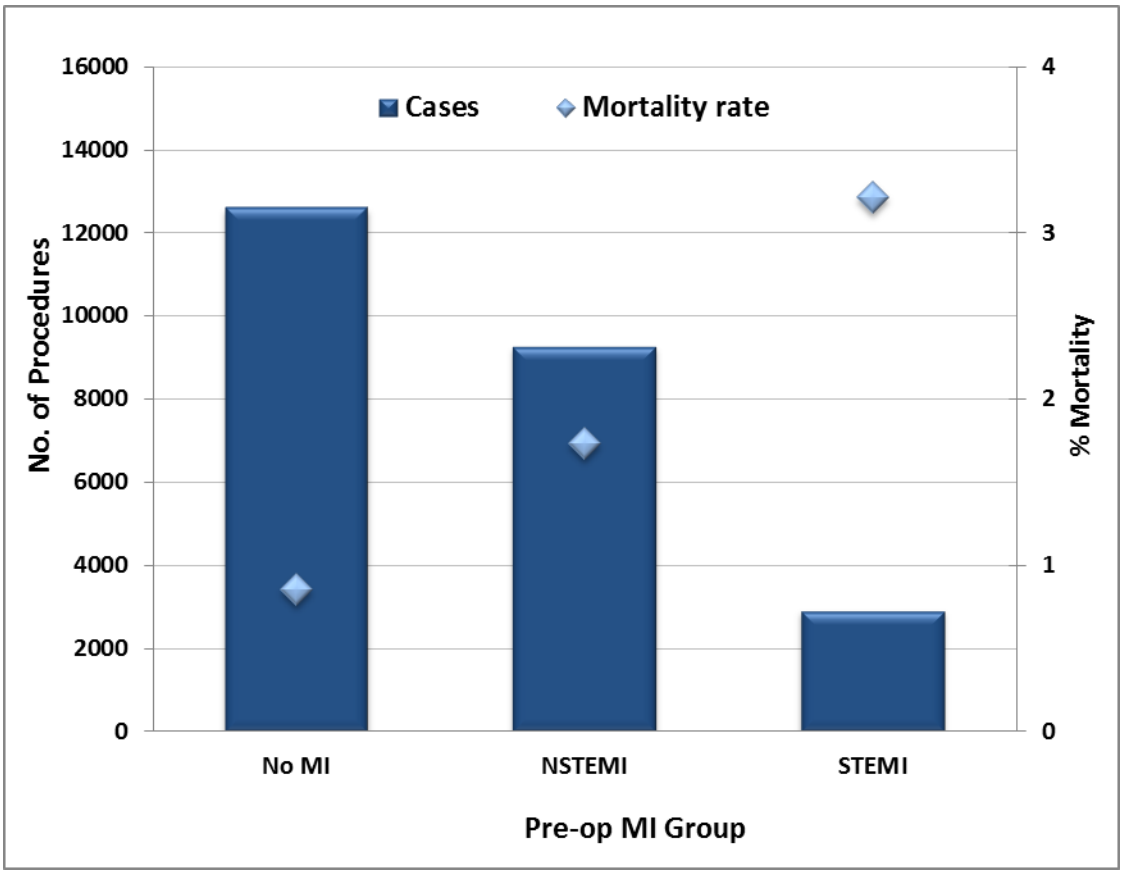


Figure 12a: In 2013, the surgical risk of mortality after MI is approximately 2.1% or just over two and a half times that without MI. The risk is high at intervals <24 hours after MI, then falls rapidly to 2.3% in the 1-7 day group and to 1.4% in the >21 day group. Table 7 details the mortality related to pre-operative MI in 2013

Isolated CABG Surgery

Figure 12b: Mortality rate for isolated CABG by type of MI 2008 - 2013



The type of pre-operative MI has been recorded for the past 6 years. The histogram indicates that overall, whereas the presence of a non-STEMI approximately doubles mortality, that of a STEMI increases mortality three and a half times.

Table 7 - Mortality rate by pre-operative MI 2008 - 2013

	Mortality (mortality/n, %)						
	Pre-op MI		Time since MI				
	Yes	No	≤6 hrs	6-24 hrs	1-7 days	8-21 days	≥ 21 days
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
2008	40/1891, 2.1	15/1659, 0.9	6/29, 20.7	2/48, 4.2	14/443, 3.2	8/533, 1.5	10/827, 1.2
Total	323/14640, 2.2	114/12777, 1.1	30/246, 12.2	32/389, 8.2	93/4000, 2.3	85/4328, 2.0	83/5637, 1.5

*28 missing cases

Isolated CABG Surgery

Figure 13: Mortality rate for isolated CABG by LV function 2008-2013

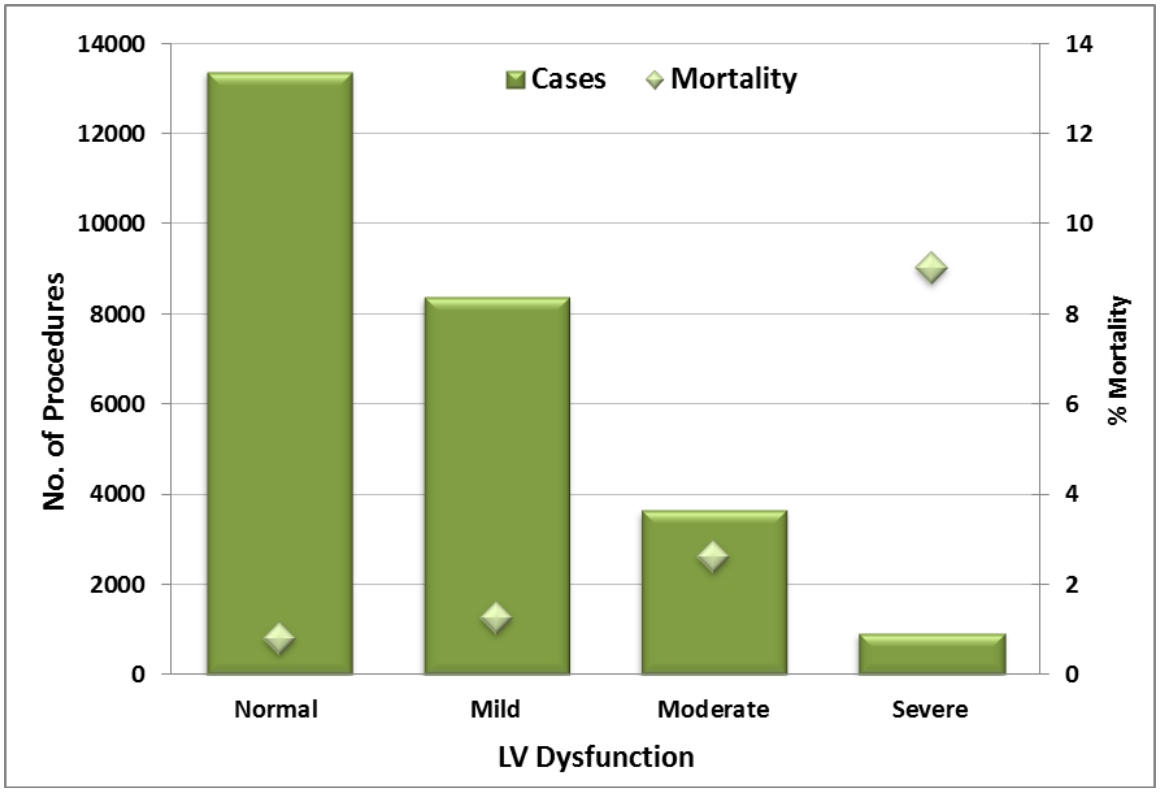


Figure 13: Reduced ventricular function remains a significant determinant of peri-operative mortality over the past 6 years.

Table 8 - Mortality rate by LV function 2008 - 2013

	Mortality (mortality/n %)			
	LV Dysfunction			
	Normal	Mild	Moderate	Severe
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
2008	10/1748, 0.6	8/1087, 0.7	16/466, 3.4	15/128, 11.7
Total	109/13479, 0.8	114/8598, 1.3	106/3752, 2.8	86/954, 9.0

Isolated CABG Surgery

Table 9 - Mortality rate by gender and procedure type (Off-/On- Pump) 2008 - 2013

	Gender (n, %)		Procedure type (n, %)	
	Male	Female	Off-Pump	On-Pump
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
2008	39/2762, 1.4	16/790, 2.0	2/273, 0.7	53/3279, 1.6
Total	286/21512, 1.3	129/5448, 2.4	24/2039, 1.2	390/24861, 1.6

Table 10 - Mortality rate by diabetes and renal function 2008 - 2013

	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
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
2008	30/1173, 2.6	28/2386, 1.2	49/3383, 1.4	6/169, 3.6	23/879, 2.6	32/2673, 1.2
Total	191/9577, 2.0	222/17345, 1.3	370/26013, 1.4	45/947, 4.8	217/6150, 3.5	198/20810, 1.0

*2 missing cases

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

Isolated CABG Surgery

Table 11 - Post-operative complications by age 2013 (% of cases)

	Age Group						
	<40yrs	**40-49yrs**	**50-59yrs**	**60-69yrs**	**70-79yrs**	**80+yrs**	**Total**
n	50	328	1072	1933	1546	428	5357*
New Renal Failure	4.0	1.5	2.3	2.9	4.9	6.6	3.6
Cerebrovascular Complication	2.0	0.3	0.8	0.8	1.5	2.6	1.1
Permanent Stroke	2.0	0.3	0.5	0.6	1.1	2.1	0.8
Deep Sternal Infection (30 days post-op)	4.0	1.5	1.0	1.1	0.8	0.5	1.0
Septicaemia	-	0.3	0.7	0.5	0.6	0.9	0.6
Return to theatre (all cases)	6.0	4.0	3.3	4.3	4.2	5.2	4.1
Re-op for Bleeding	2.0	2.7	1.4	2.0	2.2	3.0	2.1
Peri-operative AMI	-	2.4	1.5	1.4	1.2	1.2	1.4
New Cardiac Arrhythmia	6.0	13.1	18.2	26.6	30.9	36.7	25.9
Pneumonia	8.0	4.0	3.8	3.1	3.8	5.6	3.7
GIT complication	-	-	0.7	0.8	1.3	2.1	1.0
Multi-system Failure	-	-	0.5	0.5	0.8	1.4	0.6
Anticoagulant complication	-	-	0.3	0.1	0.5	0.5	0.3
Red Blood Cells transfused	28.0	24.1	24.4	28.7	39.1	57.9	32.9
Non-RBC blood products	18.0	19.8	18.5	20.4	23.3	27.9	21.4

*13 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 2013 (% of cases)

	Clinical Status				
	Elective	**Urgent**	**Emergency**	**Salvage**	**Total**
n	3456	1756	131	11	5357*
New Renal Failure	3.3	3.6	9.0	18.2	3.6
Cerebrovascular Complication	1.1	1.0	4.5	-	1.1
Permanent Stroke	0.9	0.6	2.3	-	0.8
Deep Sternal Infection (30 days post-op)	1.0	1.0	0.7	9.1	1.0
Septicaemia	0.6	0.5	2.2	9.1	0.6
Return to theatre (all cases)	3.2	5.4	9.0	27.3	4.1
Re-op for Bleeding	1.7	2.7	3.0	9.1	2.1
Peri-operative AMI	1.6	0.7	6.7	-	1.4
New Cardiac Arrhythmia	25.3	26.7	32.8	27.3	25.9
Pneumonia	3.8	3.2	9.0	9.1	3.7
GIT complication	1.0	0.6	3.0	9.1	1.0
Multi-system Failure	0.5	0.5	3.7	18.2	0.6
Anticoagulant complication	0.3	0.2	0.7	-	0.3
Red Blood Cells transfused	29.9	36.7	56.0	81.8	32.9
Non-RBC blood products	18.9	23.6	53.7	45.5	21.4

*13 missing cases

Table 12: Increasingly acute clinical status is similarly associated with an increased likelihood of developing postoperative complications and need for transfusion. When interpreting data related to clinical status, consider the information in Figure 11b (page 29).

Isolated CABG Surgery

Table 13 - Complications by redo, Off-pump and renal function 2013 (% 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	5212	145	417	4940	5185	172	4227	1130	5357*
New Renal Failure	3.6	4.8	3.8	3.6	3.3	13.5	2.5	7.5	3.6
Cerebrovascular Complication	1.1	1.4	0.7	1.2	1.1	1.7	0.8	2.5	1.1
Permanent Stroke	0.8	1.4	0.5	0.9	0.8	1.8	0.5	2.0	0.8
Deep Sternal Infection (30 days post-op)	0.9	2.7	0.2	1.0	1.0	1.7	0.9	1.1	1.0
Septicaemia	0.6	0.7	0.2	0.6	0.5	2.3	0.4	1.3	0.6
Return to theatre (all cause)	4.1	4.1	4.6	4.1	4.0	9.9	3.2	7.5	4.1
Re-op for Bleeding	2.1	2.1	1.9	2.1	1.9	5.8	1.6	3.9	2.1
Peri-operative AMI	1.4	2.8	2.6	1.3	1.4	2.3	1.3	1.9	1.4
New Cardiac Arrhythmia	25.8	31.7	26.6	25.9	25.8	29.7	24.5	31.2	25.9
Pneumonia	3.6	7.6	3.4	3.8	3.7	5.8	3.4	5.1	3.7
GIT complication	1.0	1.4	1.9	0.9	0.9	4.1	0.7	1.9	1.0
Multi-system Failure	0.6	1.4	0.7	0.6	0.5	3.5	0.4	1.2	0.6
Anticoagulant complication	0.2	0.7	0.2	0.3	0.3	0.6	0.2	0.5	0.3
Red Blood Cells transfused	32.5	46.2	22.5	33.8	31.9	62.4	26.0	58.7	32.9
Non-RBC blood products	21.0	36.6	10.3	22.3	20.9	37.6	19.3	29.1	21.4

*13 missing cases

Tables 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)	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
	2008	10.0	9.0	9.0	10.0	11.0	12.0
Intensive Care Stay (hours)	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
	2008	25.0	28.5	26.0	33.0	38.0	44.0
Post-op Length of Stay (days)	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
	2008	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)	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
	2008	9.0	11.0	23.0	50.0
Intensive Care Stay (hours)	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
	2008	27.0	39.0	67.5	188.0
Post-op Length of Stay (days)	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
	2008	7.0	7.0	8.0	25.0

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

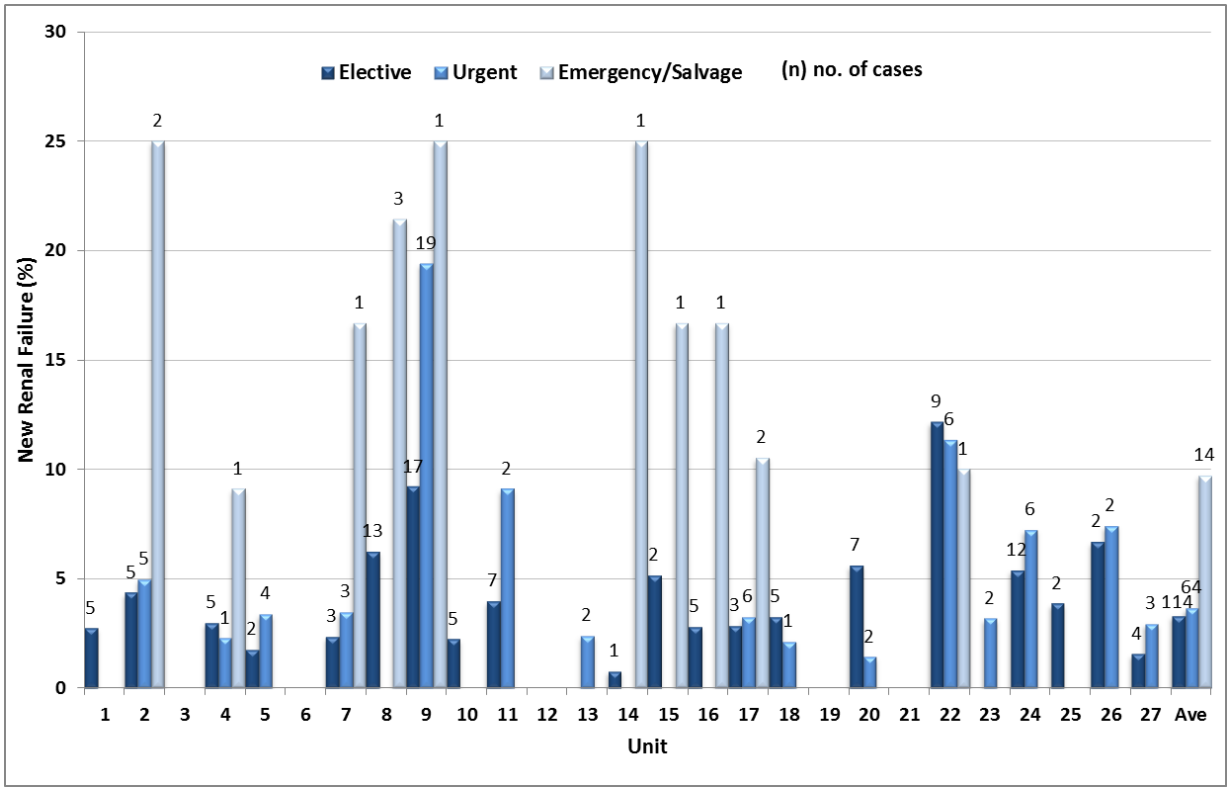
Table 16 - Resource utilisation by gender, redo, off-pump and renal function (median value)

		Gender		Redo		Off-pump		Pre-op creatinine	
		Male	Female	1st proc	Redo	Off-pump	On-pump	<200 µmol/L	≥200 µmol/L
Intubation Time (hours)	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
	2008	10.0	11.0	10.0	12.0	9.0	10.0	10.0	11.0
Intensive Care Stay (hours)	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
	2008	29.0	40.0	29.0	45.0	40.0	31.0	30.0	47.0
Post-op Length of Stay (days)	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
	2008	7.0	7.0	7.0	8.0	6.0	7.0	7.0	7.0

