Health NZ

New Zealand Cardiac Surgery National Report

2016

Preface

New Zealand Cardiac Surgical Annual Report 2016

This report of the New Zealand National Cardiac Surgery Registry (NZCS) covers the period of 1 January 2016 to 31 December 2016.

The report includes all cardiac surgical procedures undertaken at the 5 District Health Boards (DHBs) performing publicly-funded cardiac surgery in New Zealand (Auckland, Waikato, Capital and Coast, Canterbury, Southern).

This is our second annual report of the National Cardiac surgical services in New Zealand. The report has been an accomplishment for all involved to be proud of. It is encouraging to note that data completeness has improved for 2016 across all units. This is a credit to the time and diligence of all members of the cardiac surgical units at the 5 DHBs. With the implementation of mobile devices in 2017 we expect the processes to become further streamlined. I take this opportunity to thank all the effort of the different teams involved in making this possible at both a National and Local level. The data in itself is a testimony to the quality of cardiac surgical service being provided around the country.

The data presents total volume of cardiac surgery procedures in New Zealand. The risk factors associated with cardiac disease and the performance and outcomes of the most common procedures performed by a cardiac surgeons, namely coronary artery bypass surgery (CABG) and aortic valve replacement (AVR).

The report examines the impact of variables (risk factors) on surgical outcomes and compares these with international registries. In doing this we are able to benchmark New Zealand outcomes to internationally accepted standards.

As stated previously, the registry data is in its early years. This being the second year of its compilation and any inference from the data needs to be considered with caution. Bearing this in mind, we are proactively analysing quality measures in the data and hope this will continue to improve quality of care for our patients on an ongoing basis. Areas presently under consideration include minimising infection rates (already low), improve early discharge care strategies, blood and blood product utilization.

The data so far collected when compared with International data, suggests that New Zealand provides a high standard of Cardiac surgical services. For the data to be of any statistical significance we accept a minimum of 3 years of data needs to be available.

I would like to thank the members of the steering and implementation group, the data managers, DHB information services and the company Dendrite Clinical Systems for their effort and persistence.

The registry project acknowledges the Ministry of Health's (MOH) support, guidance commitment and funding which has made this important project a reality. The document would not be complete without acknowledging the work put in by Charlotte Allin.

Harsh Singh
Chairman

Contents

Contents

Tables

Charts

NCSCN members who contributed to this report:

- P Allison
- P Davis
- G Devlin
- K Evison
- S Galvin
- A El Gamel
- D Haydock
- S Morgan
- K Murray
- H Singh
- R Stewart

Other contributors:

- C Allin
- R Kinsman
- A McGeorge
- P Walton
- S Wells

Consumer advocate summary

I am the Consumer Representative who has the honour of advocating on your behalf, expressing your voice to the National Cardiac Surgical Clinical Network Governance Group.

In our first report, published last year, I indicated several conflicting ideas regarding its requirements and value for you, as a consumer. Initially, it was suggested a performance league table be included, however, this is not very useful for consumers. The key reason is because an escalation process is in use. What this means, is that more complicated and seriously ill patients are referred to cardiac surgeons with greater experience.

Due to this treatment methodology, a performance league table would not be the fairest way to compare results. For you, as a consumer, the fundamental service delivery issue remains. That is, being treated by the *right person at the right time, at the right place* to meet your needs.

This year, we publish our second report and the figures are very similar to those of last year. These findings confirm and validate the consistency of the nationwide service. Recorded numbers are still low, which can have a marked effect on final percentages.

However, what astounds me is the higher survival rate for patients who receive this service. When I joined the network, after listening to stories in my community, I had expected much lower survival rates. Now, I know first-hand, that the five centres excel when compared with international statistics.

Thank you for taking the time to read our latest report.

Kevin Murray

Consumer Representative, National Cardiac Surgical Clinical Network Governance Group

Data presentation

- The data has been complied for the period 01 January-31 December 2016.
- The report includes all public funded cardiac surgical procedures performed nationally.
- In this report we have analysed the risk factors and their impact on outcomes.
- The two standard operations included are coronary bypass grafting (CABG), and aortic valve replacement (AVR) these account for over 65% of the workload of all cardiac surgical units.
- The dataset aims to enable benchmarking with international standards by using identical definitions so a realistic comparison can be made.
- This dataset is a single year's results. It does not take into account retrospective years of surgical performance and as a result fails to recognise surgical experience and the unit's total performance. We suggest caution in interpreting performances of units. Overall with limited data available it is reassuring to see all units and surgeons are performing above the accepted international bench marks.
- The National cardiac surgical network with the MOH help was set up as a working group to review public funded cardiac surgery and equity of care at a national level. The group recognised the lack of a uniform registry to review outcomes and performance. With an MOH initiative in 2008-2009 funding was allocated for development of a national registry.
- Data is analysed independently by Dendrite Clinical Systems a specialist supplier of clinical databases, analysis software, consultancy and publishing services for the international healthcare sector.
- This is the second national report of the registry. It shows an analysis of the performance of the 5 DHB performing cardiac surgery for the one year period commencing 1 January 2016.