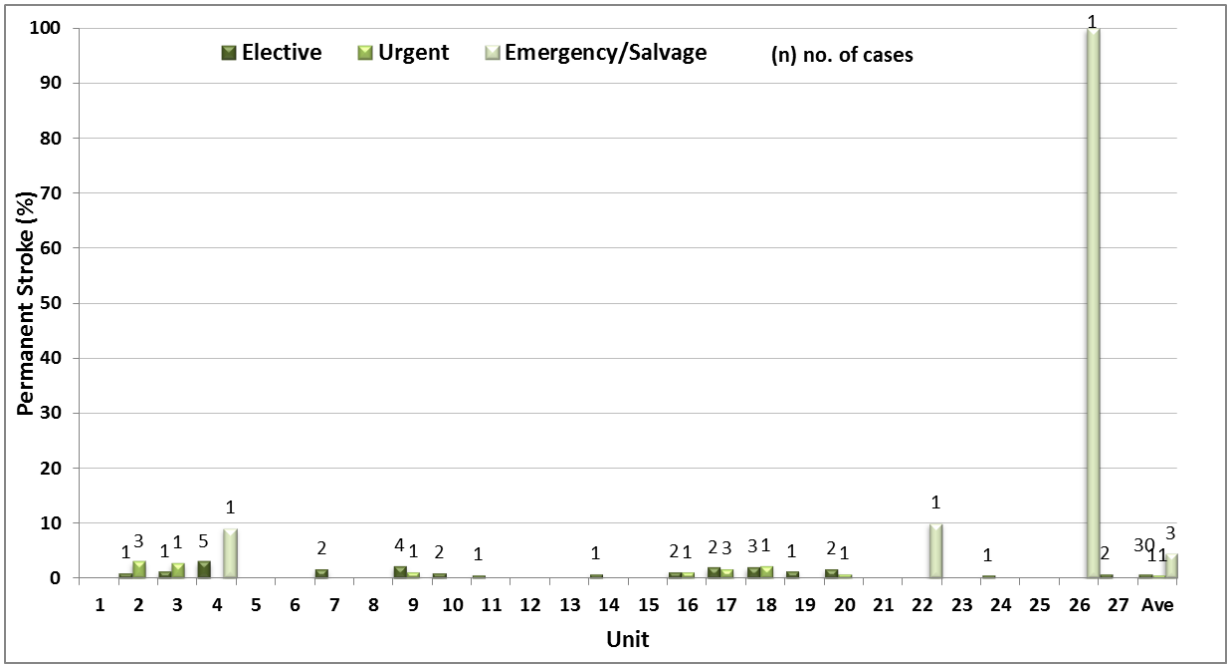
Isolated CABG Surgery

Figure 14: Morbidity by clinical status and Unit 2013

a) New Renal Failure

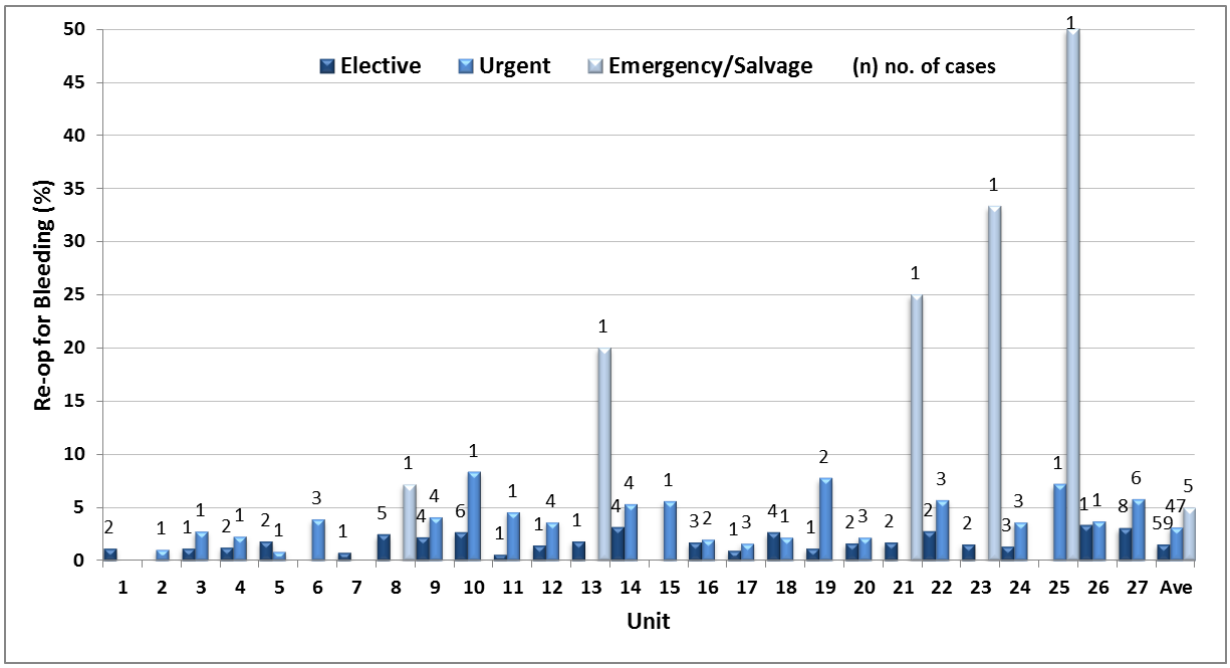


b) Permanent Stroke



Isolated CABG Surgery

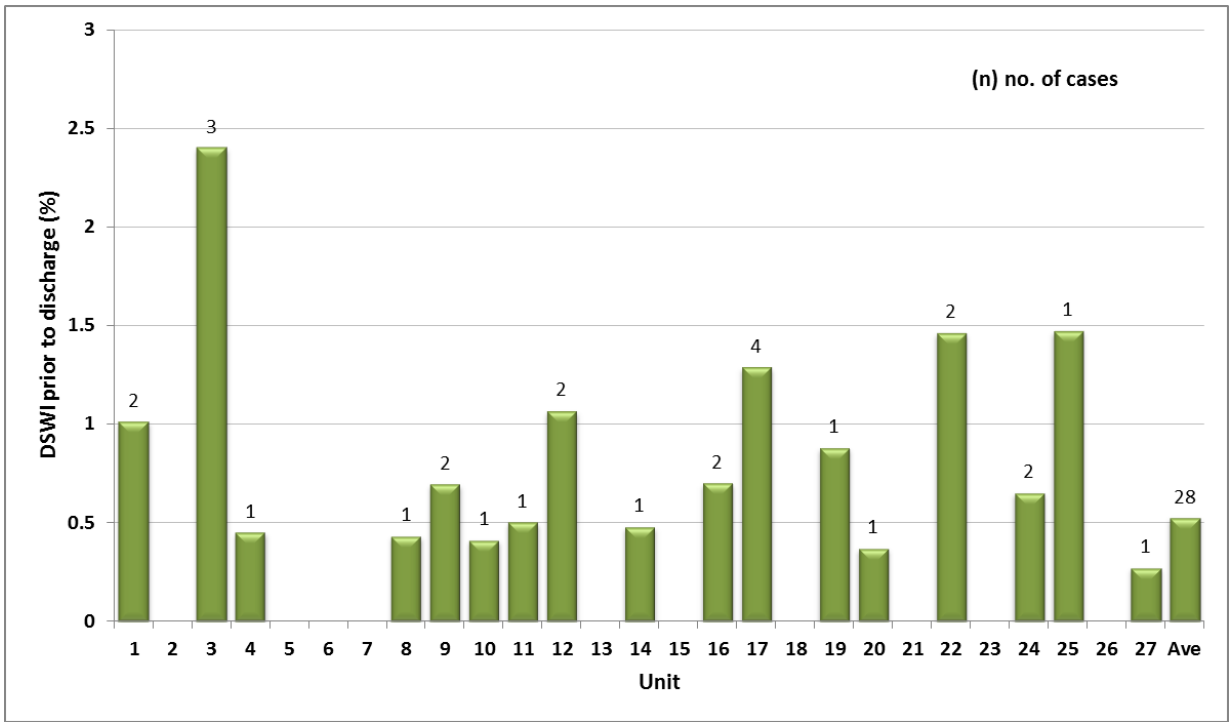
c) Return to Theatre for Bleeding



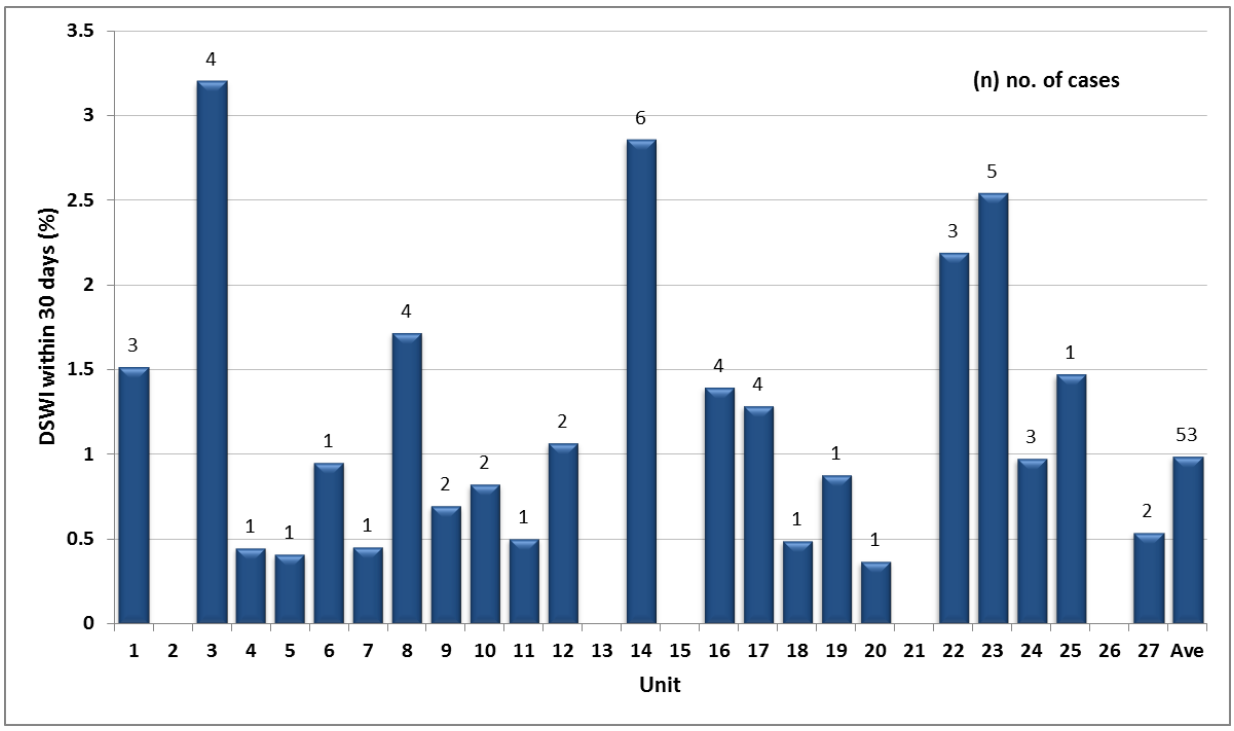
Isolated CABG Surgery

Figure 15: Post-operative complications by Unit 2013

a) Deep sternal wound infection prior to discharge

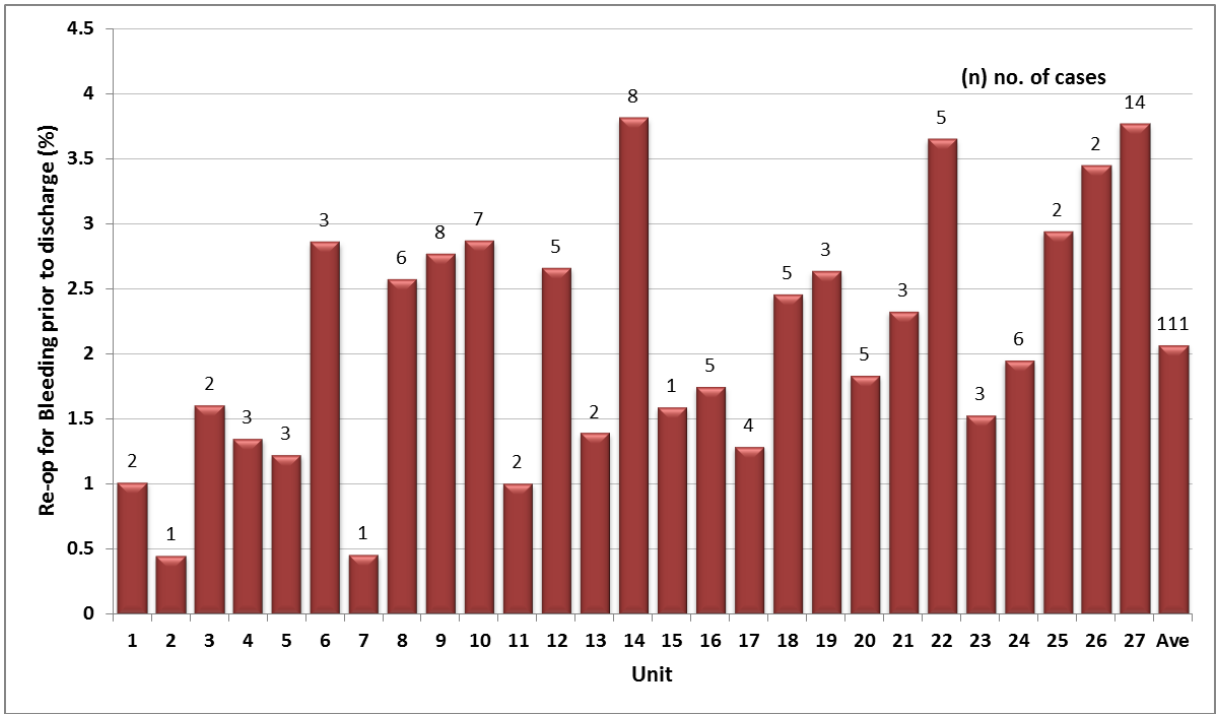


b) Deep sternal wound infection within 30 days of surgery



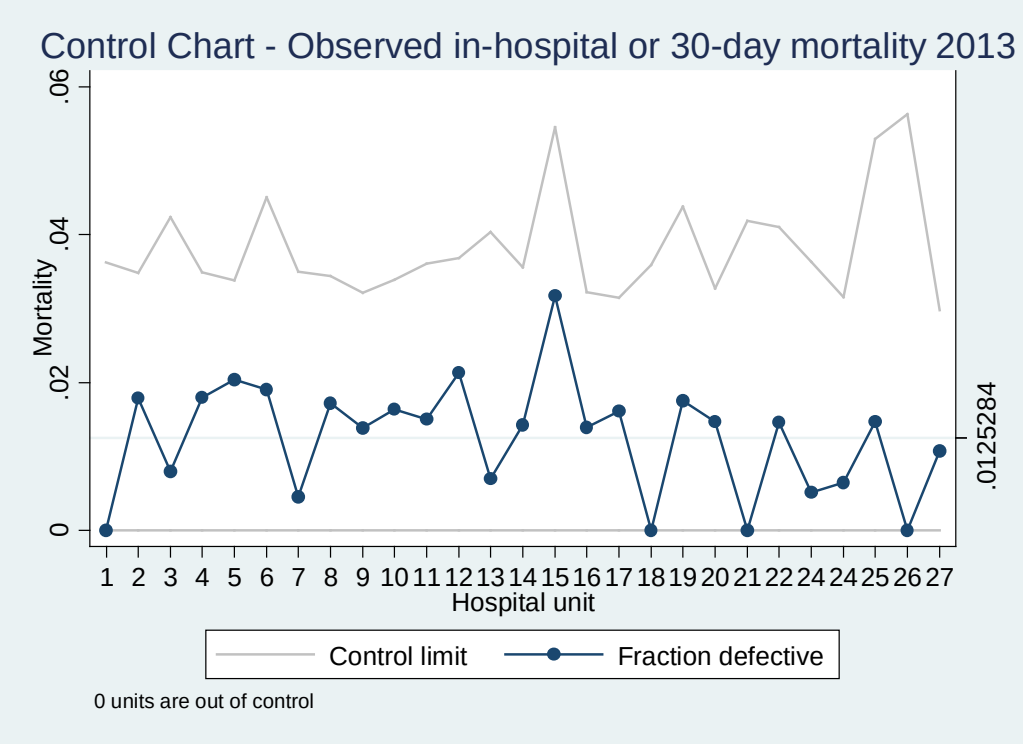
Isolated CABG Surgery

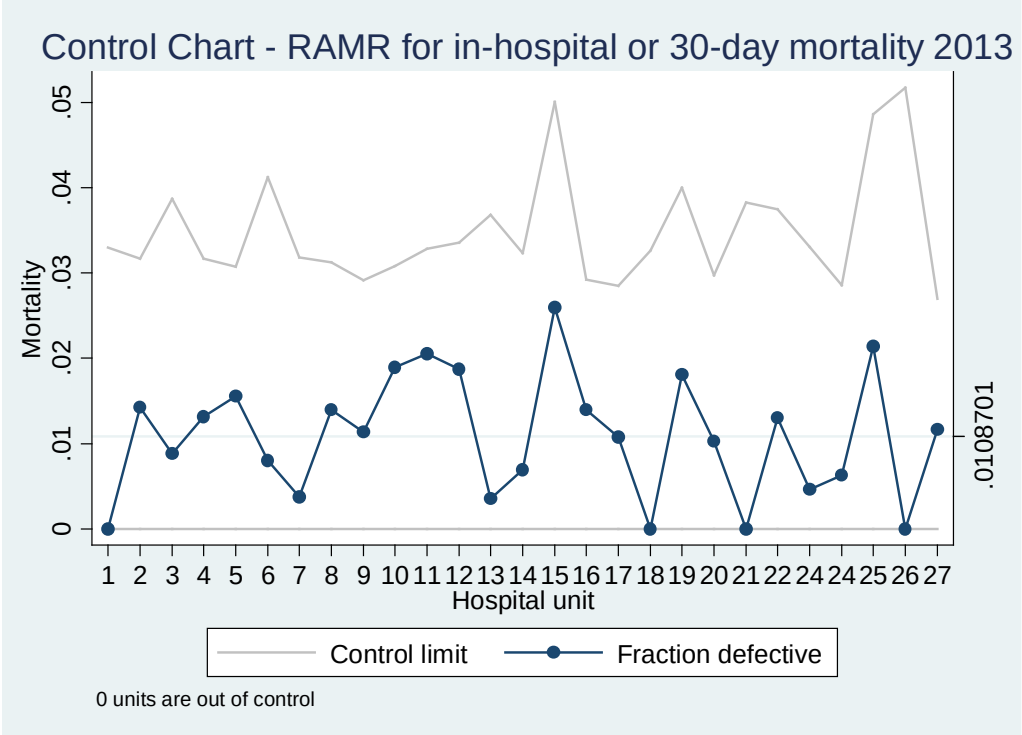
c) Return to theatre for bleeding prior to discharge



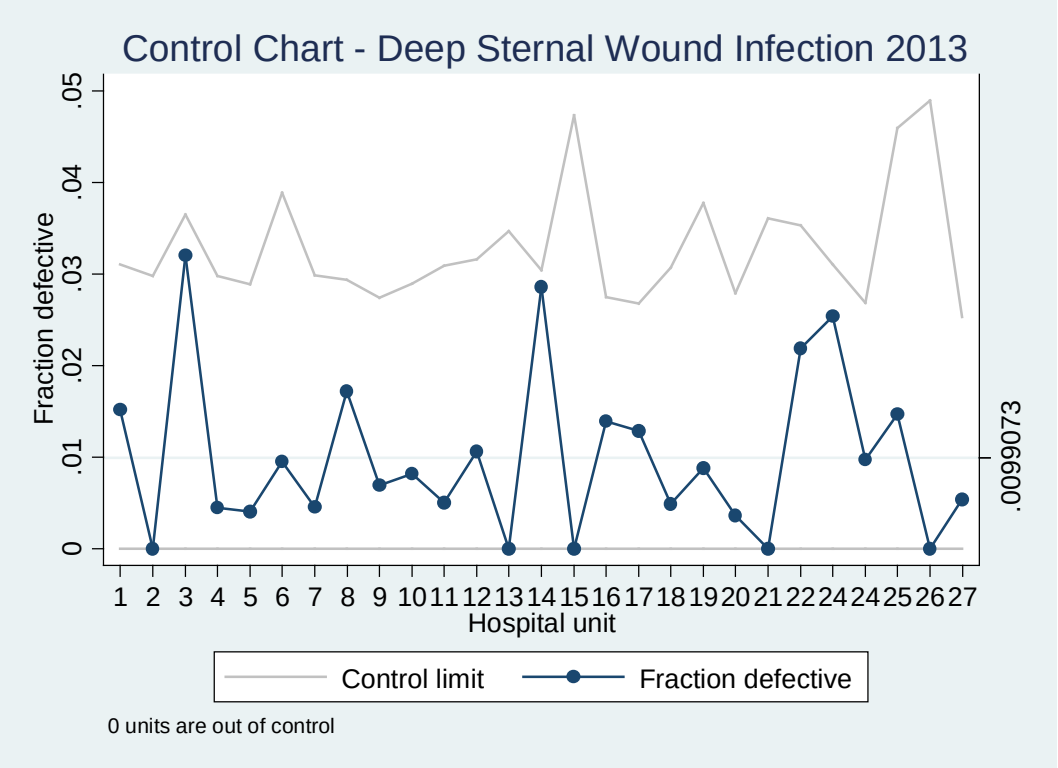
Control Charts for Isolated CABG 2013

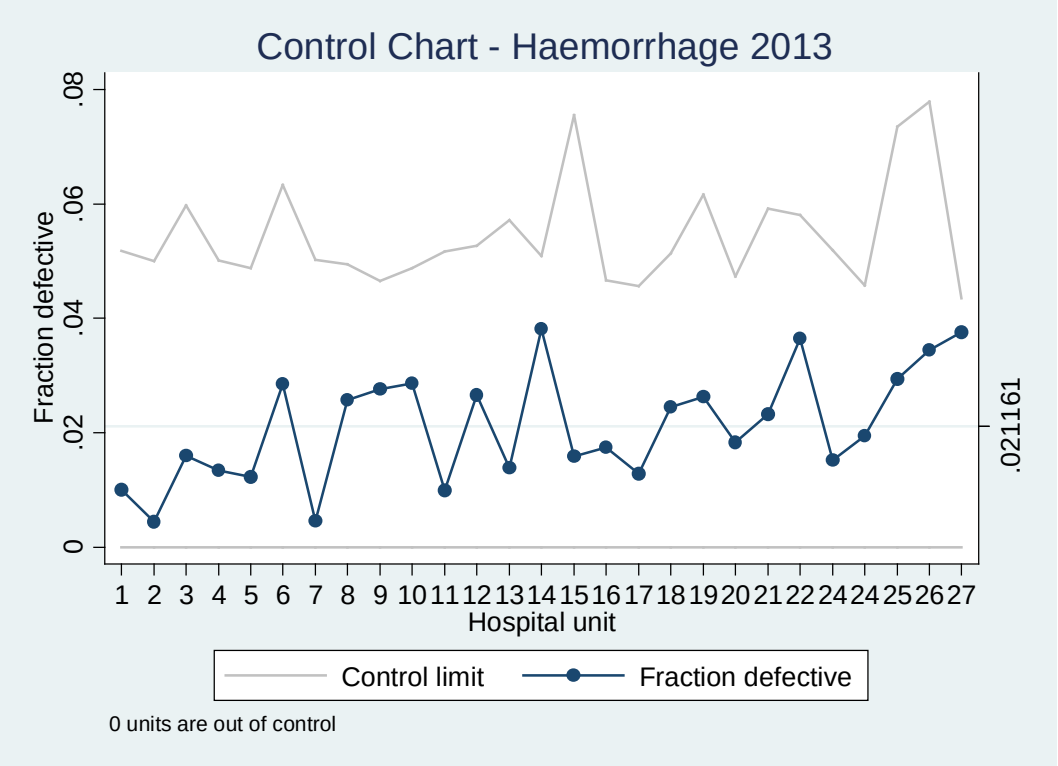
Control charts for in-hospital or 30-day mortality, deep sternal infection, and haemorrhage represent variance from the control for each Unit. ICU time, intubation time, length of stay, and post-procedure length of stay represent variation from the mean. The boundaries represent 3 standard deviations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





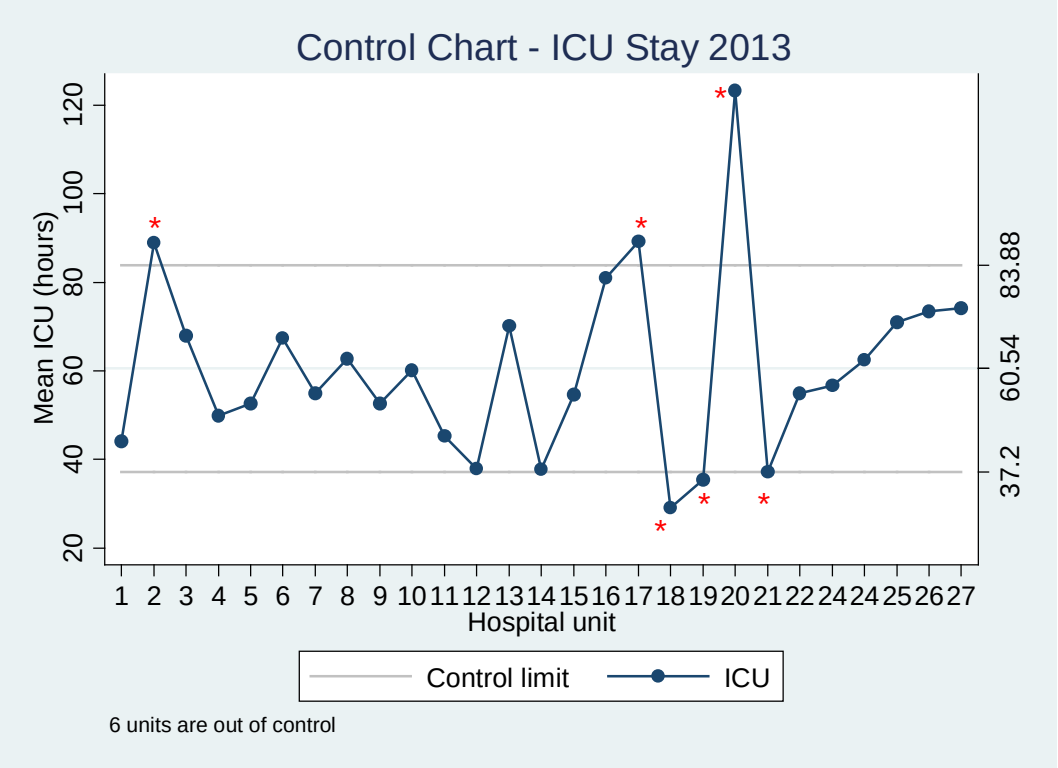
Isolated CABG Surgery



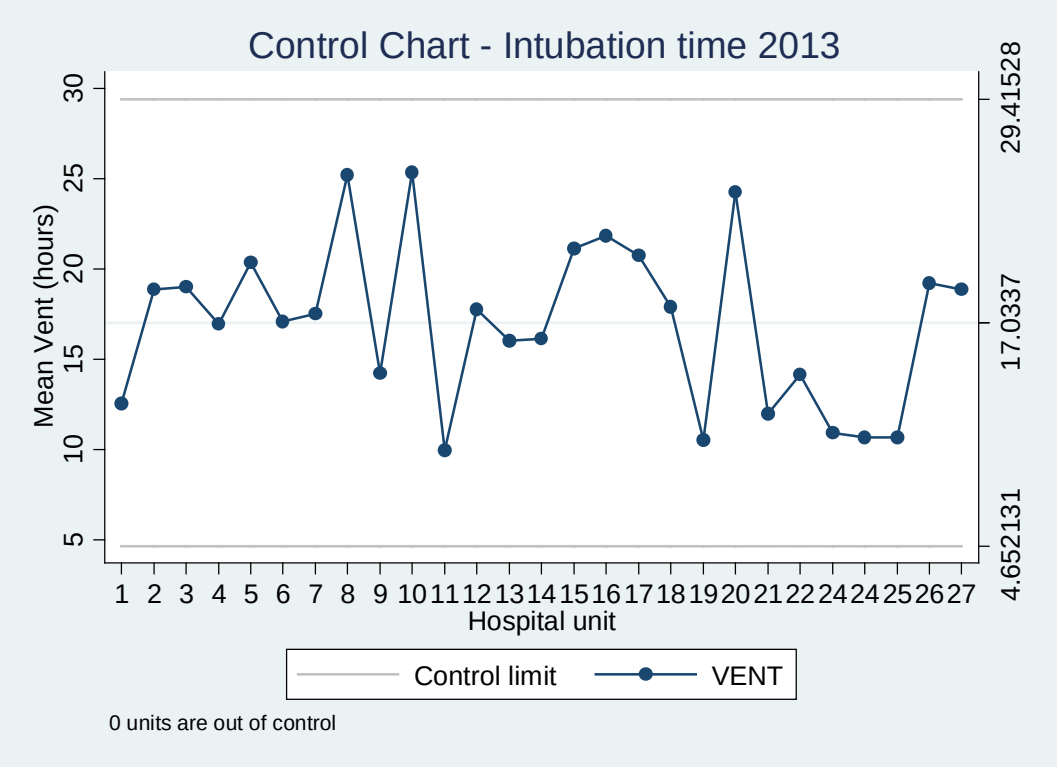


Isolated CABG Surgery

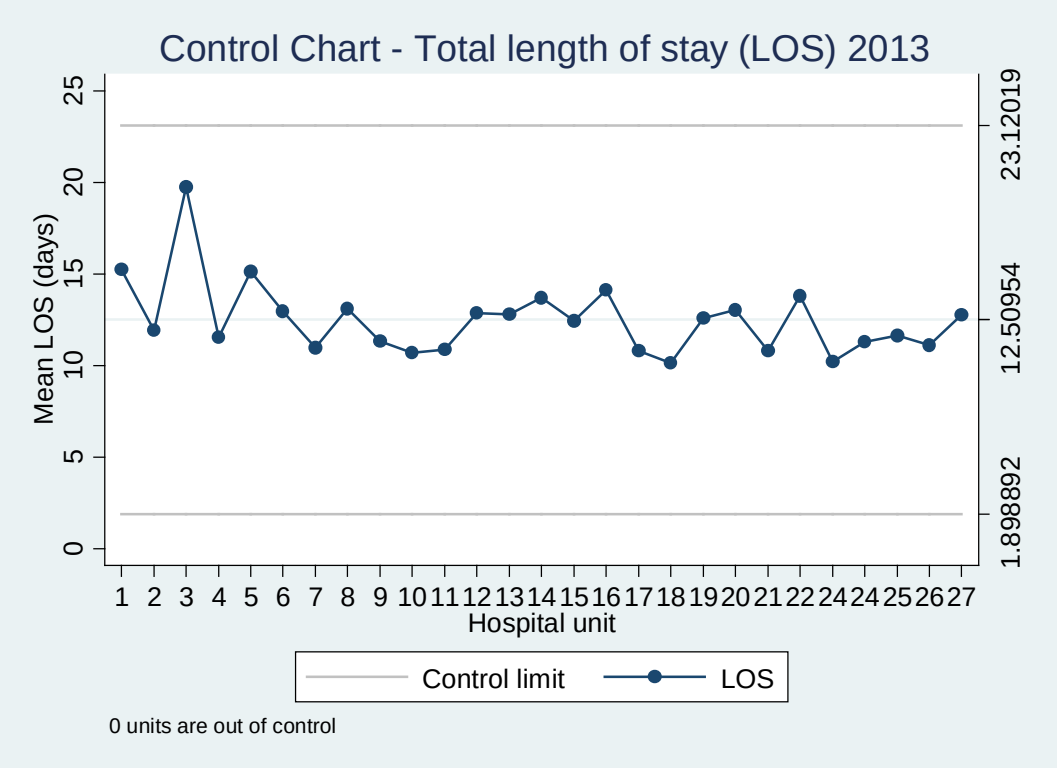
Note: the following control charts for ICU time (hours), intubation time (hours), length of stay (days), and post-procedure length of stay (days) are presented as the Mean, not the Median as they are elsewhere in the report.

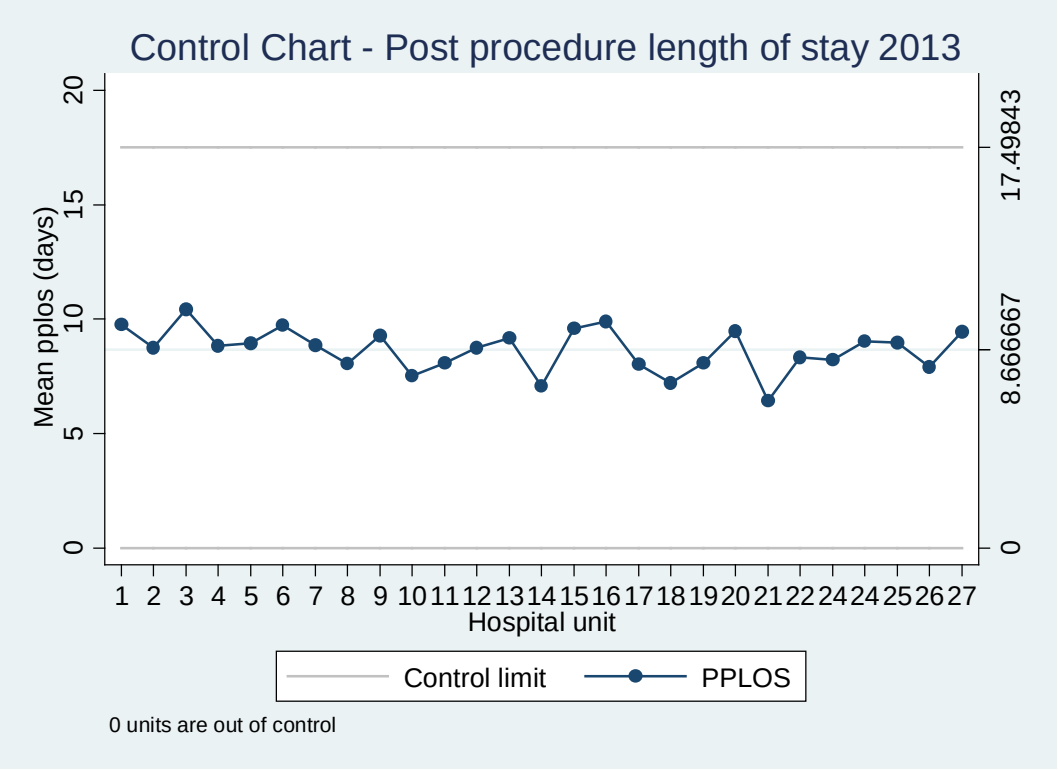


Unit 2 has been outside the upper limit for 2 consecutive years
Unit 19 has been outside the lower limits for 5 consecutive years.
Unit 20 has been outside the upper limits for 5 consecutive years.



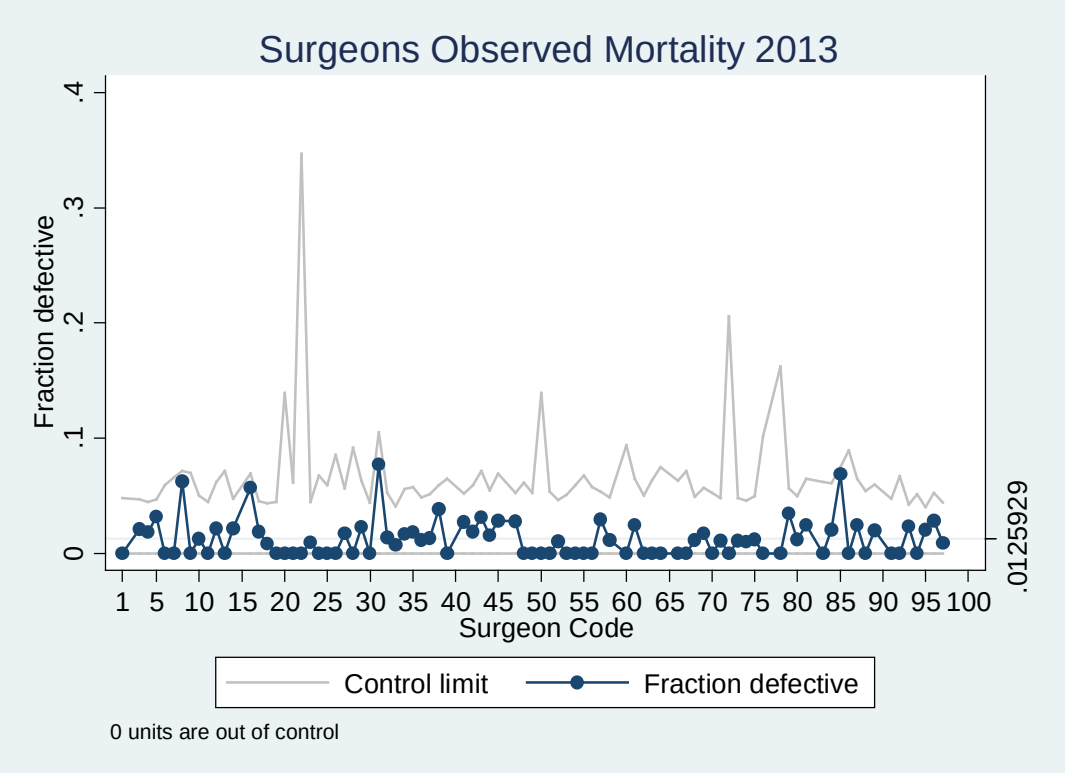
Isolated CABG Surgery

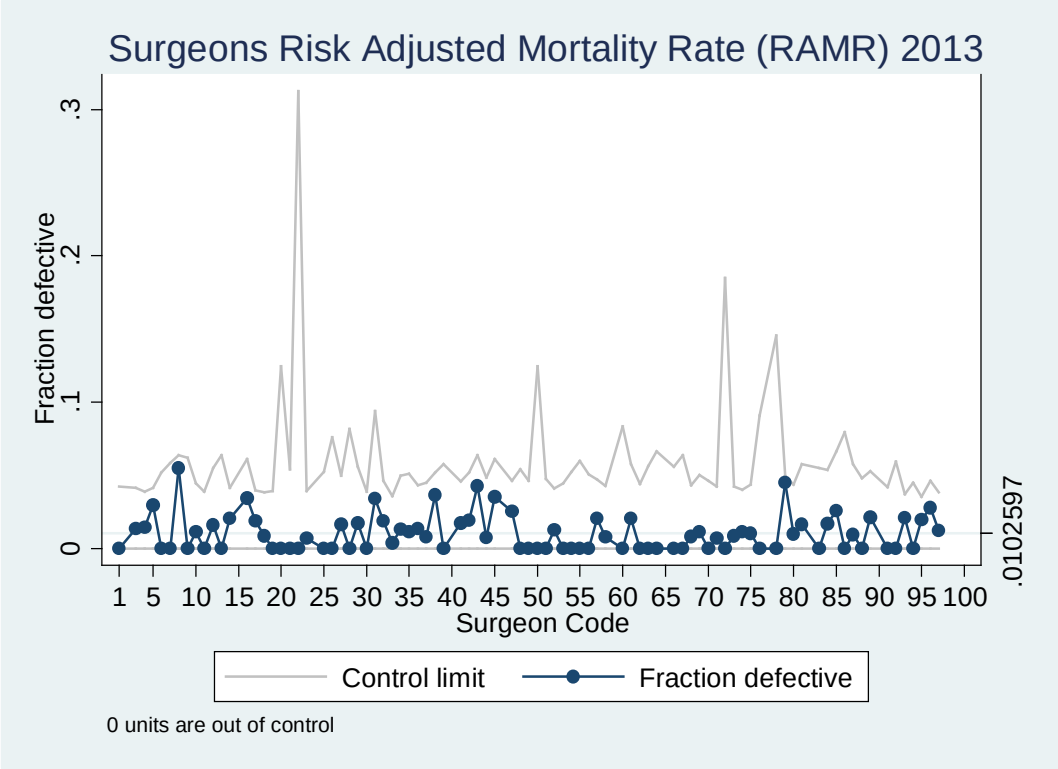




The difference between total and post-procedure length of stay represent surgical delay times.

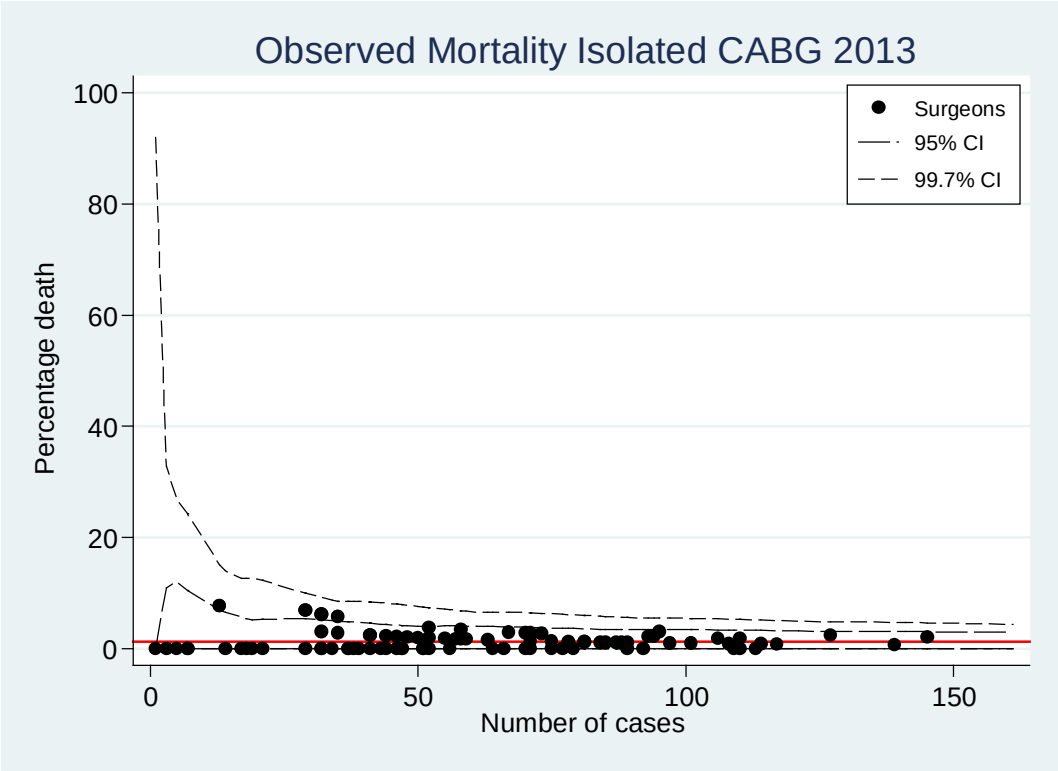
Surgeons' Control Charts

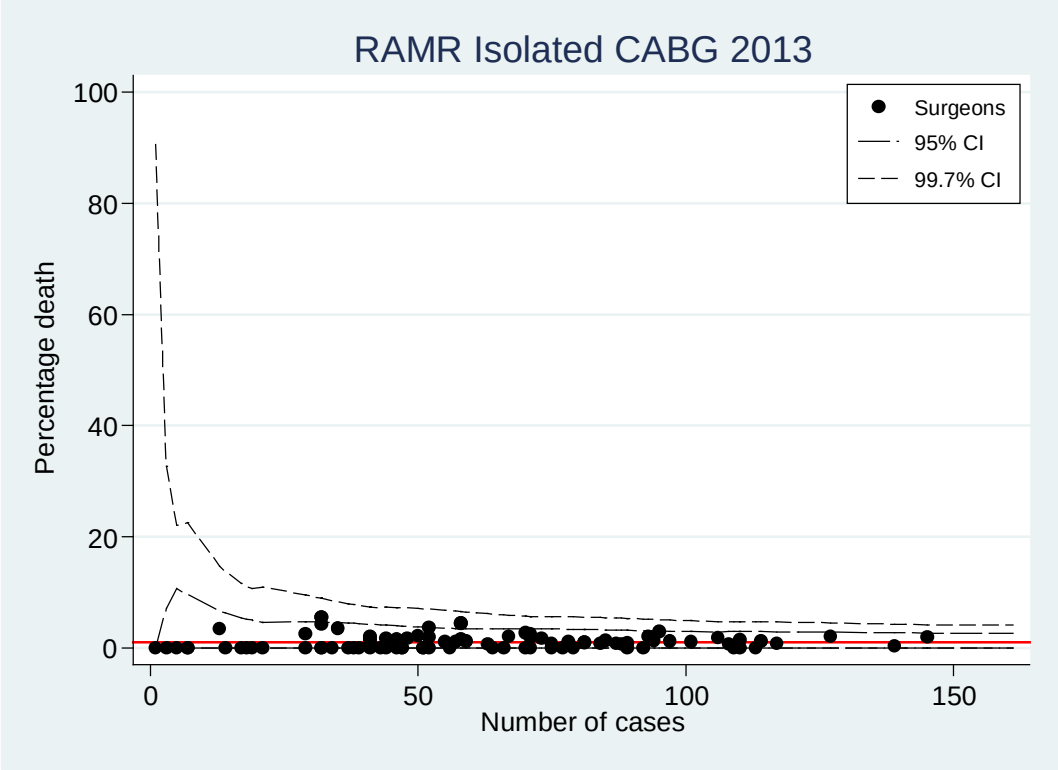




Observed and risk adjusted mortality and shows all surgeons within the defined limits (3SD over the mean).

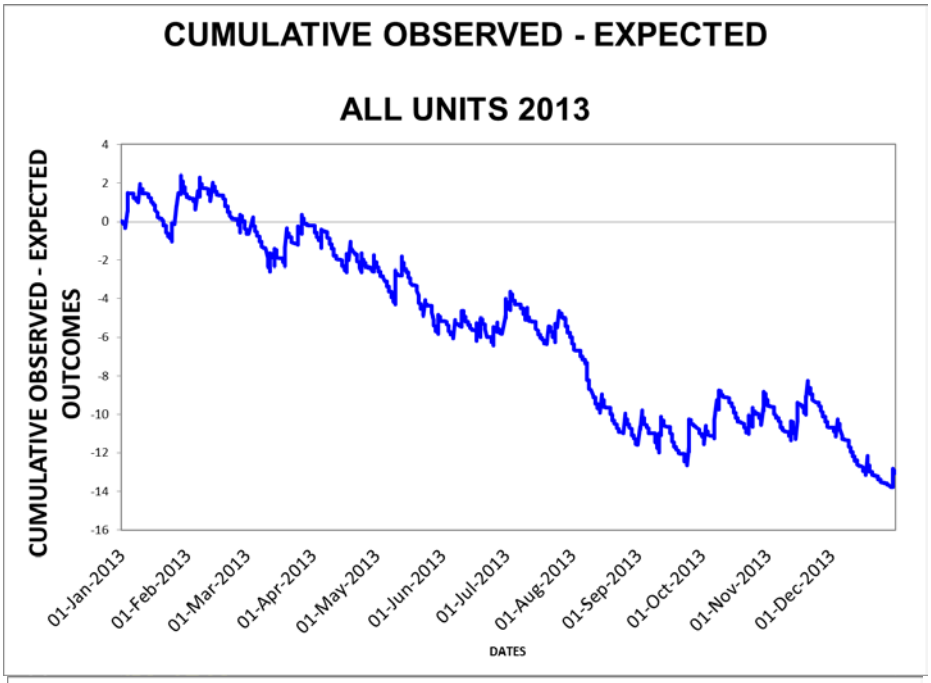
Surgeons' Funnel Plots

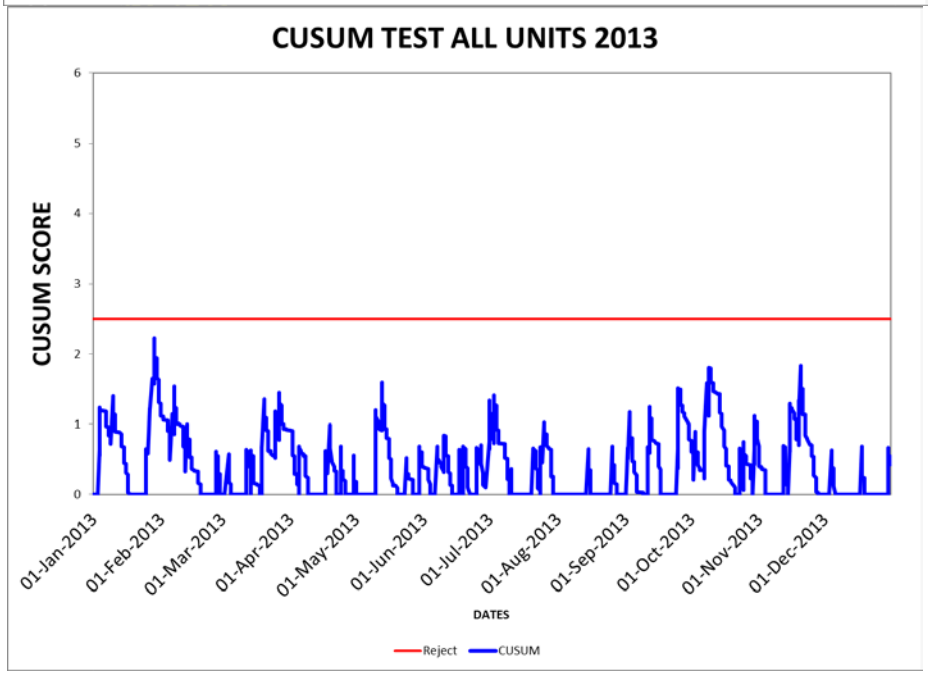




CUSUM curves for risk-adjusted 30-day mortality - Isolated CABG 2013

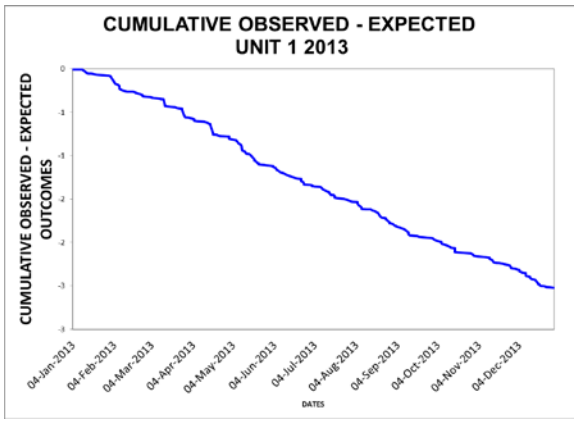
The CUSUM scores for each case in the combined units and then for separate units fall within the rejection (red) line, the performance of all hospitals is at a satisfactory level (See Appendix C).

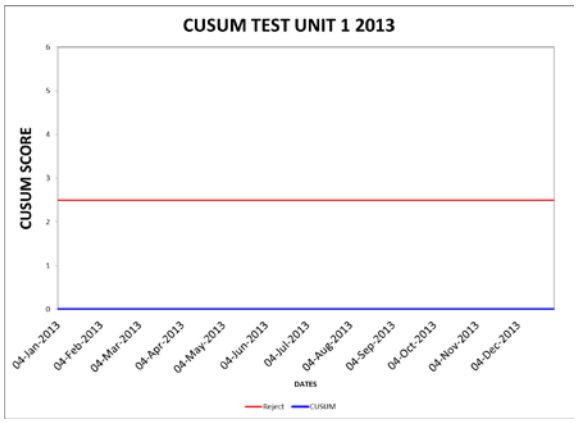


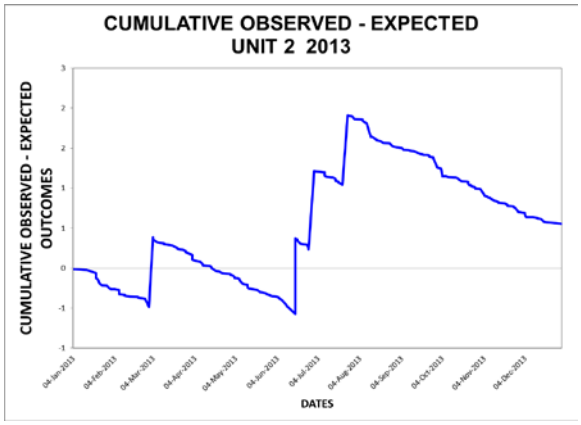


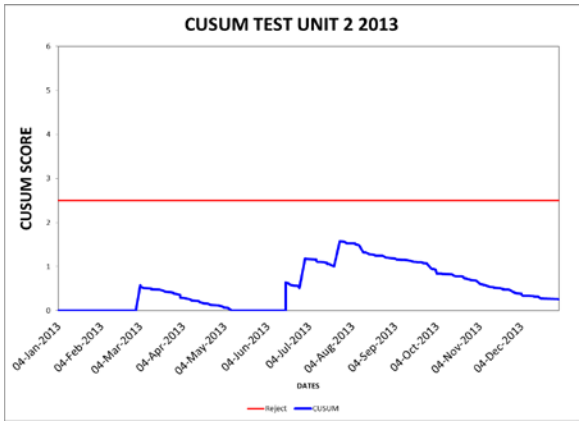
Cumulative Sum (CUSUM) control charts are suited to detect small and sustained shifts in mortality over time. In this report, changes in individual Unit performance during 2013 are displayed. The top graph above and the graphs on the left in the following pages show the Observed-Expected (O-E) mortality 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.