Overview of people who had cardiac surgery

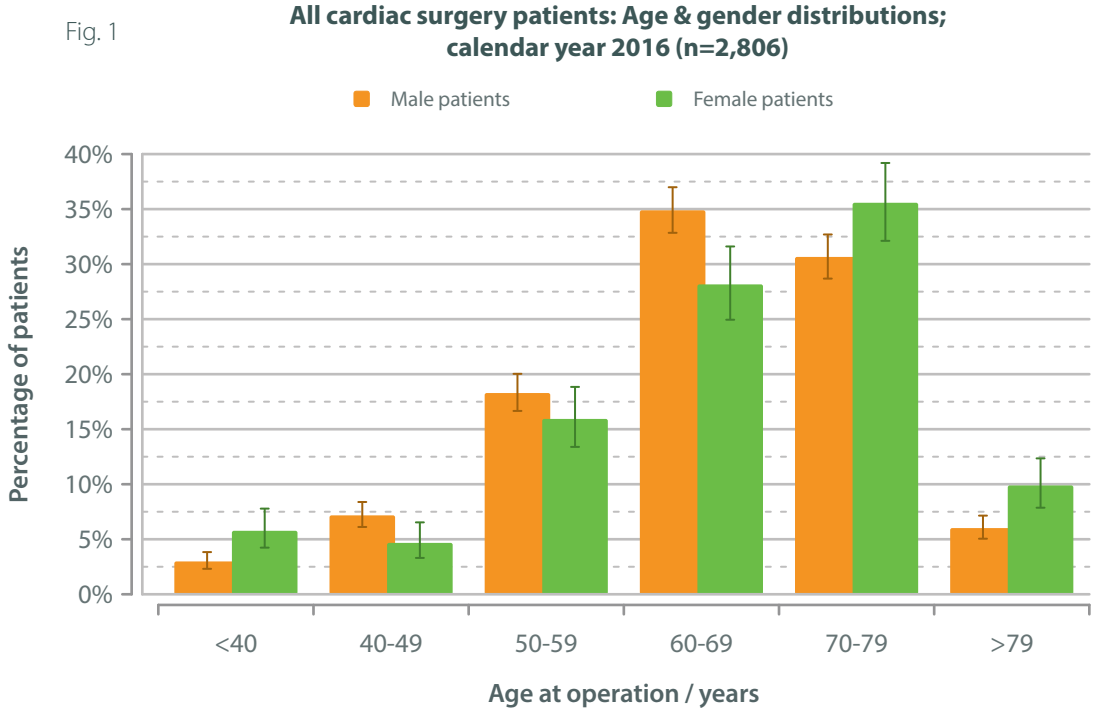
In the 12 months period (2016) a total of 2,807 cardiac operations were performed across the 5 District Health Boards (DHB) undertaking Cardiac surgery: Auckland DHB, Waikato DHB, Capital and Coast DHB, Canterbury DHB, Southern DHB. This was 43 extra procedures for the year compared to the previous year.

The presentation of over 70% of the patients was after 60 years of age. With men presenting at a slightly younger age than women. Heart disease was seen to be more common in men who accounted for 75% of the total number (Table 1, Fig. 1). This ratio distribution matches international figures and shows a similar pattern from the year before.

Table 1. All cardiac surgery patients in 2016: age and gender

		Gender		
		Male	Female	All
Age at operation / years	<40	62	42	**104**
	40-49	149	34	**183**
	50-59	380	116	**496**
	60-69	725	205	**930**
	70-79	637	259	**896**
	>79	125	72	**197**
	Unspecified	1	0	**1**
	All	**2,079**	**728**	**2,807**

Fig. 1



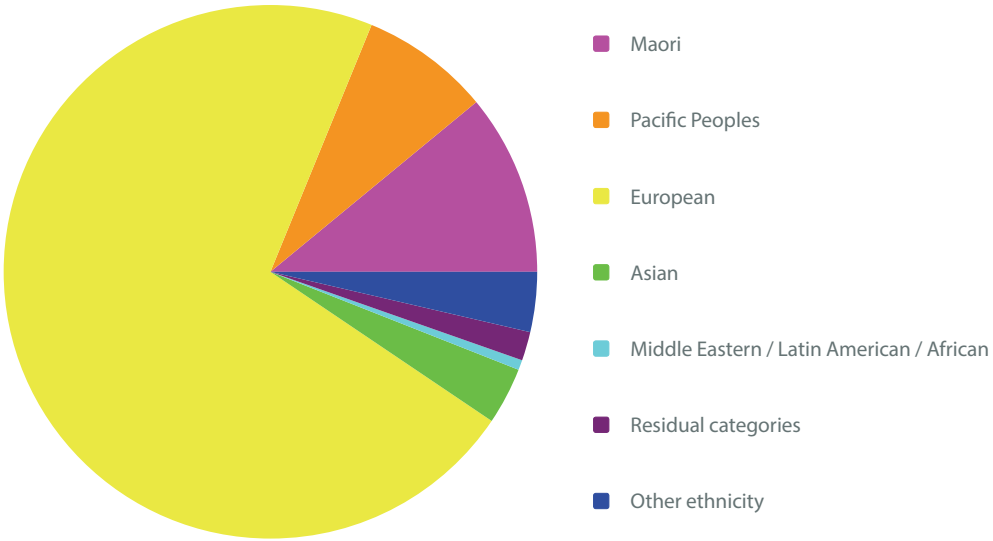
Ethnicity

The ethnicity spectrum remains similar as before. With roughly 20% of the population being of Maori / Pacific Islanders (Census 2013 shows Maori / Pacific account for 22.3% of total population). Considering the high incidence of heart disease in this sub population, effort may need to be put into health care for the sub-group.

Table 2. Ethnicity of patients undergoing cardiac surgery in 2016

		Count	Percentage
Ethnicity	Maori	308	11.0%
	Pacific Peoples	220	7.8%
	European	2,014	71.7%
	Asian	97	3.5%
	Middle Eastern / Latin American / African	17	0.6%
	Residual categories	49	1.7%
	Other ethnicity	102	3.6%
	Unspecified	0	
	All	**2,807**	

Fig. 2 **All cardiac surgery patients: Ethnicity; calendar year 2016 (n=2,807)**



Risk factors

The risk of heart disease is influenced by a number of factors. These include age, sex, lifestyle choices (*e.g.,* smoking), elevated cholesterol levels (familial, high cholesterol diet, lack of exercise), high blood pressure and diabetes. The risk factor spectrum continues to remain similar. Further analysis of this will need to be undertaken over the coming years to determine variation within diverse ethnic groups and areas for targeted improvement.