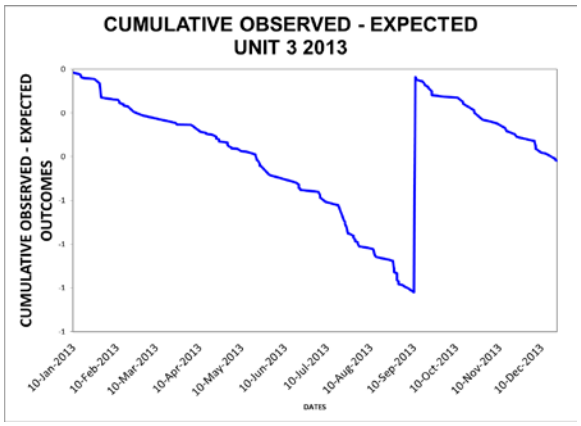
Isolated CABG Surgery

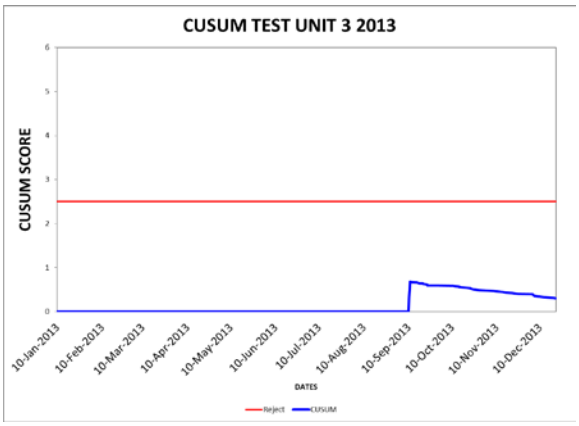


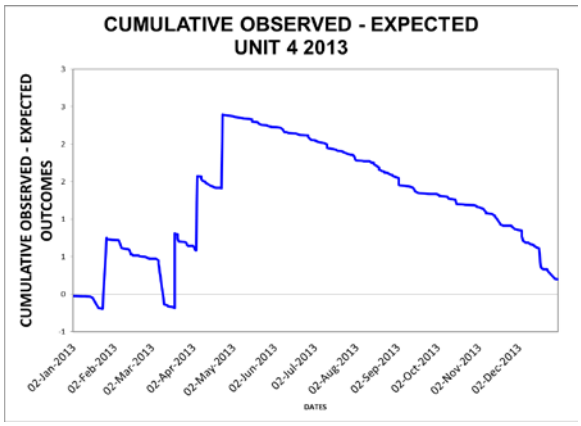


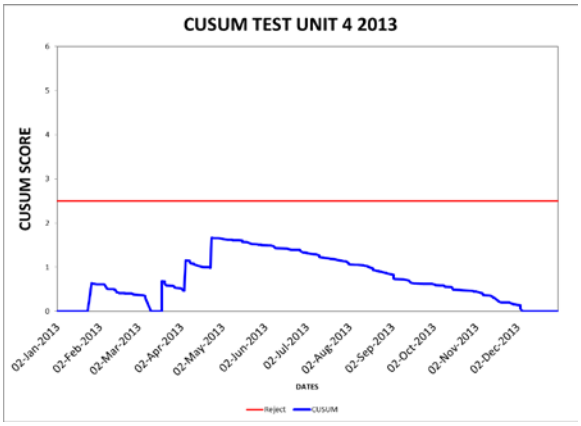




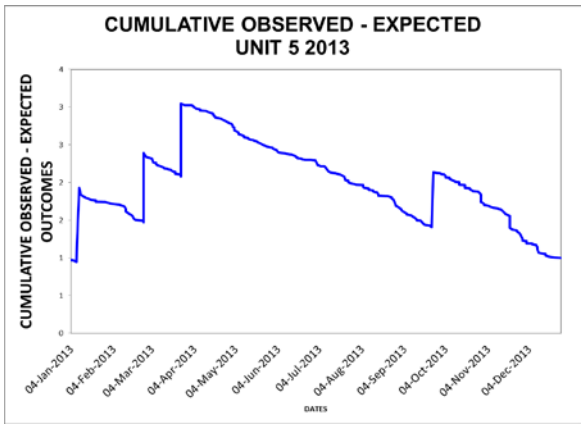


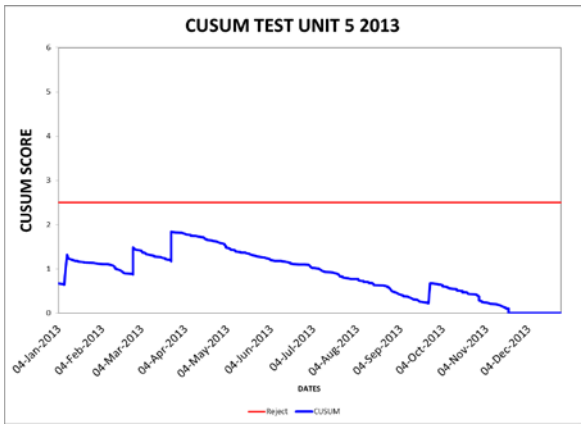


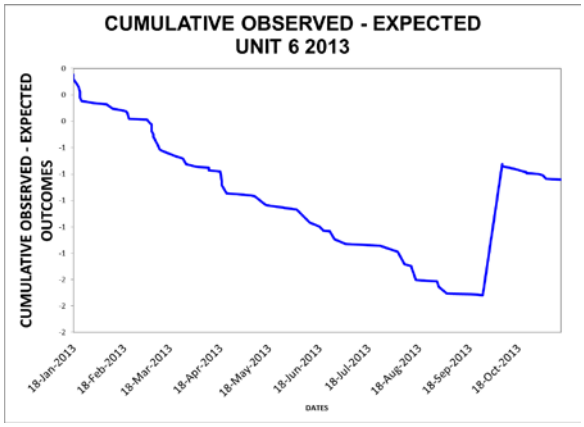


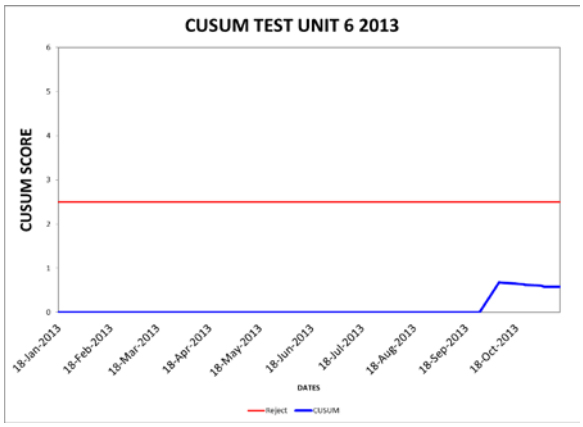


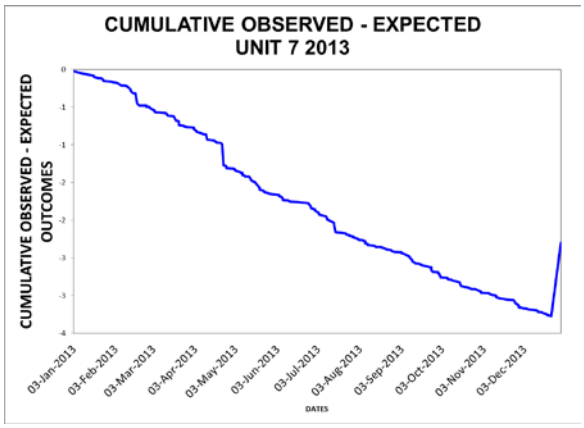
Isolated CABG Surgery

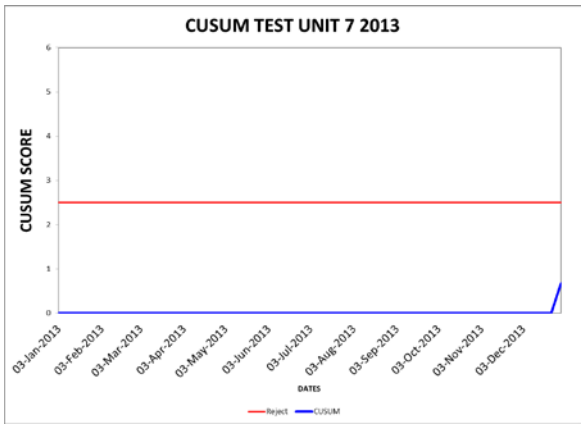


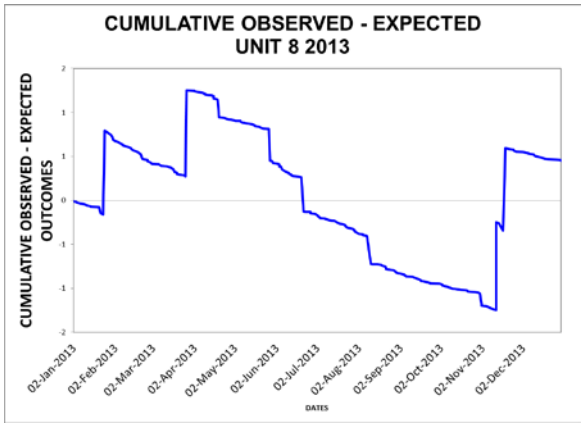


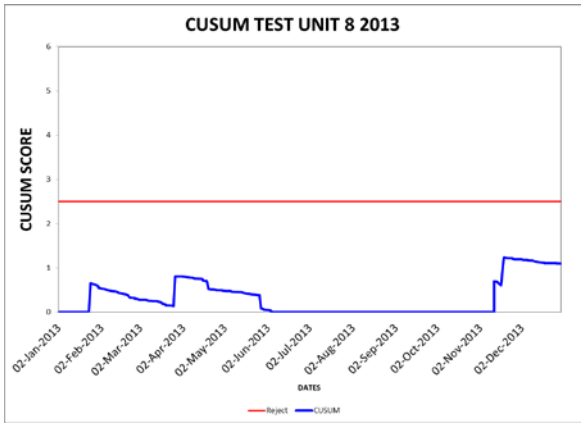




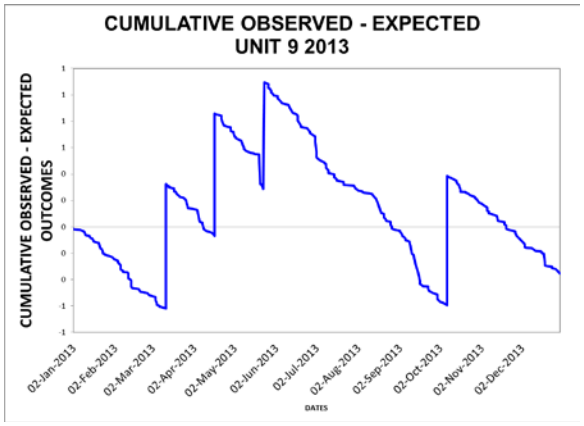


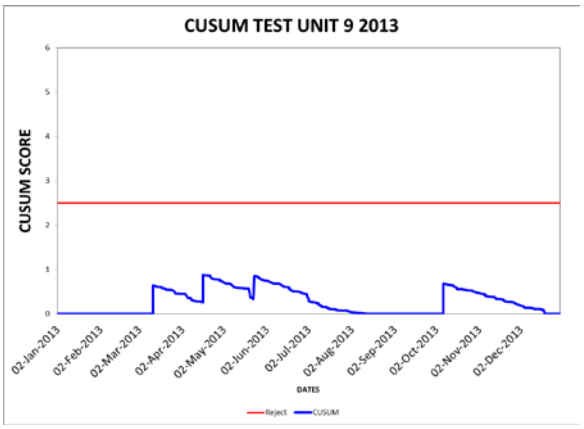


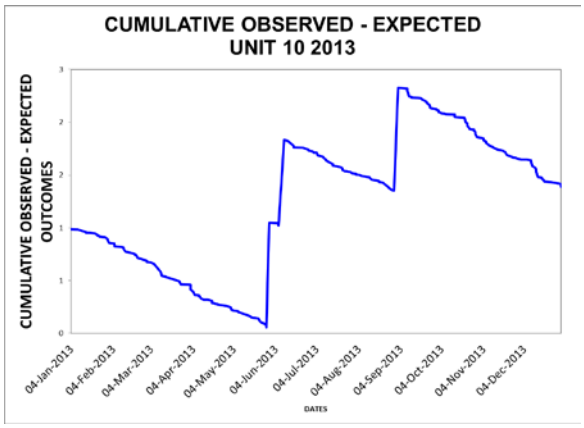


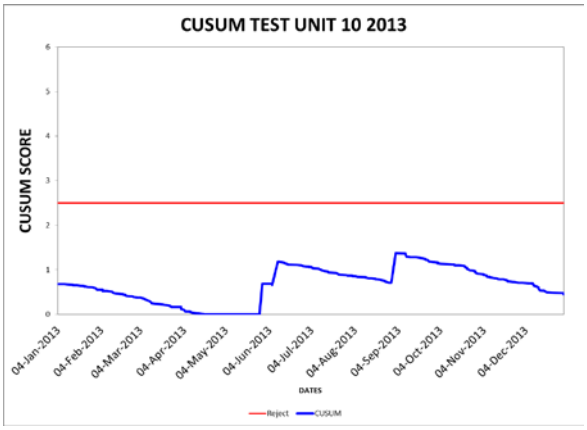


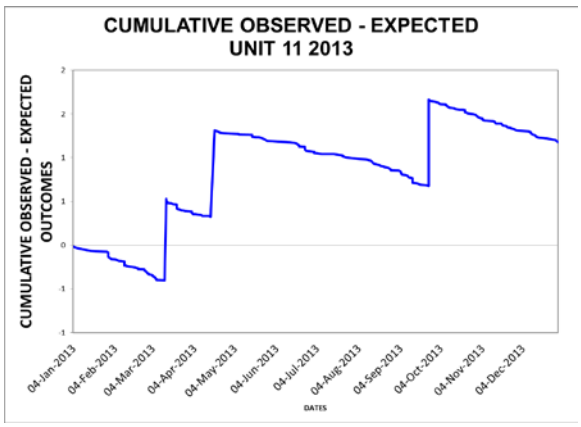
Isolated CABG Surgery

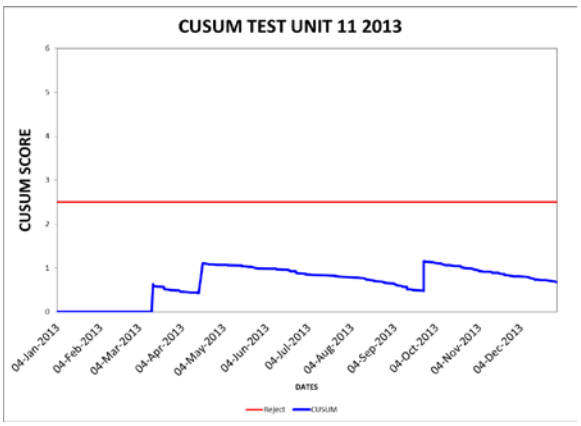


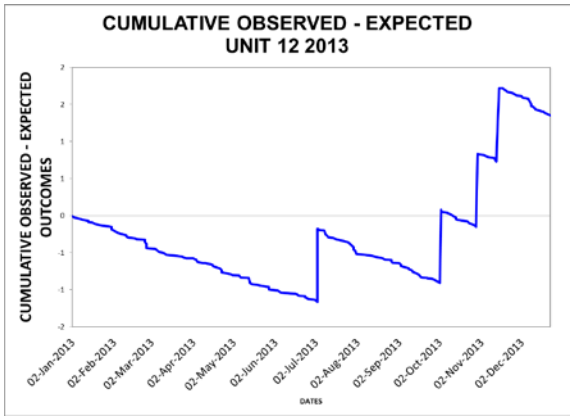


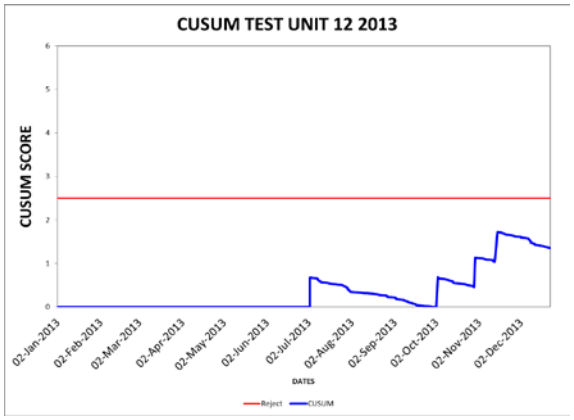




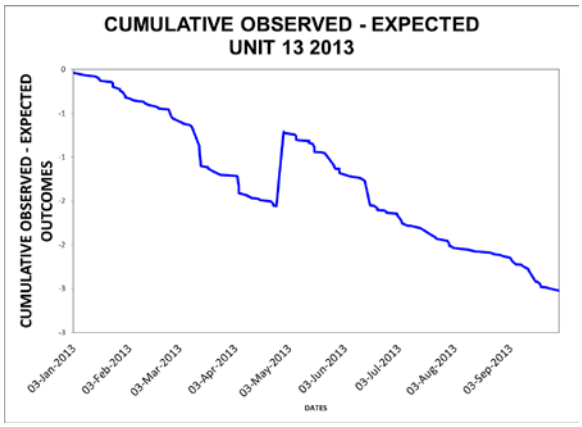


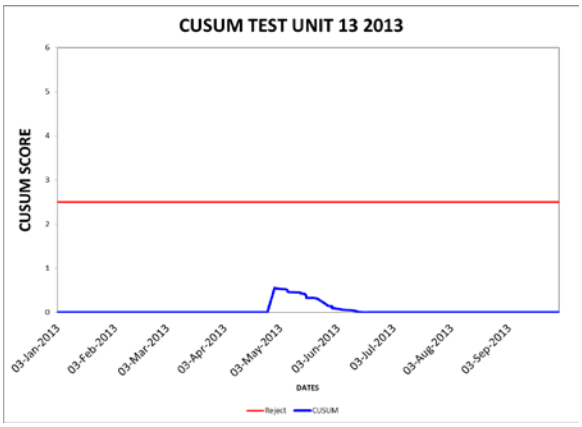


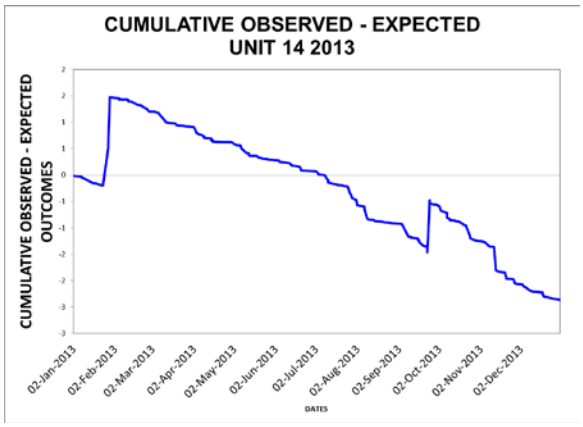


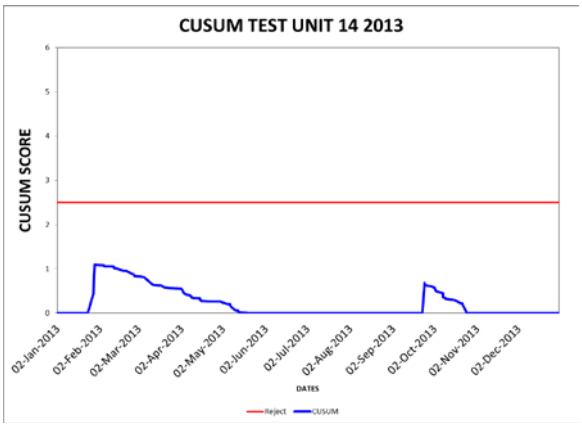


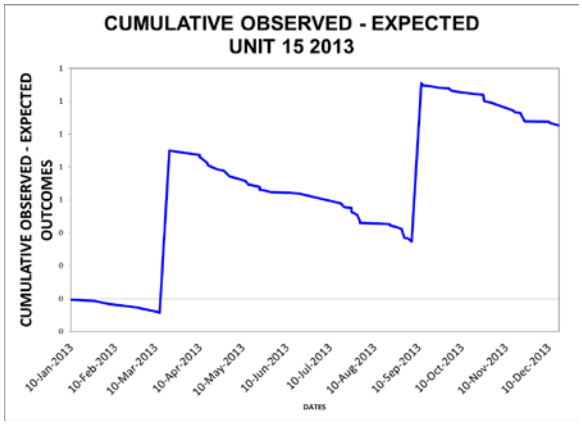
Isolated CABG Surgery

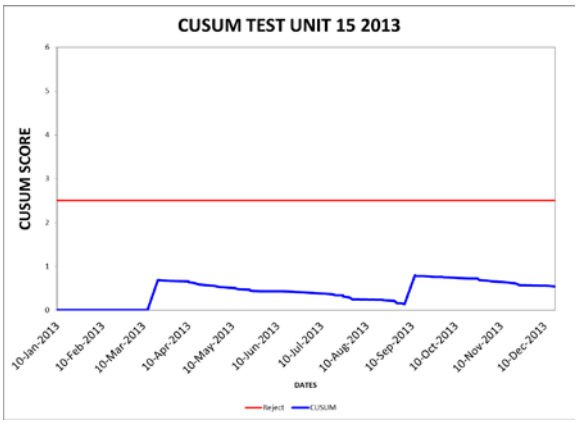


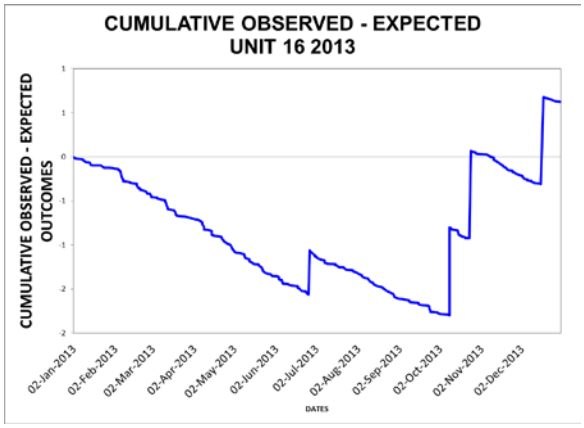


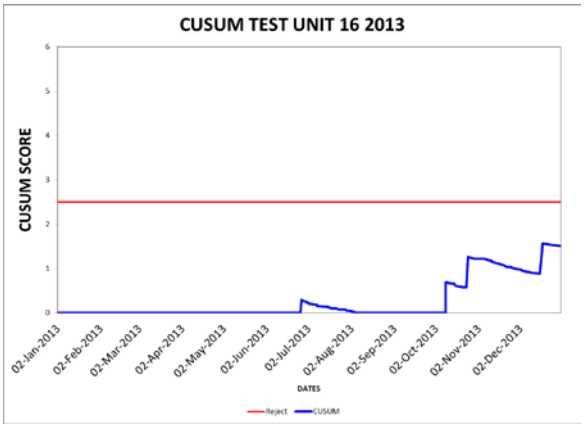




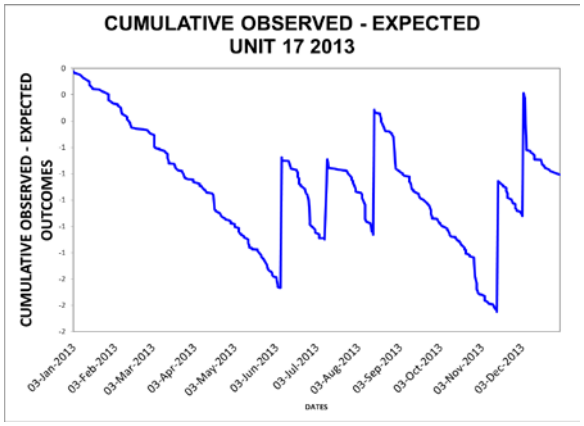


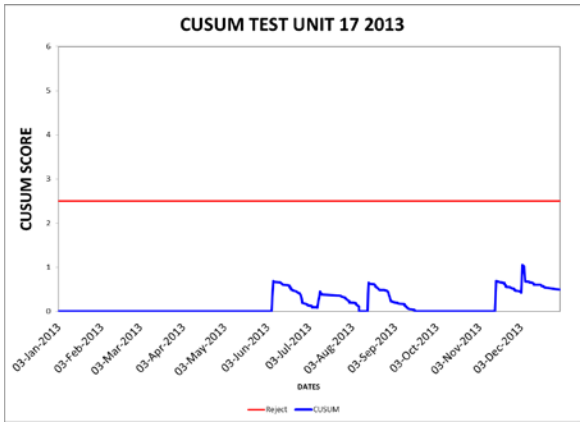


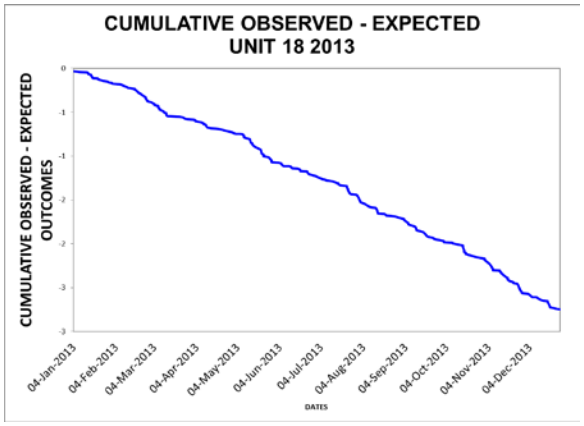


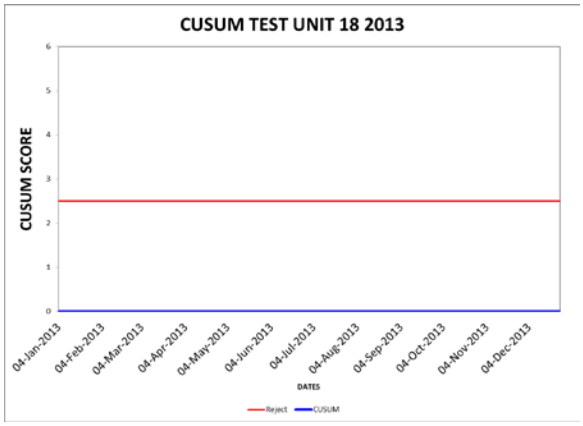


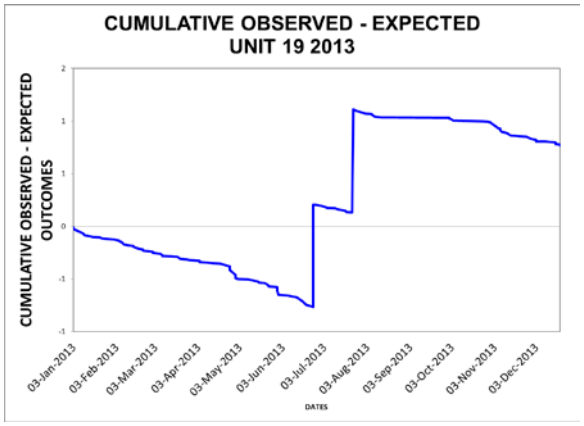
Isolated CABG Surgery

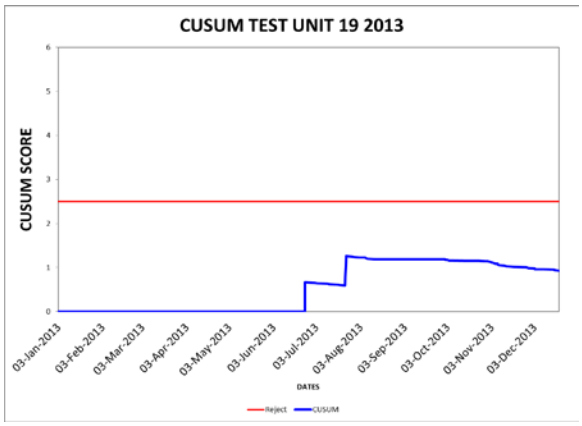


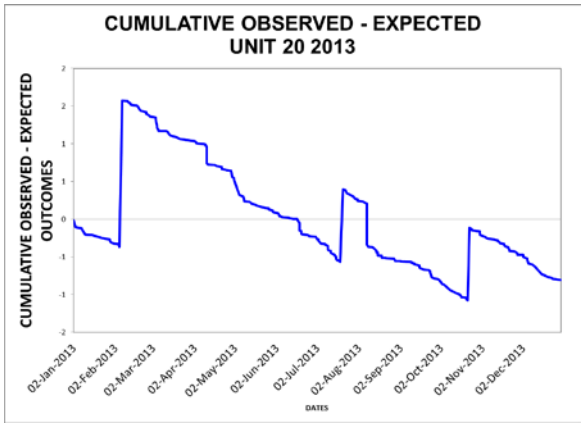


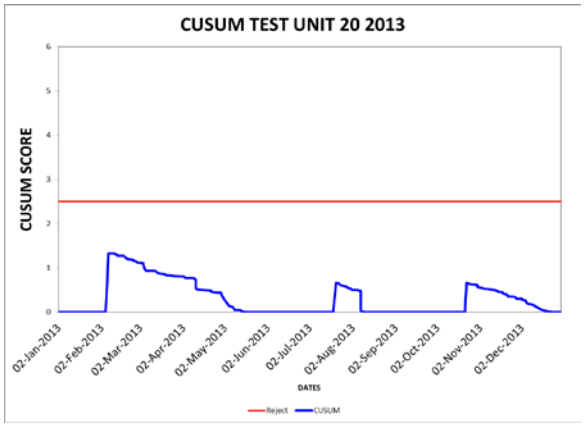




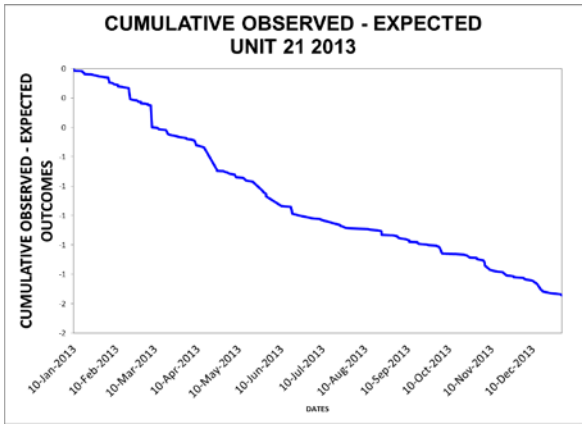


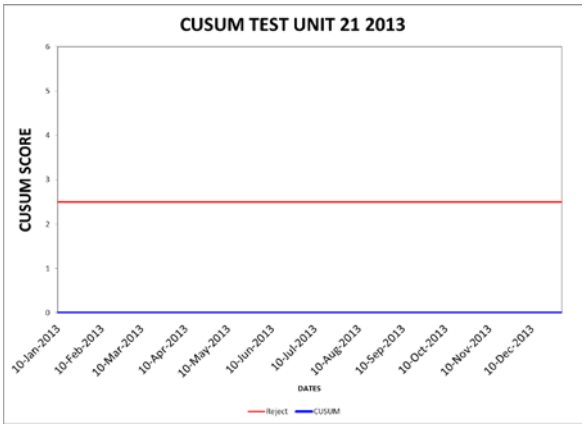


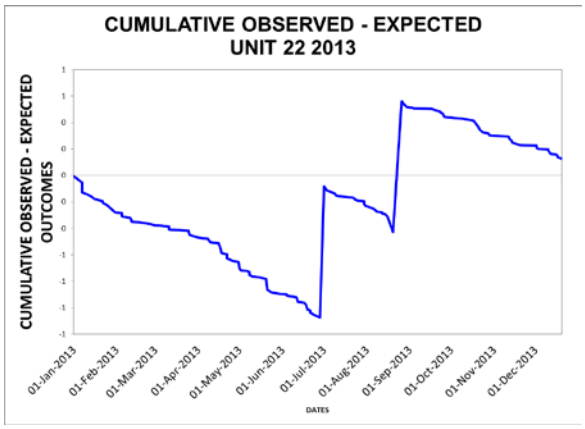


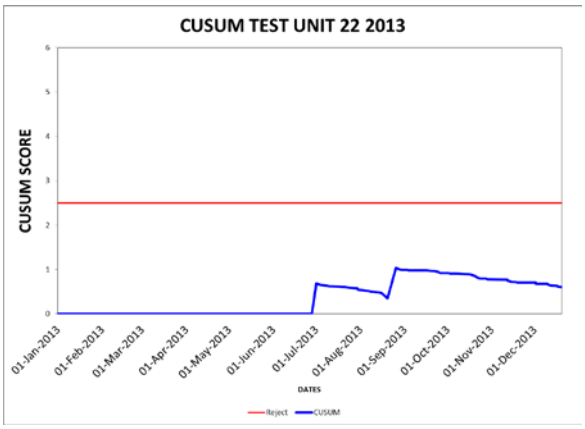


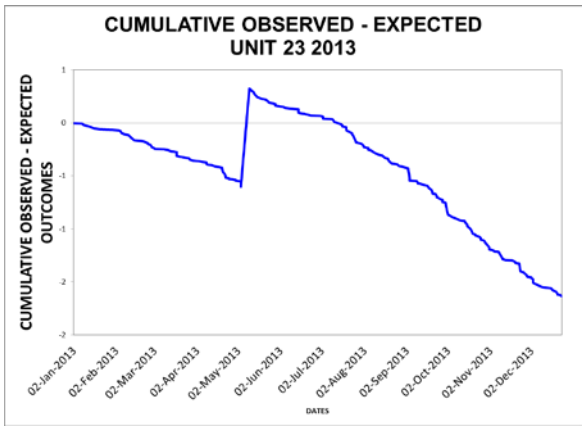
Isolated CABG Surgery

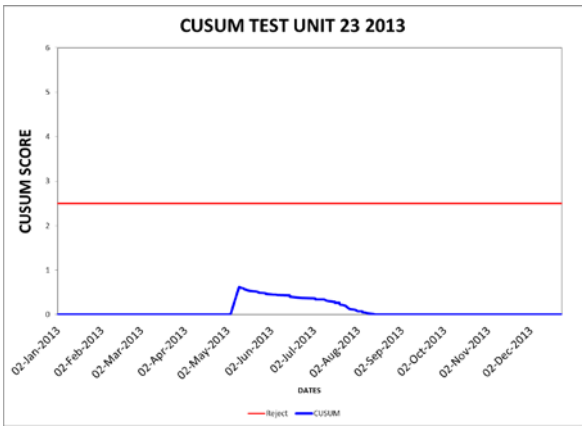


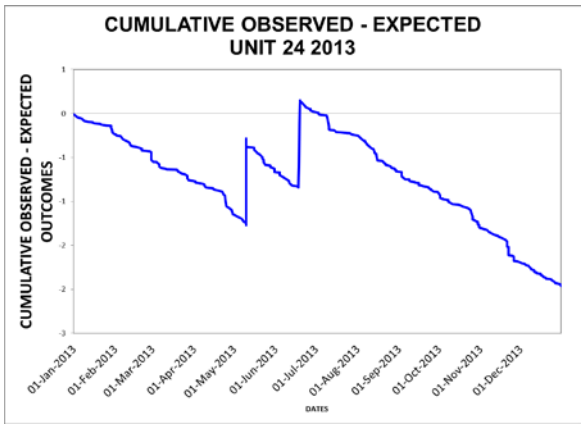


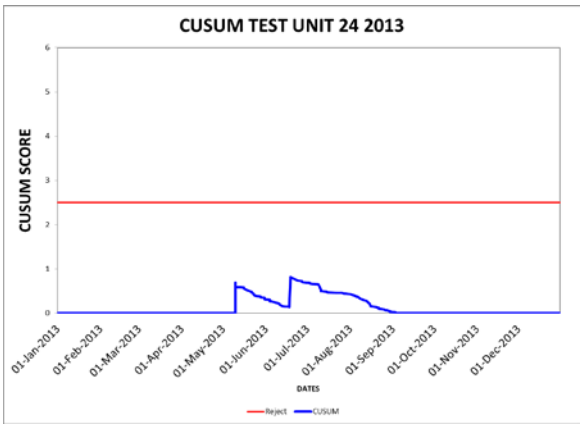




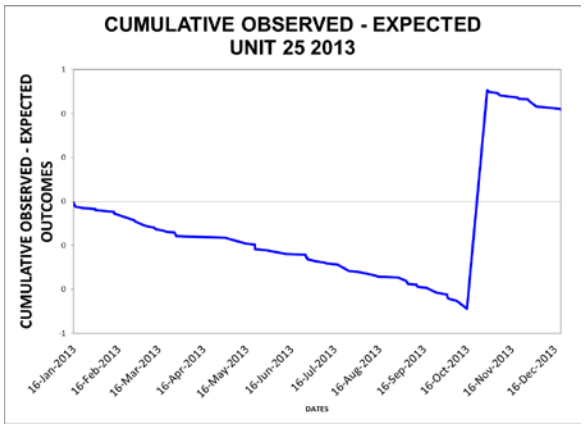


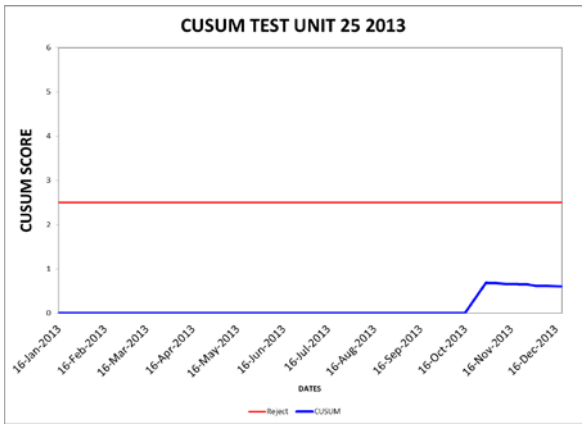


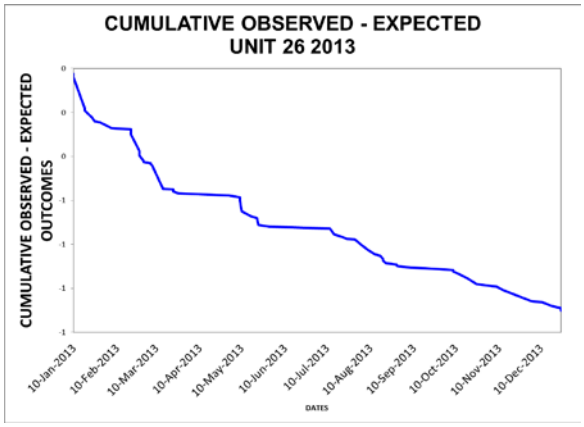


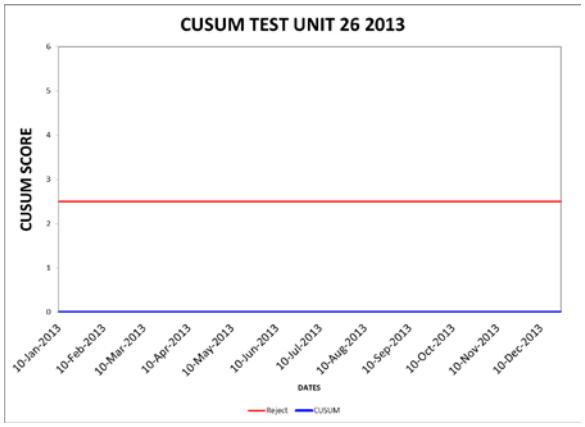


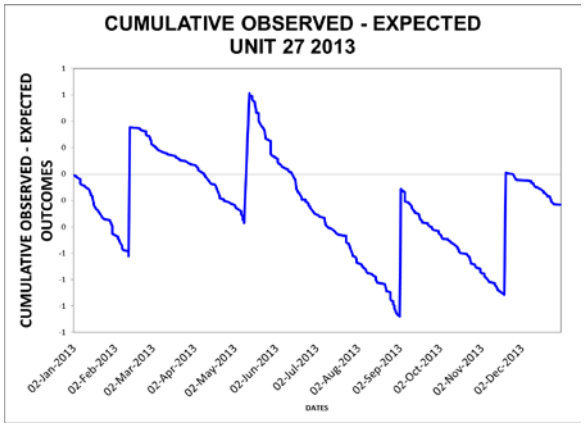
Isolated CABG Surgery

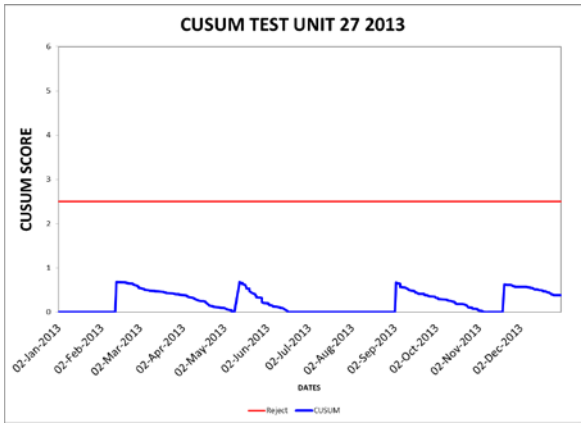












Most Units performed consistently well throughout 2013.

Valve Surgery

Table 17a - Single valve operations 2013

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	1109	18	1.6	80	5	6.3	1189	23	1.9	814	28	3.4
Repair/Reconstruction without Annuloplasty	3	-	-	-	-	-	3	-	-	1	-	-
Commissurotomy without Annuloplasty Ring	1	-	-	-	-	-	1	-	-	-	-	-
Transapical TAVI	6	1	16.7	-	-	-	6	1	16.7	-	-	-
Transfemoral TAVI	46	-	-	2	-	-	48	-	-	-	-	-
Transaortic TAVI	1	-	-	-	-	-	1	-	-	-	-	-
Repair of Paravalvular Leak	-	-	-	1	-	-	1	-	-	-	-	-
Resection Sub-Aortic Stenosis	-	-	-	1	-	-	1	-	-	-	-	-
Inspection Only	-	-	-	-	-	-	-	-	-	1	-	-
Decalcification Only	1	-	-	-	-	-	1	-	-	-	-	-
Valvotomy	1	1	100	-	-	-	1	1	100	-	-	-