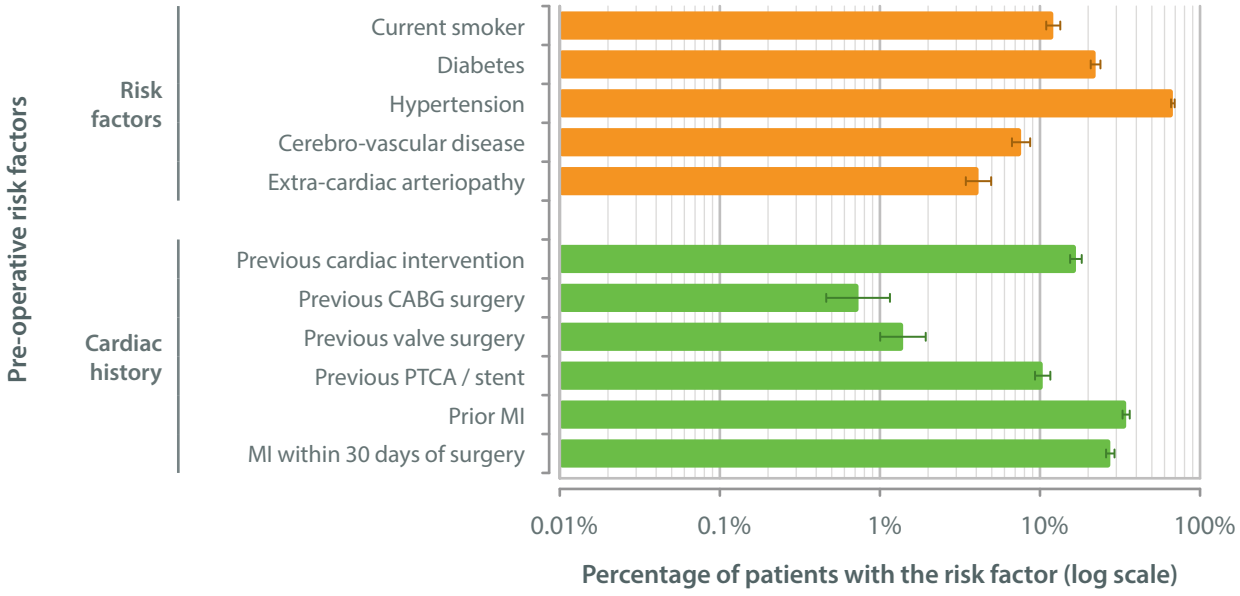
- One in eight patients were still smoking at the time of surgery.
- Approximately one-quarter of the patients had diabetes.
- Over 50% of the patients had high blood pressure.

Table 3. All patients in 2016: Pre-operative risk factors

		Risk factor present			
		No	Yes	Unspecified	Percentage with the risk factor
Risk factors	Current smoker	2,466	340	1	12.1%
	Diabetes	2,181	625	1	22.3%
	Hypertension	907	1,899	1	67.7%
	Cerebro-vascular disease	2,592	214	1	7.6%
	Extra-cardiac arteriopathy	2,690	116	1	4.1%
Cardiac history	Previous cardiac intervention	2,335	471	1	16.8%
	Previous CABG surgery	2,700	20	87	0.7%
	Previous valve surgery	2,682	38	87	1.4%
	Previous PTCA / stent	2,514	292	1	10.4%
	Prior MI	1,836	970	1	34.6%
	Prior MI within 30 days of surgery	2,033	772	2	27.5%

Fig. 3

All cardiac surgery patients: Risk factors; calendar year 2016



Types of operations performed

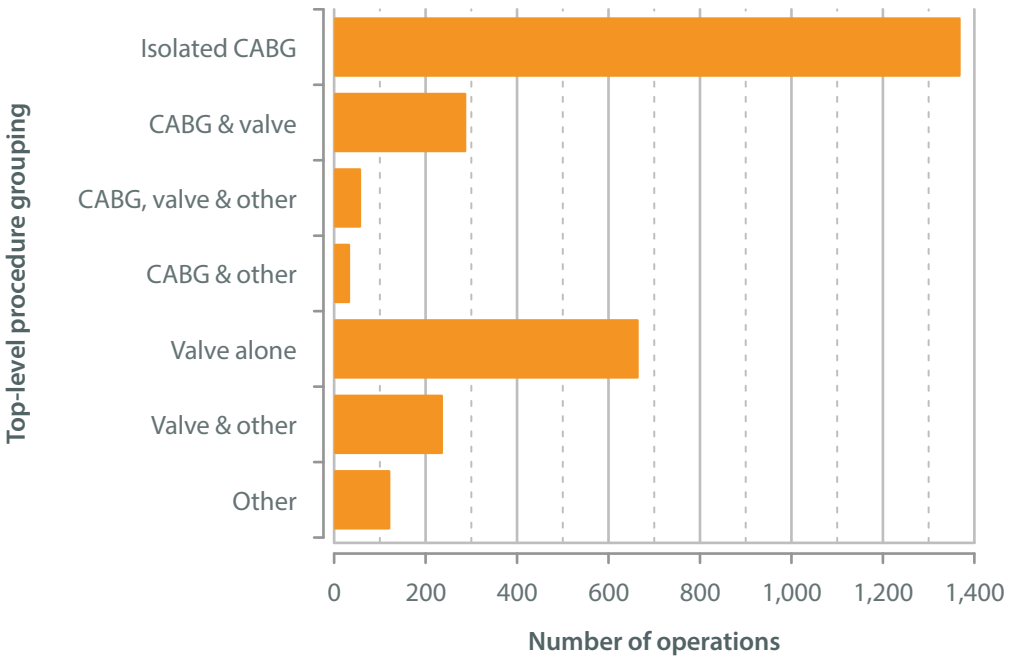
- Isolated coronary artery bypass accounted for 49.3% of the total volume of cases.
- Isolated heart valve operations were 24.5%.
- Combined valve and coronary artery bypass 10.4%.
- Approximately 15% of cases were for Other, less common procedures.

Comparing the two years 2015 / 2016, the distribution of cases performed remains similar. Suggesting no early impact of TAVI on total AVR procedures. The year 2017 has seen an increase in TAVI procedures nationally and will be interesting to note the impact of this in future years.

Table 4. Procedures performed in 2016

		Count	Percentage
Top-level procedure grouping	CABG	1,370	49.3%
	CABG & valve	289	10.4%
	CABG, valve & other	59	2.1%
	CABG & other	35	1.3%
	Valve alone	666	24.0%
	Valve & other	238	8.6%
	Other	123	4.4%
	Unspecified	27	
	All	**2,807**	

Fig. 4 **Operations performed in the calendar year 2016**



Isolated coronary artery bypass surgery

Coronary artery bypass grafting (CABG) is an operation undertaken to bypass blocked arteries of the heart in patients who are not suitable for a non-surgical option (stent placement) or due to failure of stents. The aim of the procedure is to improve quality of life and minimise the risk of a heart attack.

The operation is the most commonly performed operation by a Cardiac surgeon. In the year 2016 a total of 1,360 patients underwent a publicly-funded isolated CABG operation (49.3%) of the total volume of cardiac surgery. (Table 4). The volumes of the procedure is consistent over the two years audited.

Table 5. First-time isolated CABG in 2016: Body Mass Index

		Count	Percentage
BMI / kg m^{-2}	<20.0	22	1.6%
	20.0-24.9	266	19.6%
	25.0-29.9	545	40.1%
	30.0-34.9	354	26.0%
	35.0-39.9	121	8.9%
	40.0-44.9	40	2.9%
	>44.9	9	0.7%
	Unspecified	3	0.2%
	All	**1,360**	

Coronary artery disease is a condition where cholesterol deposition occurs in the arteries supplying blood to the heart. Multiple risk factors contribute to occurrence of the disease. The risk factors include diabetes, high blood pressure, smoking and obesity (Table 7, Fig. 5) or a combination of them. Some people unfortunately have a genetic predisposition. Other risk factors can enhance early progression of the disease in those with a familial predisposition. They also impact on outcome in terms of complications and early recovery from heart surgery.

BMI classifications

Ministry of Health New Zealand. Body size. Retrieved from: http://www.health.govt.nz/our-work/populations/maori-health/tatau-kahukura-maori-health-statistics/nga-tauwehe-tupono-me-te-marumaru-risk-and-protective-factors/body-size.

Table 6. International BMI cut-off points for adults aged 18 years and over

Classification	BMI range (kg m^{-2})	Risk of health conditions
Underweight	<18.5	Low risk
Normal range	18.5-24.9	Average risk
Overweight	25.0-29.9	Increased risk
Obese	>29.9	Substantially increased risk

In the New Zealand population entered in the registry, the incidence of these risk factors was:

- One in six patients (15.2%) were current smokers.
- One in four (29.3%) were diabetic.
- One in three (38.7%) were obese and (12.7%) had a BMI of greater than 35.
- More than half the patients were obese.
- One in nine patients were morbidly obese.

Table 7. First-time isolated CABG in 2016: Pre-operative risk factors

		Risk factor present			
		No	Yes	Unspecified	Percentage with the risk factor
Risk factors	Current smoker	1,153	207	0	15.2%
	Diabetes	961	399	0	29.3%
	Hypertension	340	1,020	0	75.0%
	Cerebro-vascular disease	1,274	86	0	6.3%
	Extra-cardiac arteriopathy	1,303	57	0	4.2%
Cardiac history	Previous cardiac intervention	1,152	208	0	15.3%
	Previous valve surgery	1,359	1	0	0.1%
	Previous PTCA / stent	1,168	192	0	14.1%
	Prior MI	555	805	0	59.2%
	Prior MI within 30 days of surgery	729	630	1	46.4%

Fig. 5 **First-time isolated CABG: Risk factors; calendar year 2016**

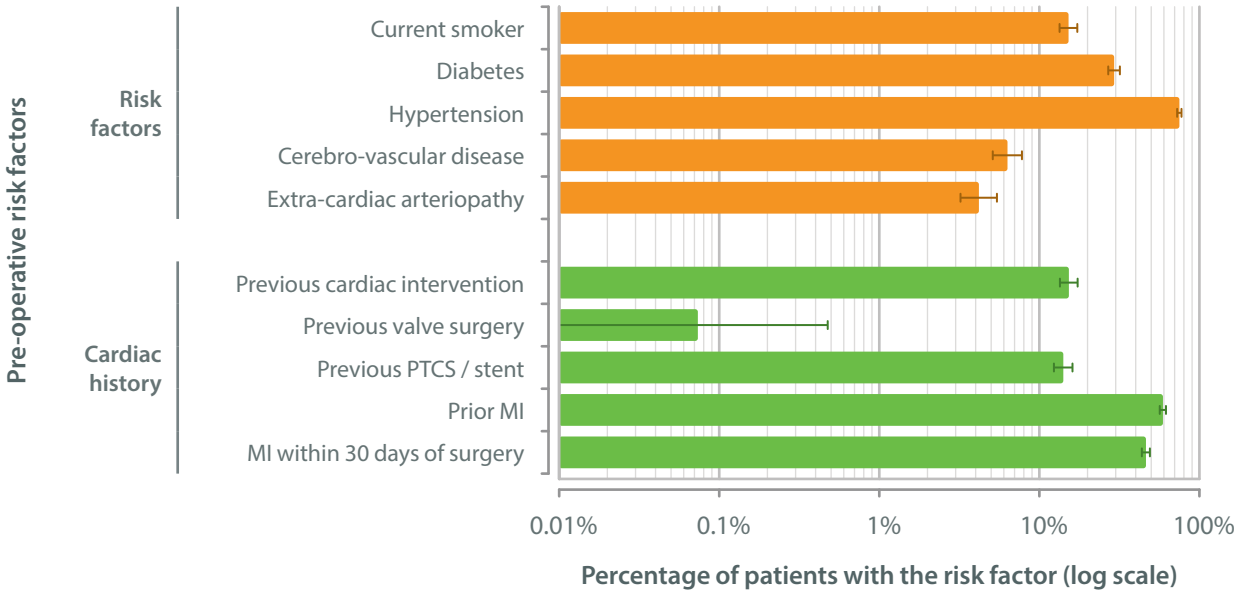
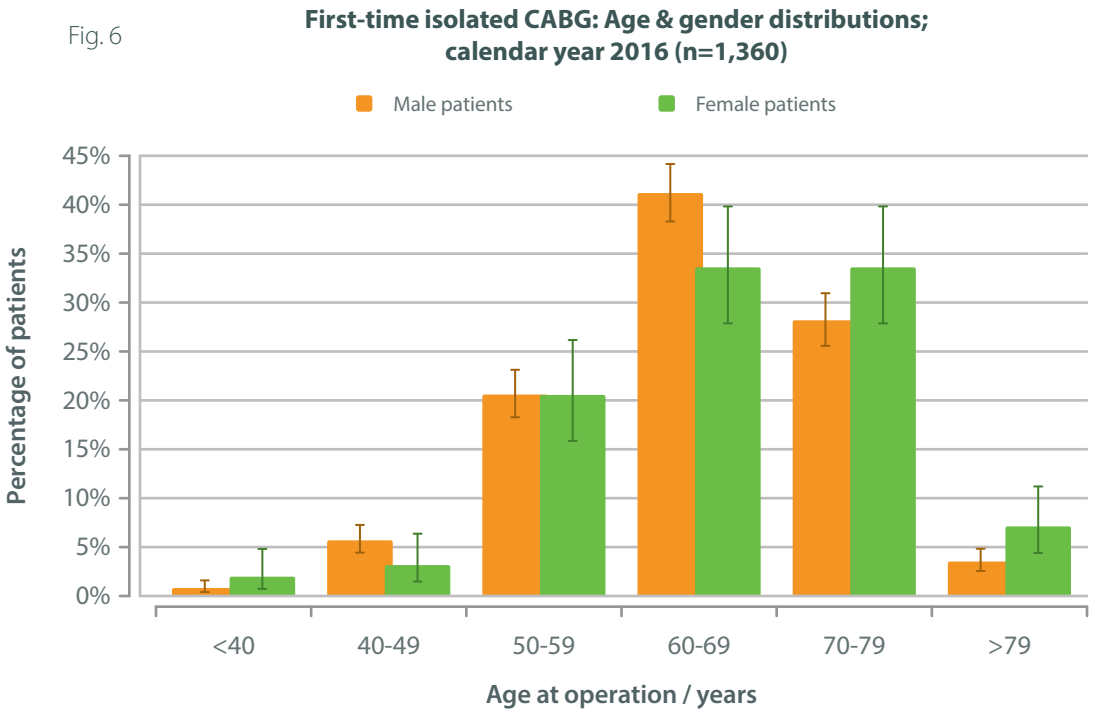