Aortic Total*	**1193**	**20**	**1.7**	**92**	**5**	**5.4**	**1285**	**25**	**1.9**	**817**	**28**	**3.4**
Mitral												
Replacement	192	10	5.2	51	1	2.0	243	11	4.5	89	10	11.1
Annuloplasty	26	-	-	1	-	-	27	-	-	48	2	4.2
Repair/Reconstruction with Annuloplasty	251	3	1.2	3	-	-	254	3	1.2	106	4	3.8
Repair/Reconstruction without Annuloplasty	7	-	-	3	-	-	10	-	-	2	-	-
Commissurotomy with Annuloplasty Ring	1	-	-	-	-	-	1	-	-	3	-	-
Repair of Paravalvular Leak	-	-	-	2	-	-	2	-	-	-	-	-
Inspection Only	-	-	-	1	-	-	1	-	-	-	-	-
Mitral Total	**477**	**13**	**2.7**	**61**	**1**	**1.6**	**538**	**14**	**2.6**	**248**	**16**	**6.5**
Tricuspid												
Replacement	13	-	-	5	-	-	18	-	-	2	-	-
Annuloplasty	4	1	25.0	-	-	-	4	1	25.0	1	-	-
Repair/reconstruction with annuloplasty	5	-	-	1	-	-	6	-	-	3	-	-
Repair/reconstruction without annuloplasty	4	-	-	-	-	-	4	-	-	-	-	-
Valvectomy	2	1	50.0	-	-	-	2	1	50.0	-	-	-
Tricuspid Total	**28**	**2**	**7.1**	**6**	**-**	**-**	**34**	**2**	**5.9**	**6**	**-**	**-**
Pulmonary												
Replacement	12	-	-	7	-	-	19	-	-	1	1	100
Repair/reconstruction without Annuloplasty	1	-	-	-	-	-	1	-	-	-	-	-
Pulmonary Total	**13**	**-**	**-**	**7**	**-**	**-**	**20**	**-**	**-**	**1**	**1**	**100**
Total Single Valve	**1711**	**35**	**2.0**	**166**	**6**	**3.6**	**1877**	**41**	**2.2**	**1072**	**45**	**4.2**

Table 17b - Multiple valve operations 2013

Double Valves												
Mitral & Aortic	113	8	7.1	12	-	-	125	8	6.4	43	3	7.0
Mitral & Tricuspid	81	3	3.7	18	-	-	99	3	3.0	23	2	8.7
Aortic & Tricuspid	4	-	-	3	1	33.3	7	1	14.3	5	-	-
Other double valves	4	-	-	1	-	-	5	-	-	1	-	-
Double total	**202**	**11**	**5.4**	**34**	**1**	**2.9**	**236**	**12**	**5.1**	**72**	**5**	**6.9**
Triple total	**19**	**2**	**10.5**	**2**	**1**	**50.0**	**21**	**3**	**14.3**	**7**	**2**	**28.6**
Quats total	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
Total Multiple	**222**	**13**	**5.9**	**36**	**2**	**5.6**	**258**	**15**	**5.8**	**79**	**7**	**8.9**
Total Single	**1711**	**35**	**2.0**	**166**	**6**	**3.6**	**1877**	**41**	**2.2**	**1072**	**45**	**4.2**
Total Valve	**1933**	**48**	**2.5**	**202**	**8**	**4.0**	**2135**	**56**	**2.6**	**1151**	**52**	**4.5**

*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 2013

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

	WITHOUT CABG			**WITH CABG**		
	No.	Died	%	No.	Died	%
Pulmonary Autograft Aortic Root Replacement (Ross)	11	-	-	-	-	-
Aortic Root Replacement with valved conduit	190	6	3.2	30	4	13.3
Root Reconstruction with valve sparing (David)	31	1	3.2	4	-	-

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 2013

	Valve Position							
	Aortic		Mitral		Tricuspid		Pulmonary	
n	2092	%	771*	%	34*	%	20	%
Mechanical	258	12.3	140	42.3#	3	8.8	-	-
Xenograft	1815	86.8	191	57.7#	17	44.7	19	95.0
Allograft	3	0.1	-	-	-	-	-	-
Autograft	9	0.4	-	-	-	-	-	-
Annuloplasty Ring/Band	-	-	439	97.8##	14	41.2	-	-
Not specified	7	0.3	1	1.5	-	-	1	5.0

♦ of all procedures
# of replacements
of repairs
*1 procedure incorrectly coded and therefore excluded from the table

Note: Only procedures with prostheses were included in this table.