Table 8. First-time isolated CABG in 2016: age and gender

Age at operation / years	Gender		
	Male	Female	All
<40	9	5	**0**
40-49	63	8	**71**
50-59	228	52	**280**
60-69	456	85	**541**
70-79	312	85	**397**
>79	39	18	**57**
Unspecified	0	0	**0**
All	**1,107**	**253**	**1,360**

Fig. 6



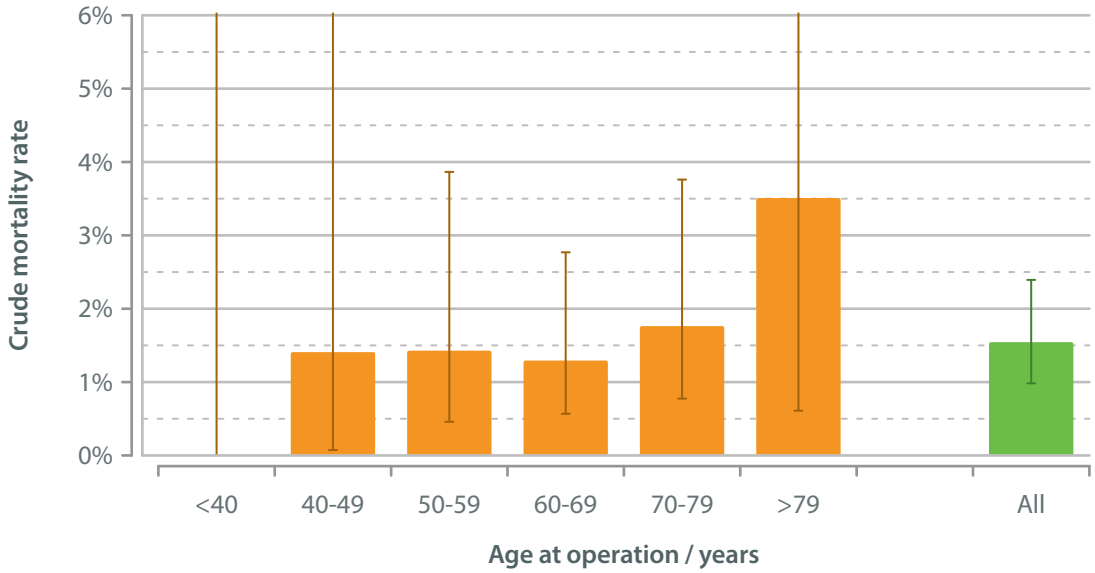
The overall survival results of isolated CABG operations nationwide is well within the International standard bench mark of care at 98.5% [1]. This is similar to the year before. The most common presentation of these patients is between 50 to 75 years of age, which accounts for over 85% of the total volume. The majority of these patients present between 50 to 79 years of age, with men presenting at an earlier age than female patients. The overall male to female ratio is 5: 1.

Table 9. First-time isolated CABG in 2016: age and in-hospital mortality

Age at operation / years	In-hospital mortality			
	No	Yes	All	Mortality rate (95% CI)
<40	14	0	**14**	0.0% (0.0-19.3%)
40-49	70	1	**71**	1.4% (0.1-8.7%)
50-59	276	4	**280**	1.4% (0.5-3.9%)
60-69	534	7	**541**	1.3% (0.6-2.8%)
70-79	390	7	**397**	1.8% (0.8-3.8%)
>79	55	2	**57**	3.5% (0.6-13.2%)
Unspecified	0	0	**0**	NA
All	**1,339**	**21**	**1,360**	**1.5% (1.0-2.4%)**

Fig. 7

First-time isolated CABG: In-hospital mortality and age; calendar year 2016 (n=1,360)

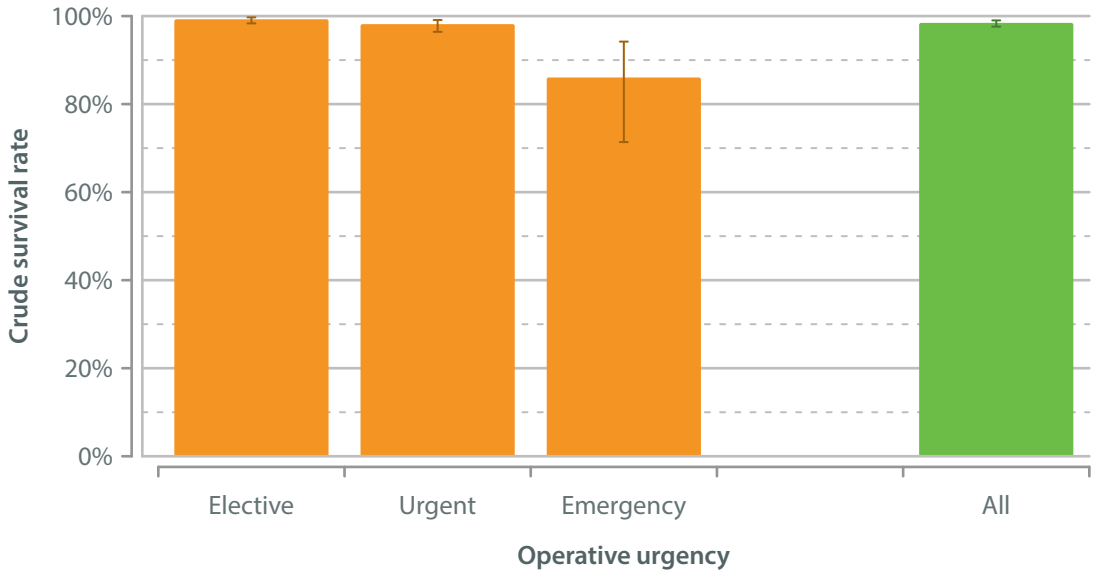


1. http://anzscts.org/wp-content/uploads/2016/12/ANZSCTS-National-Annual-Report-2015.pdf