Valve Surgery

Table 19 - Valve aetiology by age - Single Aortic Valve with or without CABG 2013 (% of cases)

Age Group	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	55	63	156	474	797	515	2060*
Rheumatic	5.5	6.3	5.8	2.5	1.0	0.4	1.8
Congenital	36.4	27.0	30.1	16.0	4.9	1.2	10.0
Idiopathic Calcific	3.6	20.6	41.0	62.7	80.3	88.7	71.5
Myxomatous degeneration	-	1.6	1.9	2.7	1.9	1.6	1.9
Failed prior repair	3.6	-	-	0.2	-	-	0.1
Prosthetic valve failure	10.9	3.2	4.5	0.4	1.4	0.4	1.5
Peri-prosthetic leak	1.8	-	1.3	1.1	-	-	0.4
Prosthetic valve thrombosis	1.8	-	-	-	-	-	0.0
Active infection	14.5	19.0	4.5	4.0	1.5	0.6	3.0
Previous infection	7.3	9.5	1.3	1.1	0.5	0.2	1.1
Marfans	5.5	-	-	0.2	-	-	0.2
Annuloaortic ectasia	5.5	-	1.3	1.1	0.6	0.4	0.8
Other degenerative disease	-	6.3	2.6	3.0	2.6	2.3	2.7
Dissection	-	-	-	-	-	-	-
Tumour	-	-	-	-	-	-	-
Trauma	-	-	-	-	-	-	-
Iatrogenic	-	-	-	-	-	0.2	0.0
Other	-	3.2	1.9	0.8	0.6	1.2	1.0
Unknown	-	1.6	0.6	0.8	1.3	1.6	1.2

*42 missing cases

Valve Surgery

Table 20 - Valve aetiology by age - Mitral Valve with or without CABG 2013 (% of cases)

Age Group	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	50	47	152	201	195	82	727*
Rheumatic	24.0	21.3	10.5	5.5	7.2	6.1	9.4
Congenital	8.0	6.4	1.3	1.0	-	-	1.5
Ischaemic	4.0	2.1	13.2	16.4	17.4	13.4	13.9
Idiopathic Calcific	2.0	4.3	1.3	6.0	7.2	11.0	5.5
Myxomatous degeneration	30.0	40.4	48.7	45.8	41.0	48.8	44.0
Failed prior repair	2.0	4.3	3.9	1.5	3.6	-	2.6
Prosthetic valve failure	4.0	-	-	-	1.0	3.7	1.0
Peri-prosthetic leak	-	-	1.3	1.5	1.0	1.2	1.1
Prosthetic valve thrombosis	2.0	2.1	-	-	-	1.2	0.4
Active infection	14.0	10.6	3.3	9.0	3.6	2.4	6.1
Previous infection	4.0	4.3	2.6	0.5	2.1	2.4	2.1
Marfans	-	-	0.7	-	-	-	0.1
Other degenerative disease	-	-	3.3	1.0	4.1	1.2	2.2
Dissection	-	-	-	-	-	-	-
Tumour	-	-	-	-	-	-	-
Trauma	-	-	-	-	-	-	-
Iatrogenic	-	-	-	0.5	-	-	0.1
Functional mitral	-	2.1	3.9	7.0	6.7	3.7	5.1
Other	6.0	2.1	3.9	4.0	4.6	3.7	4.1
Unknown	-	-	2.0	0.5	-	-	0.6

*59 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	1285	25	1.9
Aortic Valve Replacement	1189	23	1.9
Mitral Valve Surgery	538	14	2.6
Mitral Valve Replacement	243	11	4.5
Mitral Valve Repair	292	3	1.0
Tricuspid Valve Surgery	34	2	5.9
Pulmonary Valve Surgery	20	-	-
Mitral & Aortic Valve Surgery	125	8	6.4
Mitral & Tricuspid Valve Surgery	99	3	3.0
Aortic & Tricuspid Valve Surgery	7	1	14.3
Other Double Valve Surgery	5	-	-
Triple Valve Surgery	21	3	14.3
Quadruple Valve Surgery	1	-	-
Total Valves Only	**2135**	**56**	**2.6**

Valves & CABG Only	Number of Operations	Mortality (n)	Mortality (%)
Aortic Valve Surgery & CABG	817	28	3.4
Aortic Valve Replacement & CABG	814	28	3.4
Mitral Valve Surgery & CABG	248	16	6.5
Mitral Valve Replacement & CABG	89	10	11.2
Mitral Valve Repair & CABG	159	6	3.8
Tricuspid Valve Surgery & CABG	6	-	-
Pulmonary Valve Surgery & CABG	1	1	100
Mitral & Aortic Valve Surgery & CABG	43	3	7.0
Mitral & Tricuspid Valve Surgery & CABG	23	2	8.7
Aortic & Tricuspid Valve Surgery & CABG	5	-	-
Other Double Valve Surgery & CABG	1	-	-
Triple Valve Surgery & CABG	7	2	28.6
Total Valves & CABG Only	**1151**	**52**	**4.5**
TOTAL VALVE (with or without CABG)	**3286**	**108**	**3.3**

Valve Surgery

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

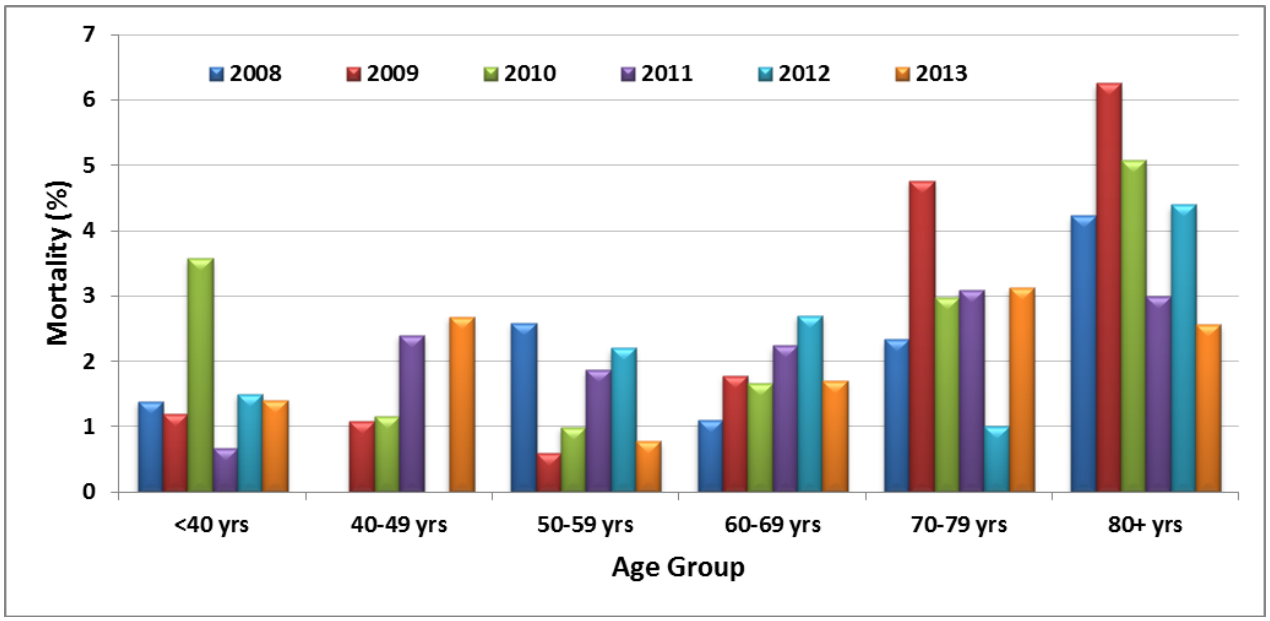


Table 22 - Mortality by age for any single valve procedure without CABG 2013

	Mortality (mortality/n, %)											
	Age Group											
	<40 years		40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs		80+ yrs	
Aortic	1/55	1.8	2/60	3.3	1/130	0.8	5/316	1.6	9/426	2.1	7/298	2.3
Mitral	0/59	-	1/45	2.2	1/126	0.8	2/143	1.4	8/114	7.0	2/51	3.9
Tricuspid	1/12	8.3	0/4	-	0/1	-	1/10	10.0	0/5	-	0/2	-
Pulmonary	0/16	-	0/3	-	0/1	-	-	-	-	-	-	-
Total	2/142	1.4	3/112	2.7	2/258	0.8	8/469	1.7	17/545	3.1	9/351	2.6

Valve Surgery

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

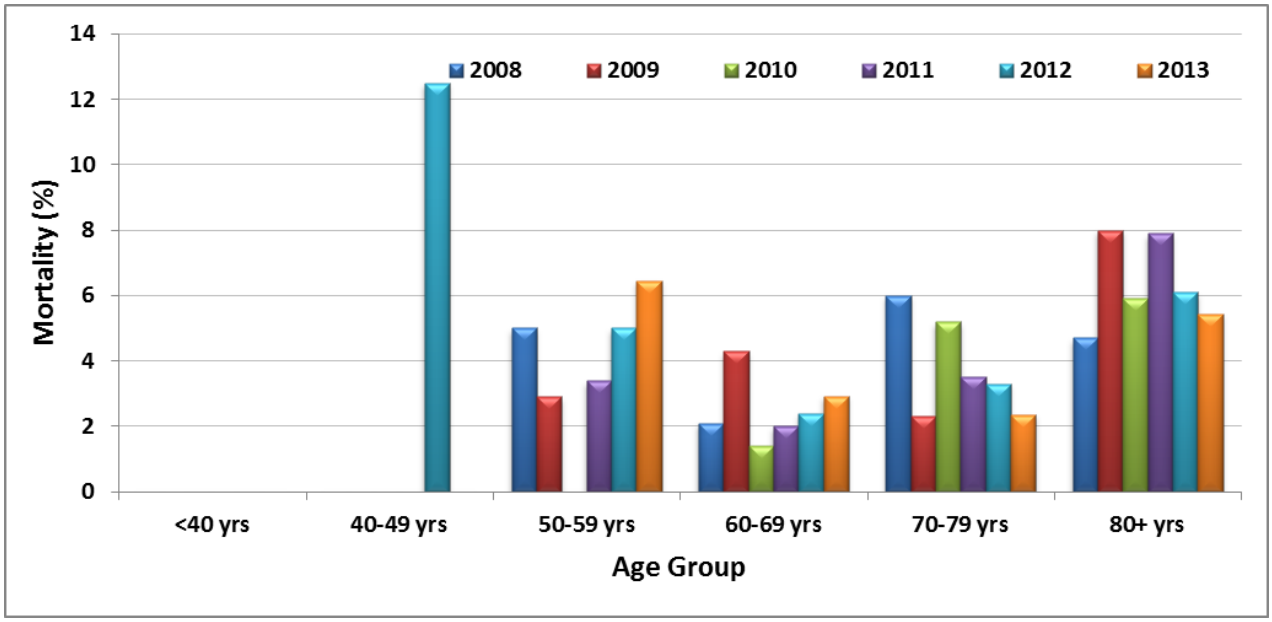


Table 23 - Mortality rate for single Aortic Valve Replacement with CABG procedures by age group 2008 - 2013

	Mortality (mortality/n, %)											
	Age Group											
	<40 years		40-49 yrs		50-59 yrs		60-69 yrs		70-79 yrs		80+ yrs	
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
2008	-	-	0/2	-	1/20	5.0	2/94	2.1	13/215	6.0	6/129	4.7
Total	0/8	-	1/33	3.0	7/184	3.8	20/798	2.5	64/1778	3.6	72/1191	6.0

Valve Surgery

Figure 18: Mortality rate for isolated Mitral Valve procedures

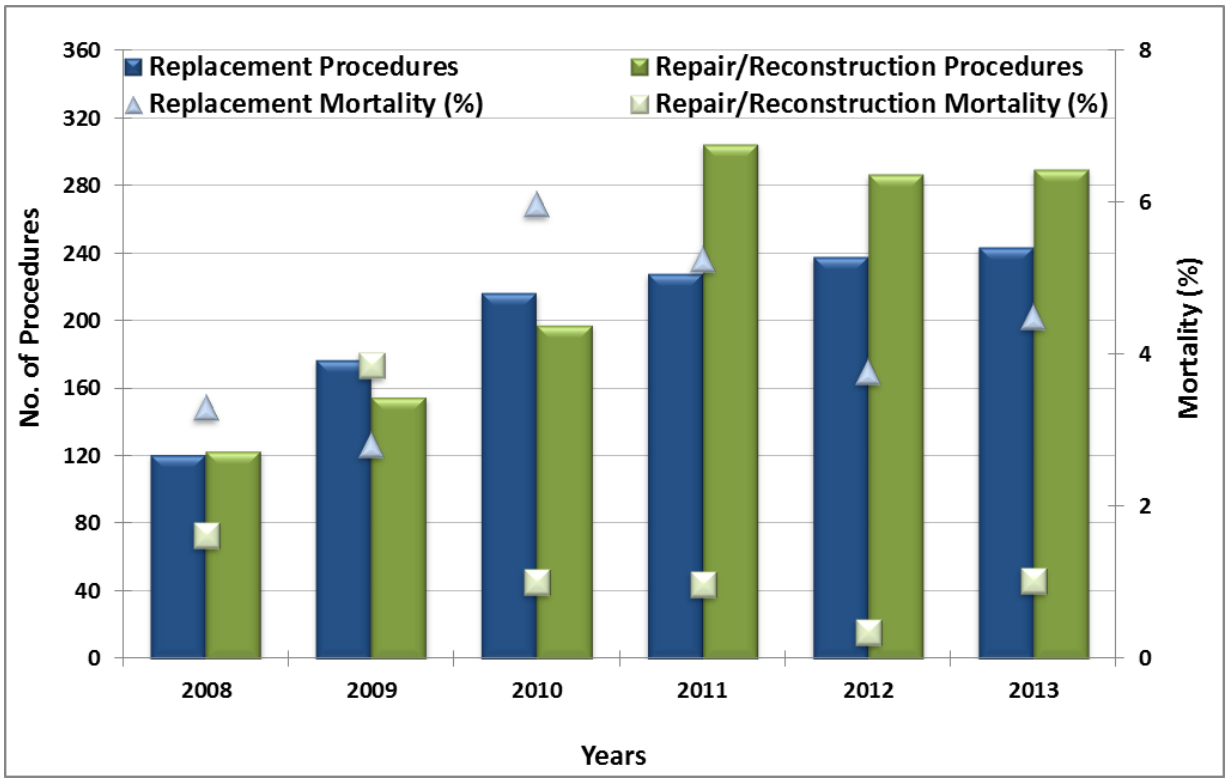
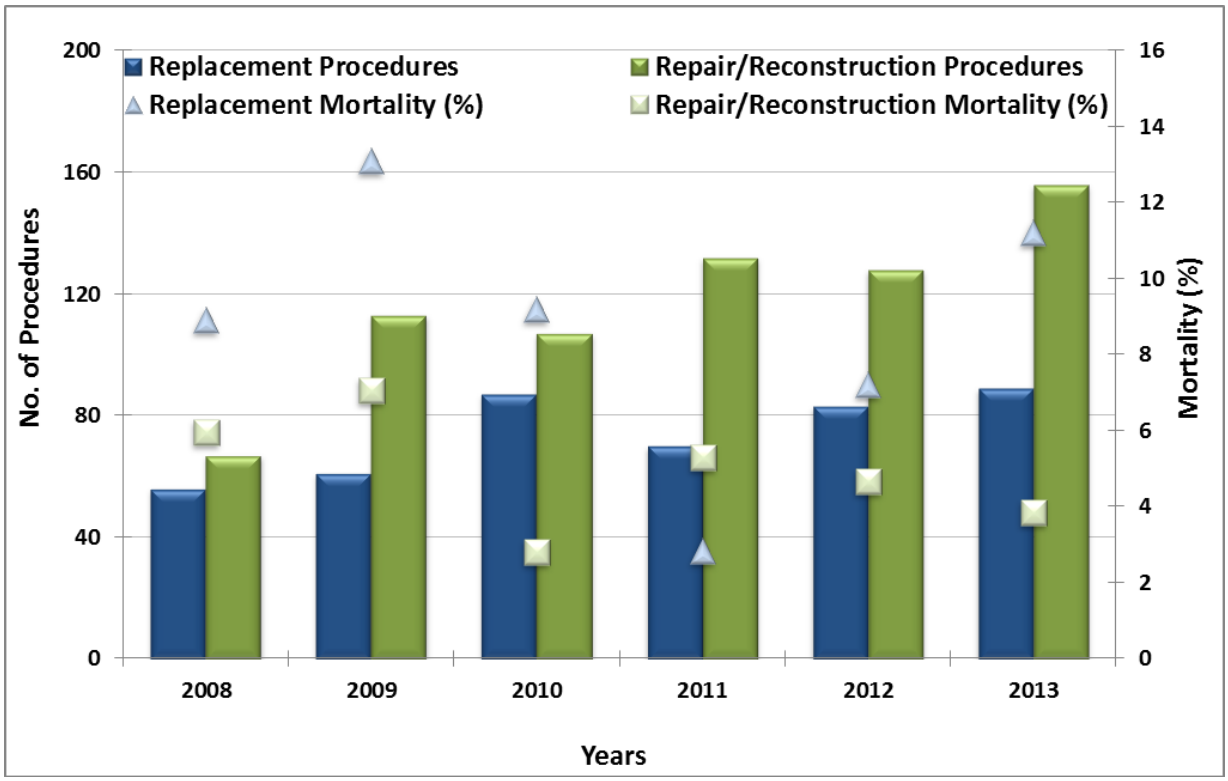


Figure 19: Mortality rate for Mitral Valve with CABG procedures



Valve Surgery

Figure 20: Mortality for single Aortic Valve Replacement by Unit 2013

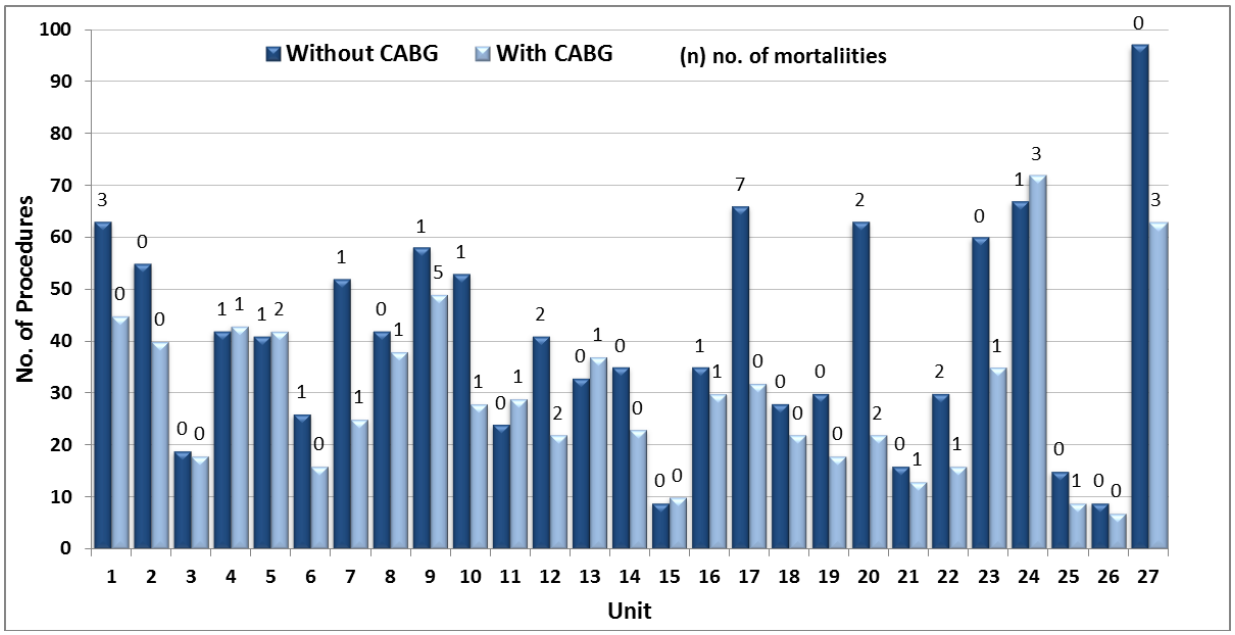
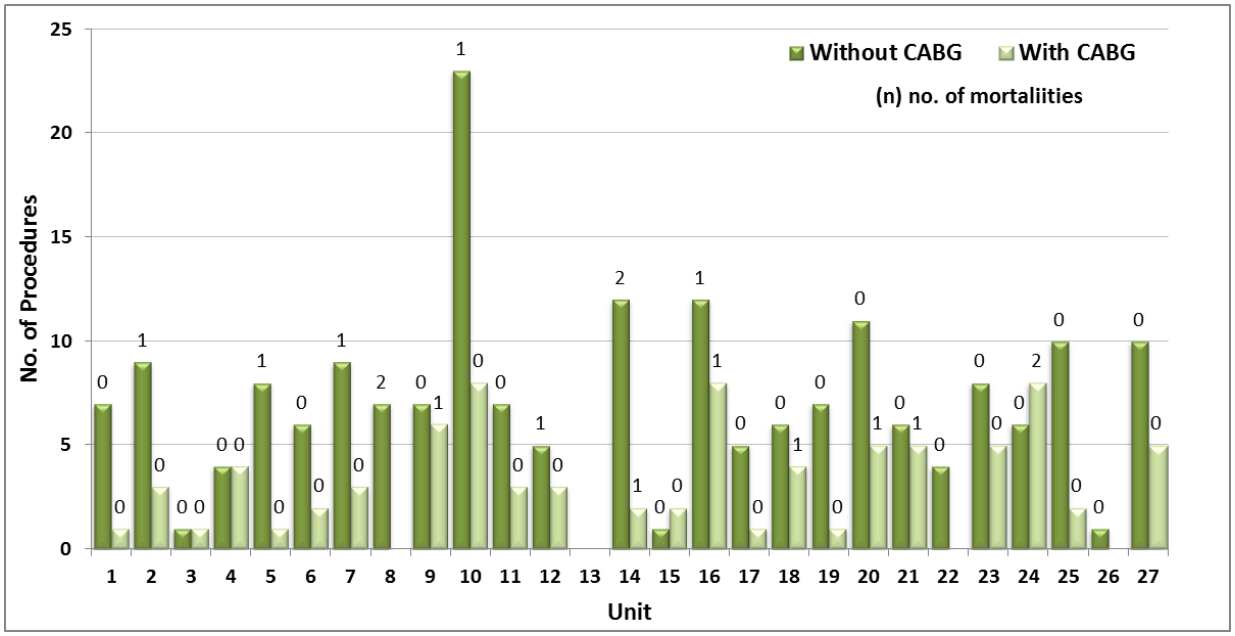


Figure 21: Mortality for single Mitral Valve Replacement by Unit 2013



Valve Surgery

Figure 22: Mortality rate for single Aortic Valve Replacement with CABG procedures by year and age group