Table 10. First-time isolated CABG in 2016: operative urgency and in-hospital survival

		In-hospital survival			
		Yes	No	All	Survival rate (95% CI)
Operative urgency	Elective	820	6	**826**	99.3% (98.3-99.7%)
	Urgent	482	9	**491**	98.2% (96.4-99.1%)
	Emergency / salvage	37	6	**43**	86.0% (71.4-94.2%)
	All	**1,339**	**21**	**1,360**	**98.5% (97.6-99.0%)**

Fig. 8 **First-time isolated CABG: In-hospital survival rates; calendar year 2016 (n=1,360)**

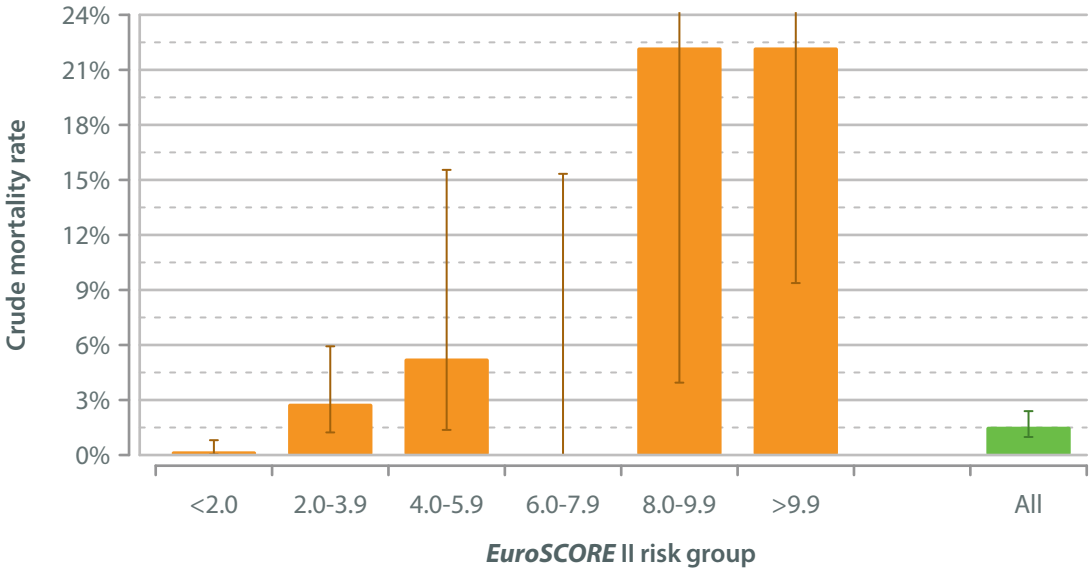


Majority of the deaths were in the high risk group of patients. As expected the salvage and emergency procedures had a higher mortality. The risk of the patient was based on a ***EuroSCORE*** [2]. This takes into account risk factors associated with coronary artery disease and the higher the score the greater risk of morbidity and mortality post-surgery (*e.g.,* ***EuroSCORE*** 6.0-7.9). ***EuroSCORE*** II is a method of calculating predicted operative mortality for patients undergoing cardiac surgery (Table 11). It is not a determinant factor for precluding any patient from having surgical intervention.

Table 11. First-time isolated CABG in 2016: ***EuroSCORE*** II risk score and in-hospital mortality

EuroSCORE II	In-hospital mortality			
	No	**Yes**	**All**	**Mortality rate** (95% CI)
<2.0	991	2	**993**	0.2% (0.0-0.8%)
2.0-3.9	243	7	**250**	2.8% (1.2-5.9%)
4.0-5.9	54	3	**57**	5.3% (1.4-15.5%)
6.0-7.9	18	0	**18**	0.0% (0.0-15.3%)
8.0-9.9	7	2	**9**	22.2% (3.9-59.8%)
>9.9	21	6	**27**	22.2% (9.4-42.7%)
Unspecified	5	1	**6**	16.7% (0.9-63.5%)
All	**1,339**	**21**	**1,360**	**1.5% (1.0-2.4%)**

Fig. 9 **First-time isolated CABG: In-hospital mortality and pre-operative risk; calendar year 2016**



2. Nashef SA, Roques F, Sharples LD, Nilsson J, Smith C, Goldstone AR, Lockowandt U. EuroSCORE II. *European Journal of Cardiothorac Surgery*. 2012; **41(4)**: 734-745.

Quality of care of cardiac surgical patients

The success and quality of care provided for a Cardiac surgical patient is determined far more on the journey of the patient. From the time of being accepted for surgery to discharge from the hospital following surgery and not only the mortality associated with the procedure. The impact of the team in delivery of a satisfactory outcome cannot be underestimated.

The registry is designed to measure these quality measures to allow us to identify and focus on specific areas and help improve quality of care. Some of these measures include mechanical ventilation, time spent in the intensive care unit, hospital stay and wound infection.

Mechanical ventilation is temporarily required following cardiac surgery. The duration of ventilated assistance is determined to a large extent by the complexity of the patient's procedure and the presence or absence of pre-existing risk factors such as obesity and lung function (Table 12). The median ventilation time for 2016 was 6 hours.

Following cardiac surgery patients usually spend a period of time in intensive care (ICU) and are transferred to the ward once fully recovered. The median time spent in ICU for 2016 was 23 hours. Time spent in ICU is determined by how quickly the patients recover which is impacted by core morbidity conditions and complications of the procedure.

Patients' length-of-stay in hospital following a CABG procedure was on average 6 days. These all compare favourably with the international literature [1].

Table 12. First-time isolated CABG in 2016: hospital resource utillisation

		No	Yes	Rate
Resource utilisation	Same day admission	1,305	55	4.0% (3.1-5.3%)
		Count	**Median**	**Inter-quartile range**
	Ventilation time / hours	1,352	6.0	4.0-10.0
	Time on ICU / hours	1,350	23.0	20.0-44.0
	Post-operative stay / days	1,356	6.0	5.0-7.0
	Hospital stay / days	1,357	9.0	7.0-15.0

1. http://anzscts.org/wp-content/uploads/2016/12/ANZSCTS-National-Annual-Report-2015.pdf

Complications following cardiac surgery are not only determined by patient conditions but also reflect the quality of care that the patient receives; commonly monitored by measurement of:

- Deep sternal wound infection.
- Return to theatre.
- Readmission rates following surgery.