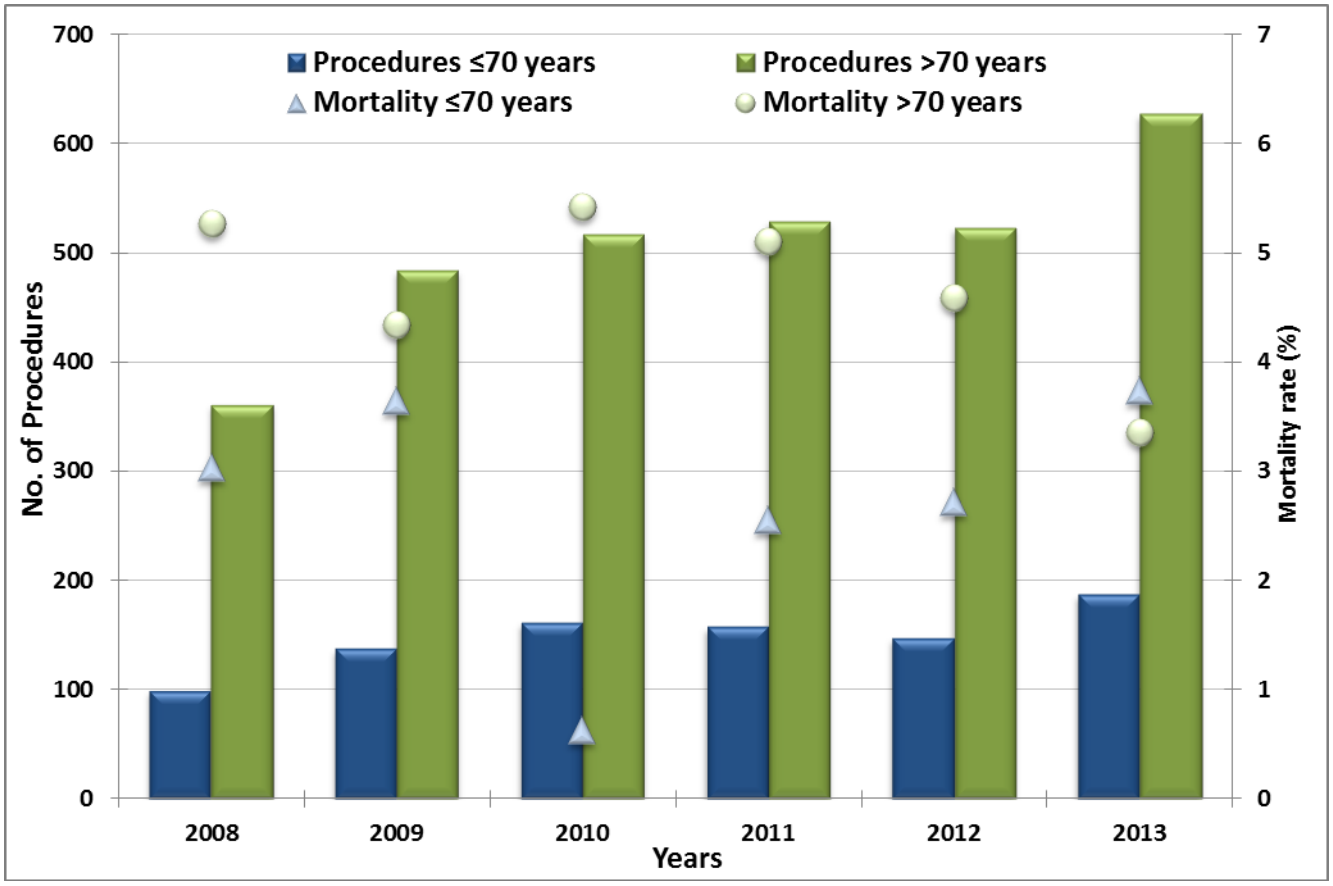
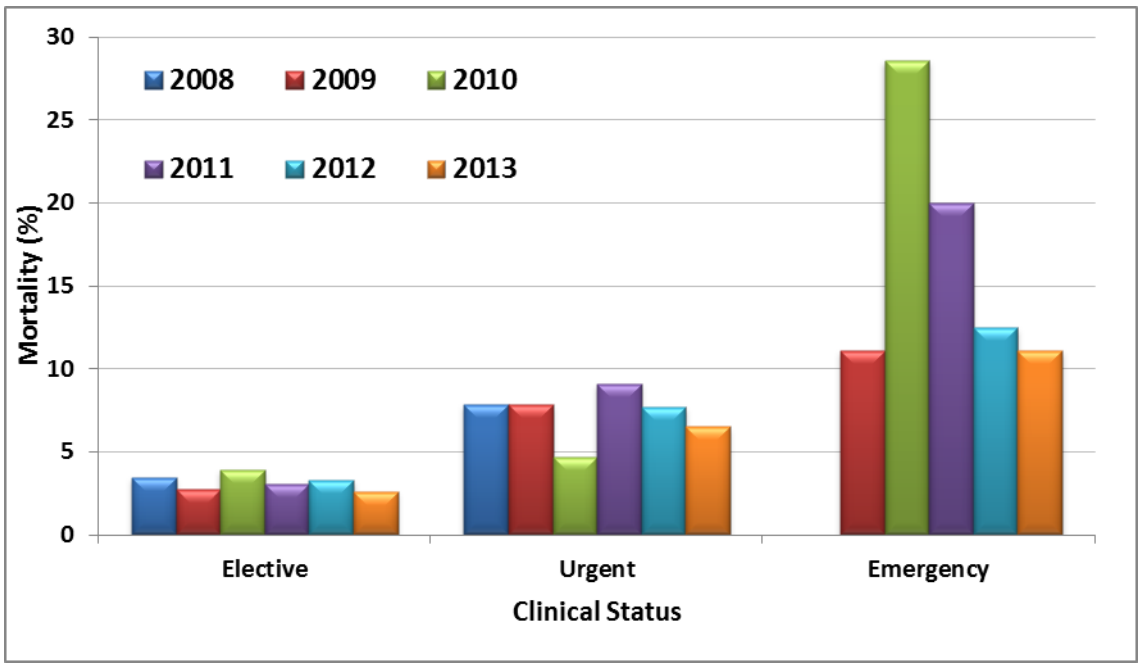


Figure 23: Mortality rate for Aortic Valve Replacement with CABG procedures by clinical status and year



Valve Surgery

Table 24a - Mortality rate for Aortic Valve Replacement with CABG procedures by clinical status 2008 - 2013

	Mortality (mortality/n, %)					
	Clinical Status					
	Elective		Urgent		Emergency	
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
2008	12/348	3.4	8/102	7.8	0/7	-
Total	99/3142	3.2	53/729	7.3	7/50	14.0

Table 24a: In 2013, elective surgery for Aortic Valve Replacement with CABG procedures had an average mortality of 2.6% which is less than the mortality reported for urgent (6.5%) and emergency (11.1%). Over the past 6 years, the average mortality for elective Aortic Valve Replacement with CABG was 3.2%, for urgent 7.3% and for the small number of emergency cases, 14.0%.

Table 24b - Mortality rate for isolated Aortic Valve Replacement by clinical status 2008 - 2013

	Mortality (mortality/n, %)					
	Clinical Status					
	Elective		Urgent		Emergency	
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
2008	8/423	1.8	2/79	2.5	0/2	-
Total	83/4631	1.7	24/587	4.1	4/43	9.3

A similar trend is shown for isolated Aortic Valve Replacement procedures over the past 6 years where the average mortality for elective procedures is reported as 1.7%, urgent 4.1% and emergency 9.3%.

Valve Surgery

Table 25a - Mortality rate for Aortic Valve Replacement with CABG procedures by redo 2008 - 2013

	Mortality (mortality/n, %)			
	Redo			
	Yes		No	
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
2008	5/35	14.3	17/425	4.0
Total	20/285	7.0	144/3644	4.0

Table 25a shows that in 2013, the overall mortality rate for redo surgery for Aortic Valve Replacement and CABG procedures (5.6%) is higher than the mortality reported for first procedure (3.3%).

Table 25b - Mortality rate for Isolated Aortic Valve Replacement procedures by redo 2008 - 2013

	Mortality (mortality/n, %)			
	Redo			
	Yes		No	
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
2008	6/76	7.9	4/428	0.9
Total	32/770	4.2	79/4491	1.6

Although the results vary from year to year, the data for isolated Aortic Valve Replacement procedures over the past 6 years shows the average mortality for redo procedures more than double (4.2%) compared to first procedures (1.6%).

Valve Surgery

Table 26 - Post-operative complications by valve position – isolated single valve 2013 (% of cases)

	Valve Position			
	Aortic	Mitral	Tricuspid or Pulmonary	Total
n	1279	533	54	1866*
New Renal Failure	5.6	4.1	5.6	5.1
Cerebrovascular complication	1.8	2.2	1.9	1.9
Permanent Stroke	1.0	2.1	-	1.3
Transient Stroke	0.9	0.2	1.9	0.7
Continuous coma	-	0.2	-	0.1
Deep Sternal Infection (30 days post-op)	0.5	-	1.9	0.4
Septicaemia	0.8	0.4	-	0.6
Return to theatre (all cause)	5.2	7.9	13.0	6.2
Re-op for Bleeding	2.6	3.5	1.9	2.9
New Cardiac Arrhythmia	29.5	26.1	16.7	28.1
Pneumonia	2.3	2.6	1.9	2.4
GIT complication	1.0	0.4	1.9	0.9
Multi-system Failure	0.7	0.7	-	0.7
Anticoagulant complication	0.3	0.9	-	0.5
Red Blood Cells transfused	34.5	34.3	35.2	34.5
Non-RBC blood products	22.9	26.9	33.3	24.4

*11 missing cases

Valve Surgery

Table 27 - Post-operative complications by valve position – single valve with CABG 2013 (% of cases)

	Valve Position			
	Aortic	Mitral	Tricuspid or Pulmonary	Total
n	816	246	7	1069*
New Renal Failure	6.0	8.5	28.6	6.7
Cerebrovascular complication	2.6	4.4	-	3.0
Permanent Stroke	1.3	3.3	-	1.8
Transient Stroke	1.0	1.2	-	1.0
Continuous coma	0.5	1.2	-	0.7
Deep Sternal Infection (30 days post-op)	1.3	2.0	-	1.5
Septicaemia	1.1	1.6	-	1.2
Return to theatre (all cause)	8.6	11.8	-	9.3
Re-op for Bleeding	4.2	6.0	-	4.6
New Cardiac Arrhythmia	39.2	41.5	14.3	39.5
Pneumonia	4.8	9.3	14.3	5.9
GIT complication	2.1	3.7	14.3	2.5
Multi-system Failure	1.2	3.3	-	1.7
Anticoagulant complication	0.6	0.4	14.3	0.7
Red Blood Cells transfused	54.6	59.9	57.1	55.8
Non-RBC blood products	37.6	42.9	57.1	38.9

*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)	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
	2009	11.0	11.0	7.0
Intensive Care Stay (hours)	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
	2009	29.0	31.0	33.0
Post-op Length of Stay (days)	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
	2009	7.0	8.0	7.5

Valve Surgery

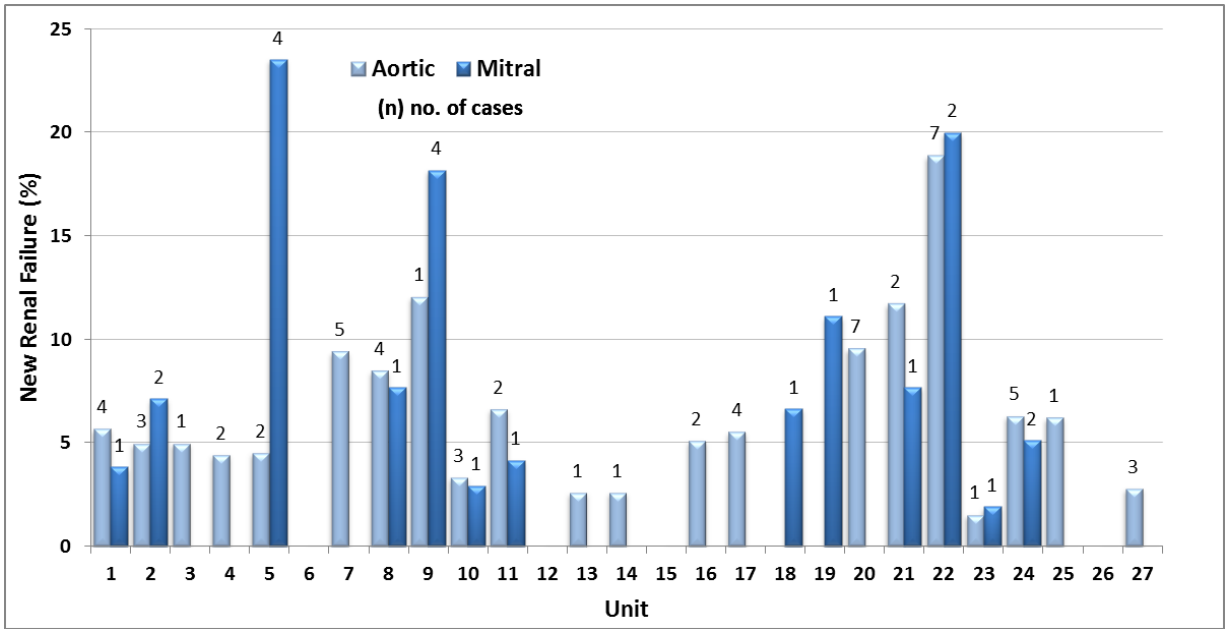
Table 29 - Resource utilisation by valve position – Single valve with CABG (median value)

		Aortic	Mitral	Tricuspid or Pulmonary
Intubation Time (hours)	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
	2009	14.0	18.0	15.0
Intensive Care Stay (hours)	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
	2009	43.0	62.0	34.0
Post-op Length of Stay (days)	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
	2009	9.0	9.0	6.5

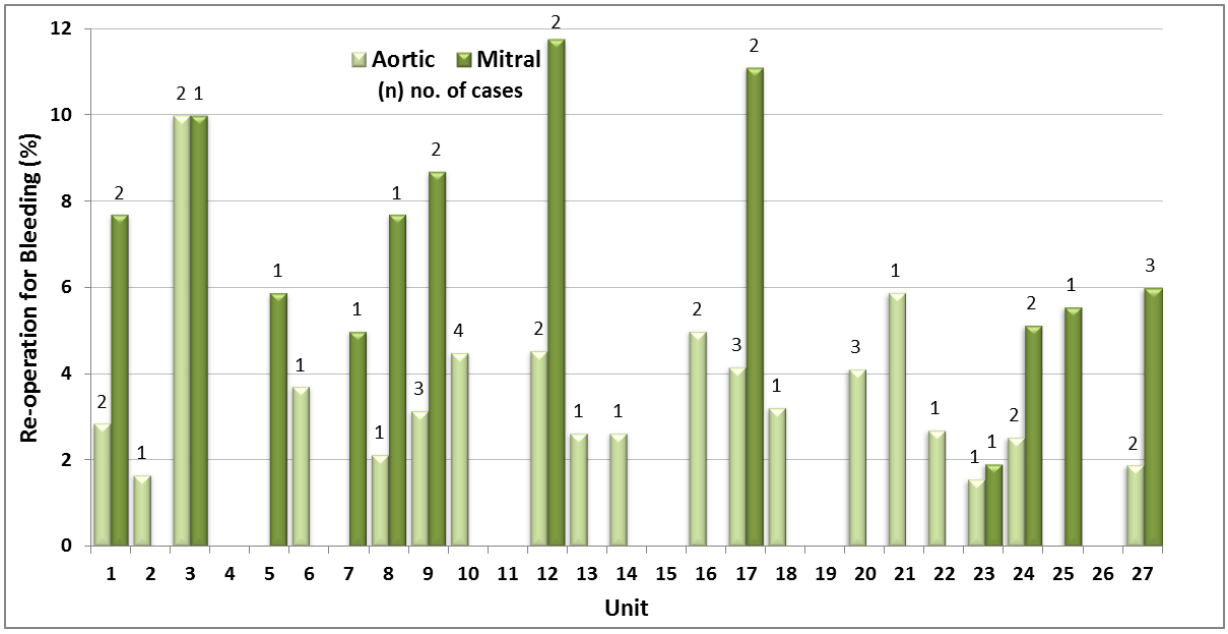
Valve Surgery

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

a) New renal failure rate by valve position and Unit 2013



b) Re-operation for bleeding by valve position and Unit 2013



.Valve Surgery

Table 30a - Post-operative complications by age – any single valve procedure with CABG 2013 (% of cases)

	Age Group (%)						
	<40 years	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	4	13	68	248	474	262	1069*
New Renal Failure	25.0	7.7	8.8	4.8	6.3	8.4	6.7
Cerebrovascular complication	-	-	5.8	2.8	2.7	3.1	3.0
Permanent Stroke	-	-	4.4	2.0	1.5	1.5	1.8
Transient Stroke	-	-	2.9	0.4	1.3	0.8	1.0
Continuous Coma	-	-	-	2.0	-	0.8	0.7
Deep Sternal Infection (30 days post-op)	25.0	-	1.4	1.6	1.5	1.1	1.5
Septicaemia	25.0	-	-	1.6	1.1	1.1	1.2
Return to theatre (all cause)	25.0	-	8.8	8.9	8.9	10.7	9.3
Re-op for Bleeding	25.0	-	8.7	3.2	3.8	6.1	4.6
Peri-operative AMI	-	-	2.9	0.8	2.3	0.8	1.6
New Cardiac Arrhythmia	25.0	23.1	29.0	35.1	38.4	49.6	39.5
Pneumonia	-	23.1	5.9	4.8	5.5	6.9	5.9
GIT complication	25.0	-	2.9	1.2	2.7	3.1	2.5
Multi-system Failure	25.0	-	-	1.2	2.1	1.5	1.7
Anticoagulant complication	25.0	-	1.4	0.8	0.2	0.8	0.7
Red Blood Cells transfused	50.0	61.5	36.2	51.8	55.7	64.9	55.8
Non-RBC blood products	25.0	61.5	30.4	37.3	40.1	39.7	38.9

*3 missing cases

Valve Surgery

Table 30b - Post-operative complications by age - any single valve procedure with CABG 2012 (% of cases)

	Age Group (%)						
	<40 yrs	40-49 yrs	50-59 yrs	60-69 yrs	70-79 yrs	80+ yrs	Total
n	4	16	70	192	379	232	893*
New Renal Failure	-	12.5	4.3	4.2	6.6	6.9	6.0
Cerebrovascular complication	-	-	1.4	4.2	3.2	2.6	3.0
Permanent Stroke	-	-	-	2.1	1.8	2.6	1.9
Transient Stroke	-	-	1.4	2.1	1.1	-	1.0
Continuous Coma	-	-	-	0.5	0.5	0.4	0.4
Deep Sternal Infection (30 days post-op)	-	-	-	2.6	1.8	0.4	1.5
Septicaemia	-	-	-	2.1	1.3	0.9	1.2
Return to theatre (all cause)	-	12.5	8.6	11.5	8.4	7.8	9.0
Re-op for Bleeding	-	6.2	7.1	6.2	4.2	4.3	4.9
Peri-operative AMI	-	6.2	-	0.5	0.8	0.4	0.7
New Cardiac Arrhythmia	-	31.2	42.9	35.9	40.1	39.7	39.0
Pneumonia	-	-	8.6	3.6	3.4	6.0	4.5
GIT complication	-	12.5	2.9	0.5	2.1	1.7	1.9
Multi-system Failure	-	6.2	2.9	1.0	1.6	3.0	2.0
Anticoagulant complication	-	6.2	-	1.0	0.8	0.9	0.9
Red Blood Cells transfused	25.0	56.2	56.5	47.4	58.9	64.4	57.5
Non-RBC blood products	-	50.0	36.2	40.1	43.9	48.1	43.5

*5 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)	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
	2009	124.5	15.0	16.5	15.0	14.0	14.0
Intensive Care Stay (hours)	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
	2009	182.5	45.0	45.5	44.5	45.0	47.0
Post-op Length of Stay (days)	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
	2009	13.0	6.5	8.0	8.0	9.0	10.0

The effect of age on post-operative complications and Resource Utilisation after single valve and CABG surgery is illustrated in Tables 32 and 33. The incidence of most major complications and blood utilisation is consistently related to age.

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)	**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
	2009	10.0	14.5	18.0	15.0	16.5	14.0
Intensive Care Stay (hours)	**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
	2009	48.0	27.5	53.0	48.5	70.0	65.0
Post-op Length of Stay (days)	**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
	2009	8.0	8.5	10.5	13.0	14.0	11.0

Other Cardiac Surgery

Table 33 - Other surgery types 2013

Surgery type (NOT mutually exclusive)	Total number of procedures	Mortality by procedure 2013	
		n (mort)	%
Left Ventricular Aneurysm	13	-	-
Acquired VSD	18	3	16.7
Aortic Procedure*	703	38	5.4
Aneurysm – Asc only	420	13	3.1
– Asc + Arch	84	5	6.0
– Arch only	17	1	5.9
– Desc	3	-	-
– Thor/Abd only	4	2	50.0
– Arch + Desc	4	1	25.0
– Desc + Thor	2	-	-
– Asc Arch + Desc	4	1	25.0
– Asc Arch + Desc + Thor	-	-	-
– Others	-	-	-
Dissection – Asc – Acute	79	13	16.5
– Asc – Chronic	7	1	14.3
– Desc – Acute	2	-	-
– Desc – Chronic	-	-	-
Acute Traumatic Aortic Transection	-	-	-
Cardiac Trauma	4	-	-
LVOT Myectomy for HOCM	56	2	3.6
LV Rupture Repair	4	-	-
Pericardiectomy	23	2	8.7
Pulmonary Thrombo-endarterectomy	11	1	9.1
Carotid Endarterectomy	19	2	10.5
Left Ventricular Reconstruction	4	1	25.0
Pulmonary Embolectomy	12	1	8.3
Cardiac Tumour	58	1	1.7
Cardiac Transplant	97	5	5.2
Congenital – ASD	138	-	-
– Other	84	1	1.2
Permanent LV Epicardial Lead	67	1	1.5
Atrial Arrhythmia Surgery	319	7	2.2

*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 - Major complication by age 2013 (% of cases)

	Age Group (years)						
	<40	40-49	50-59	60-69	70-79	80+	Total
n	435	647	1802	3192	3128	1251	10455
New Renal Failure	4.8	2.5	3.7	4.4	6.4	8.2	5.2
Cerebrovascular complication	2.3	1.2	1.3	1.5	2.2	3.1	1.9
Permanent Stroke	1.6	1.1	0.8	1.0	1.4	2.1	1.3
Transient Stroke	0.7	0.2	0.3	0.6	0.6	0.7	0.5
Continuous Coma	-	-	0.3	0.3	0.3	0.7	0.3
Deep Sternal Infection (30 days post-op)	1.6	1.7	0.8	1.1	0.9	0.6	1.0
Re-op for Bleeding	5.3	3.6	2.9	3.0	3.0	4.6	3.3

Table 34b - Resource utilisation by age 2013 (median value)

	Age Group (years)					
	<40	40-49	50-59	60-69	70-79	80+
Intubation Time (hours)	9.0	9.0	10.0	11.0	12.0	12.5
Intensive Care Stay (hours)	46.0	45.0	46.0	47.0	49.0	55.0
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 - Major complication by procedure type 2013 (% of cases)

	Procedure Type				
	Isolated CABG	Valve(s) only	Valve(s) + CABG	Other	Total
n	5365	2116	1148	1793	10422*
New Renal Failure	3.6	5.6	7.2	8.4	5.2
Deep Sternal Infection (30 days post-op)	1.0	0.6	1.6	1.1	1.0
Re-op for Bleeding	2.1	3.6	4.4	6.0	3.3
Red Blood Cells transfused	32.9	36.8	57.0	40.5	37.6
Non-RBC blood products transfused	21.4	27.5	40.8	42.9	28.5

*33 missing cases

Table 35b - Resource utilisation by procedure type 2013 (median value)

	Procedure Type			
	Isolated CABG	Valve(s) only	Valve(s) + CABG	Other
Intubation Time (hours)	10.0	10.0	14.0	13.0
Intensive Care Stay (hours)	46.0	47.0	55.0	59.0
Post-op Length of Stay (days)	7.0	8.0	9.0	9.0

Data for the entire cardiac surgical population

Table 36a - Major complication by LV function 2013 (% of cases)

	LV Dysfunction				
	Normal	Mild	Moderate	Severe	Total
n	5684	2907	1127	410	10128*
New Renal Failure	4.0	5.6	6.7	15.1	5.2
Cerebrovascular complication	1.6	2.0	2.2	2.9	1.8
Permanent Stroke	1.0	1.3	1.7	2.0	1.2

*33 missing cases

Table 36b - Resource utilisation by LV function 2013 (median value)

	LV Dysfunction			
	Normal	Mild	Moderate	Severe
Intubation Time (hours)	10.0	11.0	13.0	21.0
Post-op Length of Stay (days)	7.0	7.2	8.0	12.0

Data for the entire cardiac surgical population

Table 37 - Major complication by diabetes 2013 (% of cases)

	Diabetes		
	Yes	No	Total
n	3007	7444	10451*
New Renal Failure	6.5	4.7	5.2
Cerebrovascular complication	2.2	1.8	1.9
Permanent Stroke	1.4	1.2	1.3
Deep Sternal Infection (30 days post-op)	1.8	0.6	1.0

*4 missing data

Table 38 - Major complication by pre-operative renal function 2013 (% of cases)

	Pre-op EGFR		
	> 60 mL/min/1.73m^2	≤ 60 mL/min/1.73m^2	Total
n	7774	2681	10455
New Renal Failure	3.6	10.0	5.2
Deep Sternal Infection (30 days post-op)	0.9	1.2	1.0
Re-op for Bleeding	2.8	4.7	3.3

Table 39 - Post procedural length of stay by renal function 2013 (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 - Major complication by clinical status 2013 (% of cases)

	Operative Status				
	Elective	Urgent	Emergency	Salvage	Total
n	7579	2549	306	21	10455
New Renal Failure	4.6	5.8	15.7	21.1	5.2
Cerebrovascular complication	1.8	1.5	7.2	14.3	1.9
Permanent Stroke	1.1	1.0	5.4	15.8	1.3
Re-op for Bleeding	2.8	4.2	7.2	9.5	3.3

Table 40b - Post procedural length of stay by clinical status 2013 (median value)

	Operative Status			
	Elective	Urgent	Emergency	Salvage
Post-op Length of Stay (days)	7.0	8.0	11.0	10.0

Table 41 - Major complication by redo procedure 2013 (% of cases)

	1st Proc	Redo	Total
n	9596	859	10455
New Renal Failure	4.9	9.0	5.2
Cerebrovascular complication	1.8	2.7	1.9
Permanent Stroke	1.2	1.8	1.3
Deep Sternal Infection (30 days post-op)	1.0	1.0	1.0
Re-op for Bleeding	3.1	5.2	3.3

Data for the entire cardiac surgical population

Table 42a - Major complication by respiratory disease 2013 (% of cases)

	Respiratory Disease				
	No	Mild	Moderate	Severe	Total
n	8994	980	363	118	10455
Deep Sternal Infection (30 days post-op)	0.8	2.2	1.4	-	1.0

Table 42b - Intubation time by respiratory disease in 2013 (median value)

	Respiratory Disease				
	No	Mild	Moderate	Severe	Total
Intubation Time	11.0	12.0	14.0	21.5	11.0

Data for the entire cardiac surgical population

Table 43a - Complications by previous cerebrovascular disease and atrial arrhythmia 2013 (% of cases)

	Previous Cerebrovascular Disease			Atrial Arrhythmia		
	Yes	No	Total	Yes	No	Total
n	987	9426	10413*	1452	8962	10414**
Cerebrovascular complication	4.0	1.7	1.9	2.7	1.8	1.9
Permanent Stroke	2.7	1.1	1.3	1.8	1.2	1.3
Transient Stroke	1.2	0.4	0.5	0.8	0.4	0.5
Continuous Coma	0.7	0.3	0.3	0.7	0.3	0.3

*42 missing cases, **41 missing cases

Table 43b - Complications by CPB time 2013 (% of cases)

	CPB time			
	≤1 hrs	>1 to ≤3 hrs	>3 hrs	Total
n	1262	7707	845	9879*
Cerebrovascular complication	0.8	1.7	5.7	2.0
Permanent Stroke	0.6	1.1	3.8	1.3
Transient Stroke	0.2	0.5	1.2	0.5
Continuous Coma	0.1	0.2	1.9	0.3

*42 missing cases

Table 44 - Deep Sternal Infection within 30 days of surgery – BITA – Obesity – Return to theatre 2008 - 2013 (% of cases)

	BITA (%)			Obesity (%)			Return to theatre (all cause, %)		
Deep Sternal Infection (30 days post-op)	Yes	No	Total	Yes	No	Total	Yes	No	Total
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
2009	2.3	1.0	1.1	2.0	0.7	1.1	9.2	0.5	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 the units for the 2013 Calendar year.