Of note was the slight increase in sternal wound infection. Which in terms of numbers is small however to ensure continued improved quality outcomes this has triggered a review by the surgical site infection improvement programme (SSII) and surgical processes have been analysed and continue to be monitored at all sites. A slight increase in return to theatre for bleeding was noticed. It is Important that we carefully interpret this data as the numbers are small and not statistically significant. They still compare favourably with international standard bench marks. It is the intention that this continued analysis of quality of care will ensure all New Zealanders benefit from high standards of cardiac surgery and further improvement measures can be identified. We anticipate the cardiac surgical registry will allow us to review and analyse other improvement measures.

Table 13. First-time isolated CABG in 2016: complications

		Complication			
		No	Yes	Unspecified	Rate (95% CI)
In-hospital	Deep sternal wound infection	1,350	10	0	0.7% (0.4-1.4%)
	Any return to theatre	1,301	59	0	4.3% (3.3-5.6%)
	Return to theatre for bleeding	1,324	36	0	2.6% (1.9-3.7%)
30-day	Readmission	1,227	133	0	9.8% (8.3-11.5%)
	Deep sternal wound infection	1,344	16	0	1.2% (0.7-1.9%)

Aortic valve surgery

Aortic valve replacement (AVR) is undertaken to replace a diseased aortic valve. This is done with either a synthetic mechanical valve or a valve made from animal tissue. Damage to the native aortic valve leads to symptoms that may include shortness of breath, chest pain, dizziness or fainting. Internationally AVR is the most commonly performed isolated valve procedure performed by a cardiac surgeon.

Surgical aortic valve replacement is the gold standard intervention for the majority of patients with aortic valve disease and is performed by a cardiac surgical team utilising an incision in the chest and with the use of a heart and lung / cardiopulmonary bypass machine.

Transcatheter aortic valve interventions (TAVI / TAVR) are performed almost exclusively for aortic stenosis in New Zealand in a much smaller patient population. The outcomes of TAVI / TAVR are not currently discussed in this report. All patients presented here underwent standard open surgical aortic valve replacement performed by a cardiac surgical team.

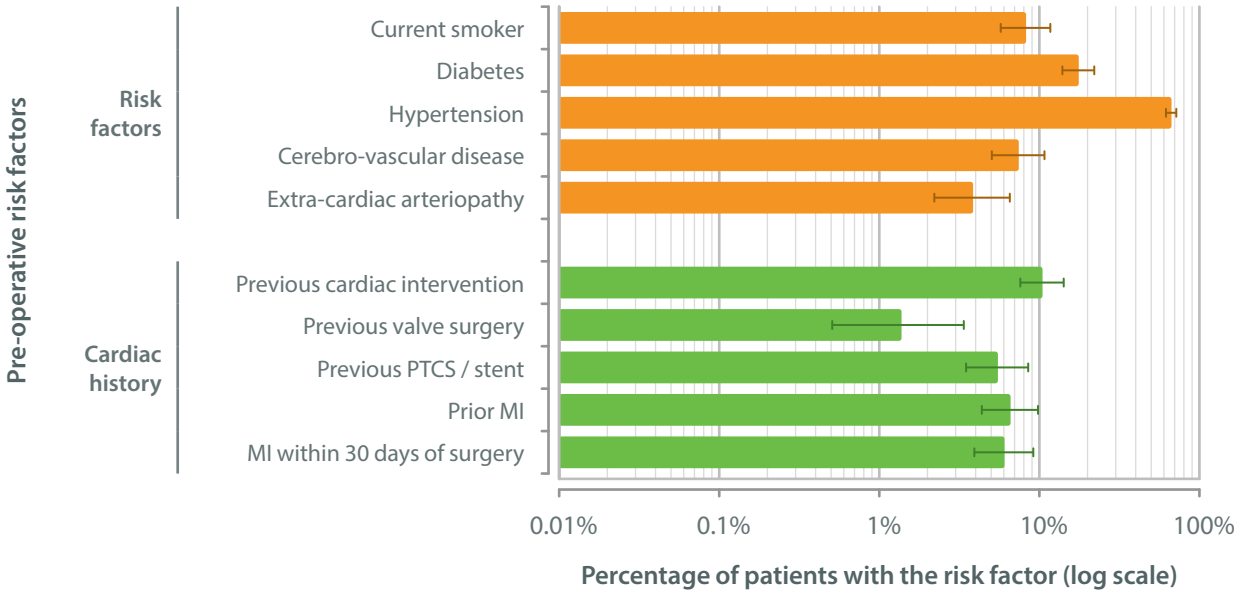
Table 14. Valve surgery in 2016

		Top-level procedure classification	
		Valve alone	**CABG & valve**
Valves treated	Aortic valve alone	398	216
	Mitral valve alone	162	53
	Aortic & mitral valves	36	9
	Mitral & tricuspid valves	49	9
	Others	20	2
	Unspecified	1	0
	All	**666**	**289**

Table 15. First-time isolated AVR in 2016: Pre-operative risk factors

		Risk factor present			
		No	Yes	Unspecified	Percentage with the risk factor
Risk factors	Current smoker	333	30	0	8.3%
	Diabetes	299	64	0	17.6%
	Hypertension	120	243	0	66.9%
	Cerebro-vascular disease	336	27	0	7.4%
	Extra-cardiac arteriopathy	349	14	0	3.9%
Cardiac history	Previous cardiac intervention	325	38	0	10.5%
	Previous CABG surgery	358	5	0	1.4%
	Previous PTCA / stent	343	20	0	5.5%
	Prior MI	339	24	0	6.6%
	Prior MI within 30 days of surgery	341	22	0	6.1%