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 01/01/2013 to 31/12/2013

Note: Incomplete data will affect the overall data presented 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	10400	**Salvage**	21
Number of procedures (number of procedures includes double mortality)	10459	**Day of Surg Admission**	2730
		Redo	859
Average Age	65.92	**Second procedure**	560
Male / Female	7668 / 2732	**Total Mortality**	261
Elective	7579	**Hospital Mortality**	243
Urgent	2549	**30-day Mortality**	219
Emergency	306	**Readmission**	943

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	5370	51.36 %	67	1.25 %
Valve(s) only	2139	20.46 %	56	2.62 %
Valve(s) + CABG	1151	11.01 %	52	4.52 %
Other (COTH,NCOTH,AO)	1795	17.17 %	86	4.80 %
All Procedures	10455	100.00 %	261	2.50 %

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	50	435	0.93 %	4.16 %	0	10	0.00 %	2.30 %
40 - 59 years	1401	2449	26.01 %	23.42 %	7	34	0.50 %	1.39 %
60 - 69 years	1938	3192	36.01 %	30.53 %	21	70	1.08 %	2.19 %
70 - 79 years	1550	3128	28.86 %	29.92 %	25	85	1.61 %	2.72 %
80 + years	431	1251	8.03 %	11.97 %	14	62	3.25 %	4.96 %
All Procedures	5370	10455	51.36 %	100.00 %	67	261	1.25 %	2.50 %

Isolated Coronary artery surgery

Number of patients	5367	Total Radial Anastomoses	1874
Number of procedures	5370	Single Radials	1596
Male / Female	4385 / 982	Double Radials	278
Stable/Unstable Angina	3286 / 1196	GEPA Anastomoses	33
Clinical Status: Elective	3465	Graft Numbers:	
Urgent	1760	6-graft	76
Emergency/Salvage	145	5-graft	464
Total CABG Mortality	67	4-graft	1430
Offpump / Mort	417 / 5	3-graft	2068
Onpump / Mort	4953 / 62	2-graft	1087
Redo / Mort	146 / 3	1-graft	226
Total no. of arterial grafts	1333	30-day Mortality	59
Mean no. of grafts	3.20	30-day Mortality by elective	26
LIMA	4503	30-day Mortality by urgent	21
RIMA	23	30-day Mortality by emerg/sal	12
BIMA	504		
Total IMA conduits	5534		
Total SVG Anastomoses	4032		

Isolated Coronary artery surgery - Complications

Return to theatre	222	Pulmonary:	
Valve dysfunction	2	Prolonged Vent	381
Graft occlusion	6	Re-intubation	90
Reop Deep sternal inf	17	Pneumonia	200
Bleeding	111	Neurologic:	
Other cardiac	50	Stroke Permanent	44
Other non-cardiac	49	Stroke Transient	10
Deep Sternal Infections	53	Septicaemia	32
Renal failure	192	Anticoagulant complications	14
Haemofiltration	56	GIT complications	52
Peri-op AMI	75	Multi system failure	32
Peri-op Cardiogenic Shock	81	Inotrope use:	
New Cardiac Arrhythmia	1389	> 4 hrs	2550
Heartblock	29	low CO	1201
Cardiac arrest	53	low SVR	1264
Atrial Arrythmia	1261		
Ventricular tachycardia	107		

Isolated Coronary artery surgery - Performance Indicators

Length of Stay (mean)	12.43	**30-Day Sternal Infection**	0.99 %
Post-procedure Length of Stay (mean)	8.69	**Reop for bleeding**	2.07 %
ICU hours (mean)	62.64	**30 Day Mortality**	1.10 %
Ventilation hours (mean)	17.44	**Total Mortality**	1.25 %

Isolated Valve(s) surgery

Number of patients	2120	**30-day Mortality**	46
Number of procedures	2139	**Total Mortality**	56
Male / Female	1267 / 853		
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	1189	55.59 %	23	1.93 %	Mechanical 186
					Bioprosthesis 999
					Homo/Allograft 1
					Autograft 0
Other Aortic Valve Procedure (Only)	96	4.49 %	2	2.08 %	
Mitral Valve Replacement (Only)	243	11.36 %	11	4.53%	Mechanical 114
					Bioprosthesis 124
					Homo/Allograft 0
Mitral Valve Repair (Only)	294	13.74 %	3	1.02 %	Ring 280
Aortic and Mitral Valve Procedure (Only)	125	5.84 %	8	6.40 %	Mechanical 81
					Bioprosthesis 118
					Homo/Allograft 0
					Autograft 0
					Ring 38
Mitral and Tricuspid Valve Procedure (Only)	99	4.63 %	3	3.03 %	Mechanical 25
					Bioprosthesis 30
					Homo/Allograft 0
					Ring 139
Aortic, Mitral and Tricuspid Valve Procedure (Only)	21	0.98 %	3	14.29 %	Mechanical 19
					Bioprosthesis 17
					Homo/Allograft 0
					Autograft 0
					Ring 24
Other Valve Procedures	72	3.37 %	3	4.17 %	
Total	2139	100.00 %	56	2.62 %	

Isolated Valve(s) surgery - Complications

Return to theatre	156	**Pulmonary:**	
Valve dysfunction	7	**Prolonged Vent**	190
Graft occlusion	0	**Re-intubation**	40
Reop Deep sternal inf	4	**Pneumonia**	61
Bleeding	77	**Neurologic:**	
Other cardiac	41	**Stroke Permanent**	29
Other non-cardiac	34	**Stroke Transient**	13
Deep Sternal Infections	12	**Septicaemia**	17
Renal failure	120	**Anticoagulant complications**	13
Haemofiltration	49	**GIT complications**	23
Peri-op AMI	21	**Multi system failure**	22
Peri-op Cardiogenic Shock	53	**Inotrope use:**	
New Cardiac Arrhythmia	606	**> 4 hrs**	895
Heartblock	66	**low CO**	465
Cardiac arrest	19	**low SVR**	439
Atrial Arrythmia	481		
Ventricular tachycardia	41		

Isolated Valve(s) - Performance Indicators

Length of Stay (mean)	13.08	**30-Day Sternal Infection**	0.56 %
Post-procedure Length of Stay (mean)	10.32	**Reop for bleeding**	3.60 %
ICU hours (mean)	70.70	**30 Day Mortality**	2.16 %
Ventilation hours (mean)	20.35	**Total Mortality**	2.62 %

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	814	70.72 %	28	3.44 %	Mechanical	63
					Bioprosthesis	749
					Homo/Allograft	0
					Autograft	0
Other Aortic Valve Procedure + CABG	3	0.26 %	0	0.00 %		
Mitral Valve Replacement + CABG	89	7.73 %	10	11.24 %	Mechanical	25
					Bioprosthesis	57
					Homo/Allograft	0
Mitral Valve Repair + CABG	159	13.81 %	6	3.77 %	Ring	153
Aortic and Mitral Valve Procedure + CABG	43	3.74 %	3	6.98 %	Mechanical	16
					Bioprosthesis	56
					Homo/Allograft	0
					Autograft	0
					Ring	13
Mitral and Tricuspid Valve Procedure + CABG (Only)	23	2.00 %	2	8.70 %	Mechanical	1
					Bioprosthesis	10
					Homo/Allograft	0
					Ring	35
Aortic, Mitral and Tricuspid Valve Procedure + CABG (Only)	7	0.61 %	2	28.57 %	Mechanical	2
					Bioprosthesis	9
					Homo/Allograft	0
					Autograft	0
					Ring	9
Other Valve Procedures + CABG	13	1.13 %	1	7.70 %		
Total	1151	100.00 %	52	4.52 %		

CABG and Valve(s) Surgery

Number of patients	1143		
Number of procedures	1151	CABG and MVR	89
Male / Female	847 / 296	CABG and AVR and MVR	30
Redo	91	CABG and MV repair	156
CABG and AVR	812	30-day Mortality	40

CABG and Valve(s) Surgery - Complications

Return to theatre	110	Pulmonary:	
Valve dysfunction	2	Prolonged Vent	190
Graft occlusion	0	Re-intubation	38
Reop Deep sternal Inf	10	Pneumonia	71
Bleeding	51	Neurologic:	
Other cardiac	28	Stroke Permanent	21
Other non-cardiac	27	Stroke Transient	12
Deep sternal infection	18	Septicaemia	16
Renal failure	83	Anticoagulant complications	8
Haemofiltration	29	GIT complications	32
Peri-op AMI	18	Multi system failure	23
Peri-op Cardiogenic Shock	57	Inotrope use:	
New Cardiac Arrhythmia	449	> 4 hrs	644
Heartblock	29	low CO	332
Cardiac arrest	23	low SVR	324
Atrial Arrythmia	391		
Ventricular tachycardia	29		

CABG and Valve(s) Surgery - Performance Indicators

Length of Stay (mean)	16.29	30-Day Sternal Infection	1.56 %
Post-procedure Length of Stay (mean)	12.26	Reop for bleeding	4.43 %
ICU hours (mean)	88.50	30 Day Mortality	3.48 %
Ventilation hours (mean)	27.03	Total Mortality	4.52 %

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	126	64.95 %	1	0.79 %	Arch 21
					Ascending 120
					Thoracic/Abdominal % 0
					Descending 0
AVR + Aortic Dissection	4	2.06 %	0	0.00 %	Ascending 4
					Descending 0
AVR + Acute Traumatic Aortic Transection	0	0.00 %	0	0.00 %	
AVR + CABG + Aortic Aneurysm	44	22.68 %	3	6.82 %	Arch 4
					Ascending 40
					Thoracic/Abdominal % 0
					Descending 1
AVR + CABG + Aortic Dissection	3	1.55 %	1	33.33 %	Ascending 3
					Descending 0
AVR + CABG + Acute Traumatic Aortic Transection	0	0.00 %	0	0.00 %	
Total	194	64.95 %	5	2.58 %	

Other surgery

Number of patients	1770
Number of procedures	1795
Male / Female	1169 / 601

Table 3 Other surgery types

Surgery type (mutually exclusive)		Number of procedures	Total Mortality
Aortic Procedure		703	38
Aneurysm	- Asc	508	19
	- Arch	109	8
	- Desc	13	2
	- Thor/Abd	6	2
Dissection	- Asc - Acute	79	13
	- Asc - Chronic	7	1
	- Desc - Acute	2	0
	- Desc - Chronic	0	0
Acute Traumatic Aortic Transection		0	0
Carotid Endarterectomy		19	2
Lung Resection		34	4
Left Ventricular Aneurysm		13	0
Acquired VSD		18	3
Congenital ASD		138	0
Cardiac Trauma		4	0
LVOT Myectomy for HOCM		56	2
LV Rupture Repair		4	0
Pericardiectomy		23	2
Pulmonary Thrombo-endarterectomy		11	1
Left Ventricular Reconstruction		4	1
Pulmonary Embolectomy		12	1
Cardiac Tumour		58	1
Cardiac Transplant		97	5
Congenital Other		84	1
Permanent LV Epicardial Lead		67	1
Atrial Arrhythmia Surgery		319	7
Others		312	27

Other surgery - Complications

Return to theatre	198	**Pulmonary:**	
Valve dysfunction	3	**Prolonged Vent**	303
Graft occlusion	1	**Re-intubation**	61
Reop Deep sternal inf	7	**Pneumonia**	95
Bleeding	107	**Neurologic:**	
Other cardiac	54	**Stroke Permanent**	37
Other non-cardiac	46	**Stroke Transient**	16
Deep Sternal Infections	19	**Septicaemia**	17
Renal failure	150	**Anticoagulant complications**	23
Haemofiltration	67	**GIT complications**	43
Peri-op AMI	15	**Multi system failure**	36
Peri-op Cardiogenic Shock	56	**Inotrope use:**	
New Cardiac Arrhythmia	468	**> 4 hrs**	982
Heartblock	42	**low CO**	546
Cardiac arrest	35	**low SVR**	473
Atrial Arrythmia	368		
Ventricular tachycardia	53		

Other - Performance Indicators

Length of Stay (mean)	15.85	**30-Day Sternal Infection**	1.06 %
Post-procedure Length of Stay (mean)	12.88	**Reop for bleeding**	5.96 %
ICU hours (mean)	105.03	**30 Day Mortality**	4.12 %
Ventilation hours (mean)	37.05	**Total Mortality**	4.80 %

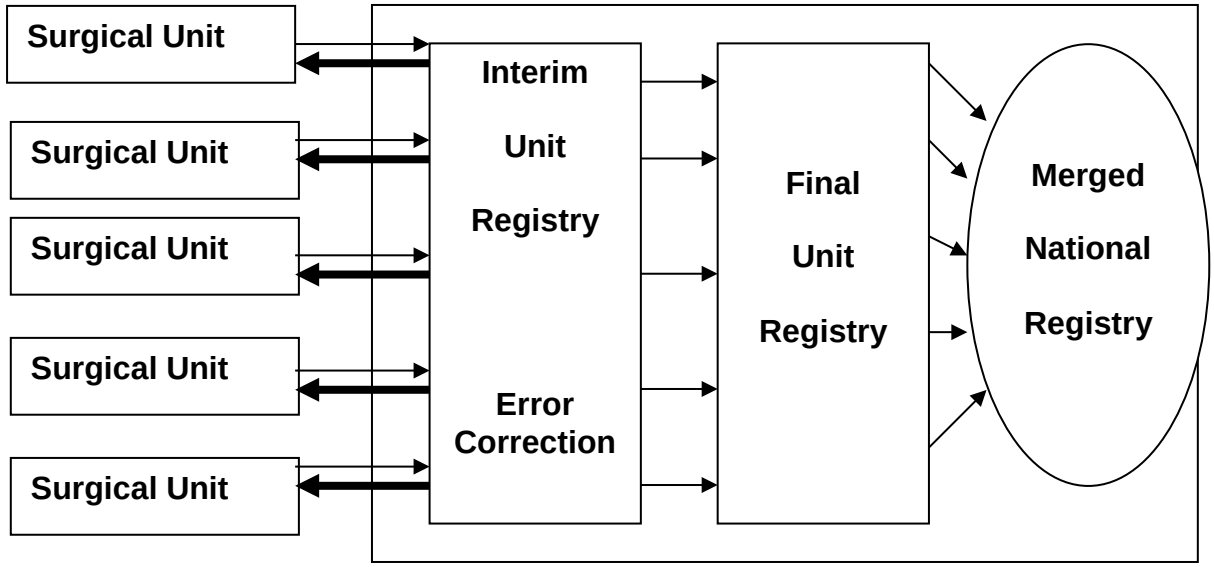
Processes

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

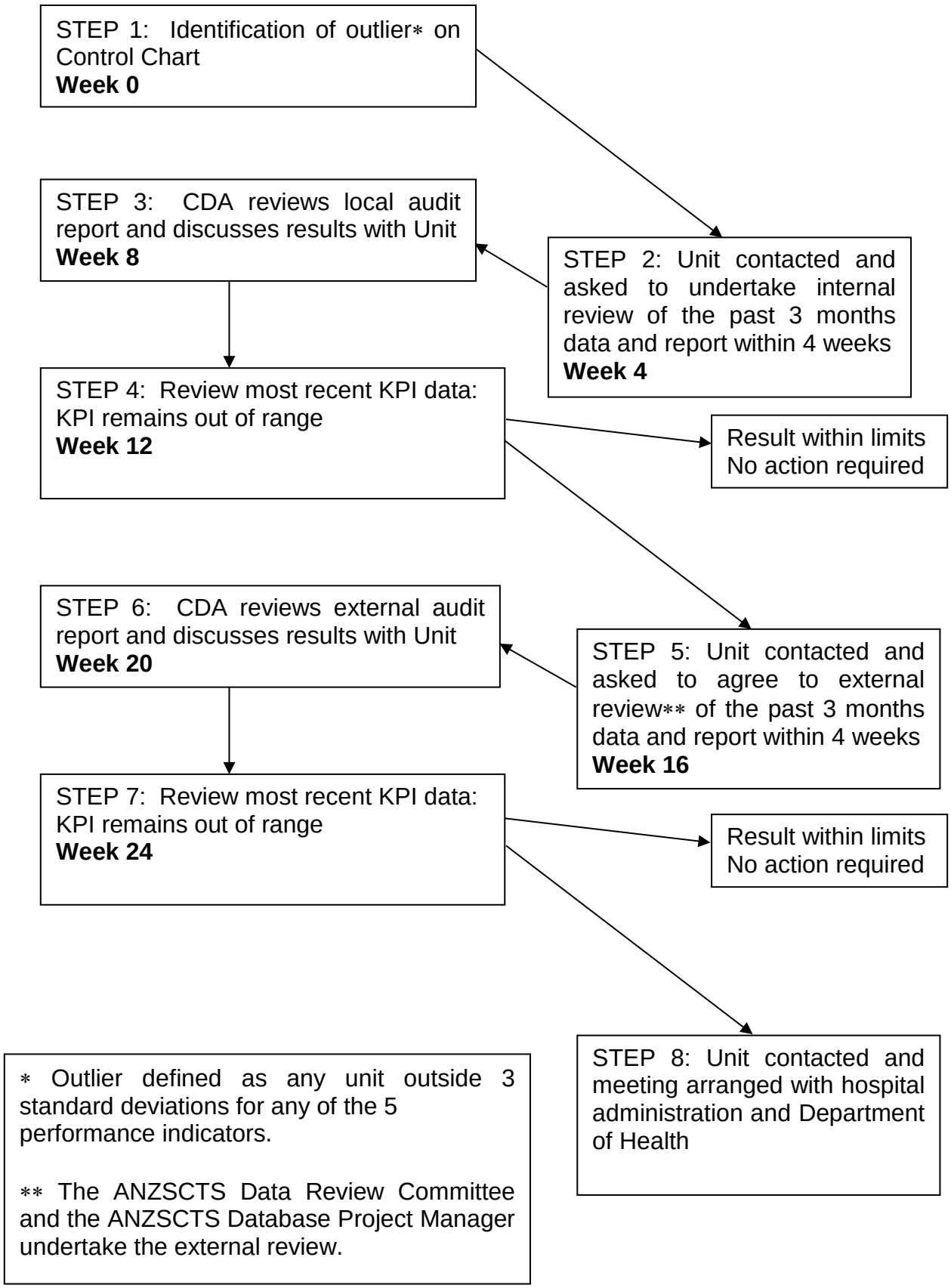
- Data management
- Peer Review mechanism
- Data collection form
- Patient Information Sheet
- Opt-off procedure

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, operative 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).

7734

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PRE OPERATIVE PAGE 2

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

Section 3. Preoperative Cardiac Status

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

			if YES	When	
Aspirin	○ YES	○ NO		○ =<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

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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 } *Perfusionist to complete*

Patient Weight kg }

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

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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 ○ Pulmonary Embolectomy ○ 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: When:	○ Asc ○ Desc (only) ○ 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

7734

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

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[2] 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, gender, 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.

[2] 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 2011 for each NSW unit for Isolated CABG. The green horizontal line represents the risk adjusted mortality rate state average (%) and the red horizontal line represents the observed mortality rate state 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 state average one would interpret the upper and lower intervals as follows: if the upper interval is below the state average than the hospital would be deemed to have performed better than the state average. Alternatively, if the lower interval is above the state average, than the hospital would be deemed to have performed poorer than the state average. If the interval includes the state average, there is no difference between the unit and the state 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.

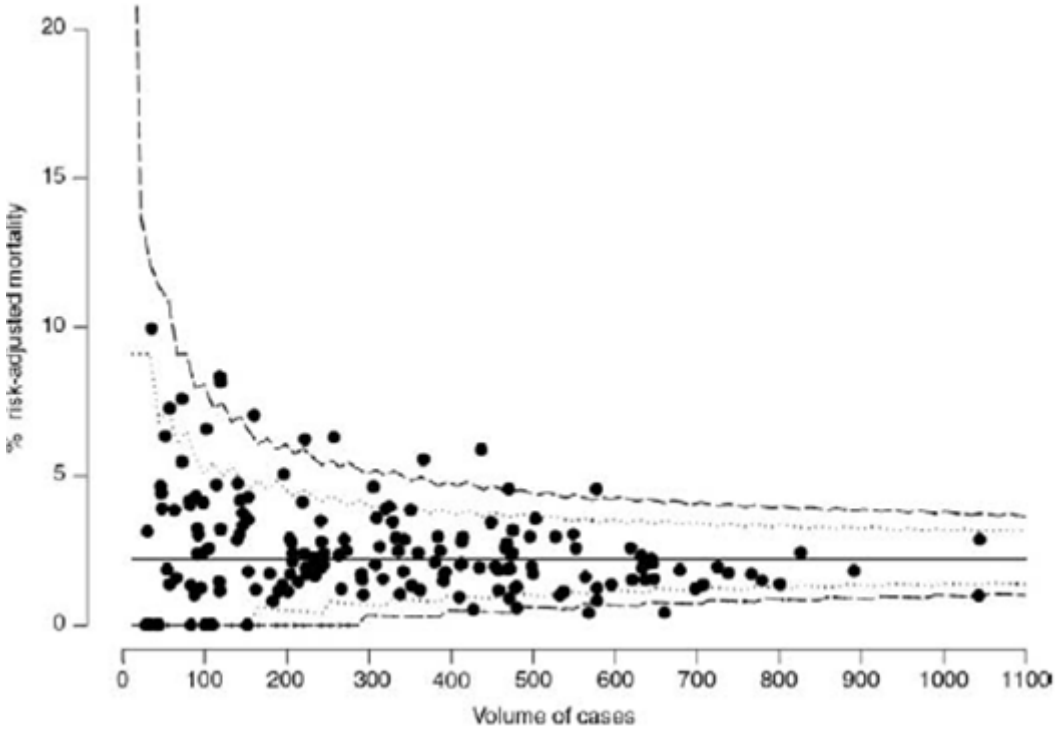

Figure take from: Spiegelhalter DJ. League Tables. IN Armitage P, Colton T, eds. Encyclopedia of Biostatistics. Chicester, UK: John Wiley & Sons: 2005: 2478 – 751.