Fig. 10 **First-time isolated AVR: Risk factors; calendar year 2016**



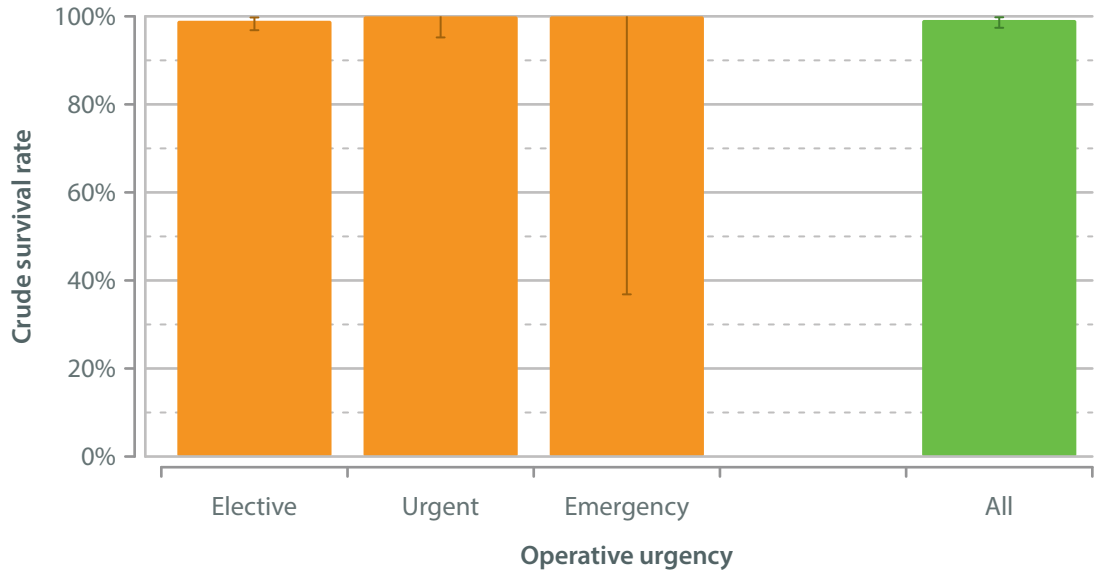
In the New Zealand registry 363 isolated first time AVRs have been performed which is approximately 13% of the overall surgical volume. This is an increase of 35 isolated aortic valve procedures compared to that reported in 2015.

Most patients undergo surgery in a planned or elective fashion with smaller numbers undergoing urgent, emergency or salvage surgery. As expected a significant number of the patients have additional cardiovascular risk factors including 17.6% diabetics, 66.9% with hypertension and 7.4% having had a previous cardiovascular intervention (Table 15).

Table 16. First-time isolated AVR in 2016: operative urgency and in-hospital survival

		In-hospital survival			
		Yes	No	All	Survival rate (95% CI)
Operative urgency	Elective	296	3	**299**	99.0%(96.8-99.7%)
	Urgent	61	0	**61**	100.0% (95.2-100.0%)
	Emergency / salvage	3	0	**3**	100.0% (36.8-100.0%)
	All	**360**	**3**	**363**	**99.2% (97.4-99.8%)**

Fig. 11 **First-time isolated AVR: In-hospital survival rates; calendar year 2016 (n=363)**

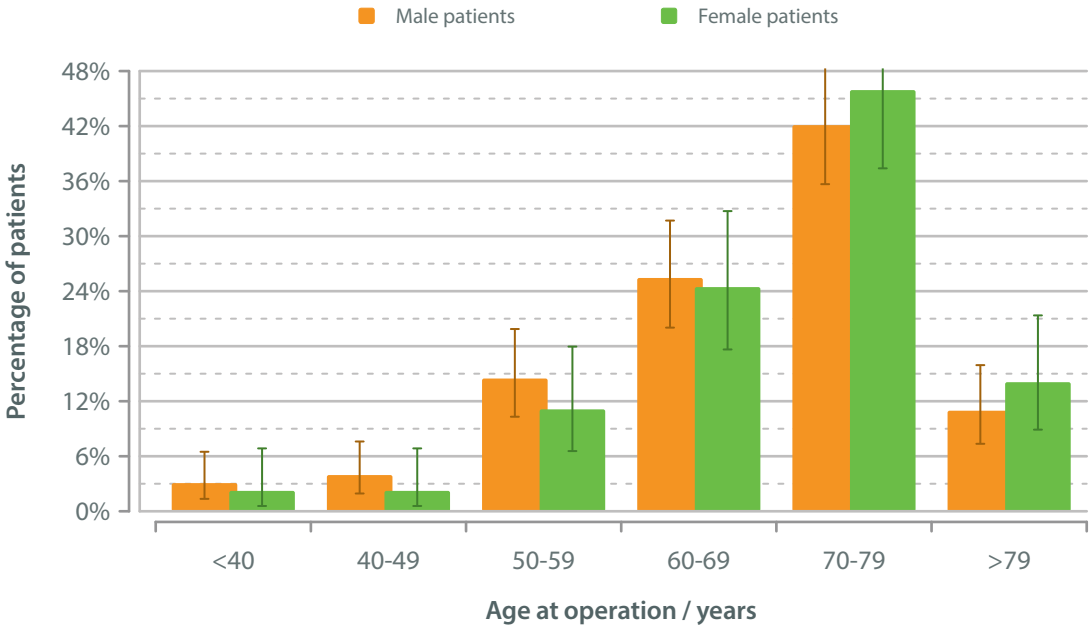


Aortic valve surgery may be required because of either leakage of the valve (aortic regurgitation) or blockage of the valve (aortic stenosis). These conditions can occur for a variety of reasons, the most common being degenerative age related calcification or hardening or the valve. Dysfunction of the valve may also be due to conditions such as rheumatic fever that can damage the structure of the valve or in some cases be due to a congenital abnormality (bicuspid aortic valve) that causes it to fail at an earlier age. In some cases the valve may need to be replaced because of infection on the leaflets that lead to valve destruction. The majority of patients have age related calcific aortic stenosis and this tends to occur later in life in particular in the >70 years of age group. Younger patients are more likely to have an AVR due to rheumatic fever, a bicuspid valves or infection on the leaflets. The total male to female ratio in this report is 2:1.

Table 17. First-time isolated AVR in 2016: age and gender

		Gender		
		Male	**Female**	**All**
Age at operation / years	<40	7	3	**10**
	40-49	9	3	**12**
	50-59	33	15	**48**
	60-69	58	33	**91**
	70-79	96	62	**158**
	>79	25	19	**44**
	Unspecified	0	0	**0**
	All	**228**	**135**	**363**

Fig. 12 **First-time isolated AVR: Age & gender distributions; calendar year 2016 (n=363)**



The ***EuroSCORE*** II is an internationally recognised tool used to predict mortality in patients undergoing cardiac surgery. It is a tool that we have used in this report to risk stratify patients undergoing AVR and to assess our performance against expected outcomes. In the 2015 report Auckland DHB were unable to generate ***EuroSCORE*** II data as at that time they did not collect all of the necessary data fields to enable risk modelling to be completed. The 2016 report has ***EuroSCORE*** II generated for all but 6 of 363 patients and gives a better reflection of risk adjusted outcomes for the entire New Zealand surgical population.

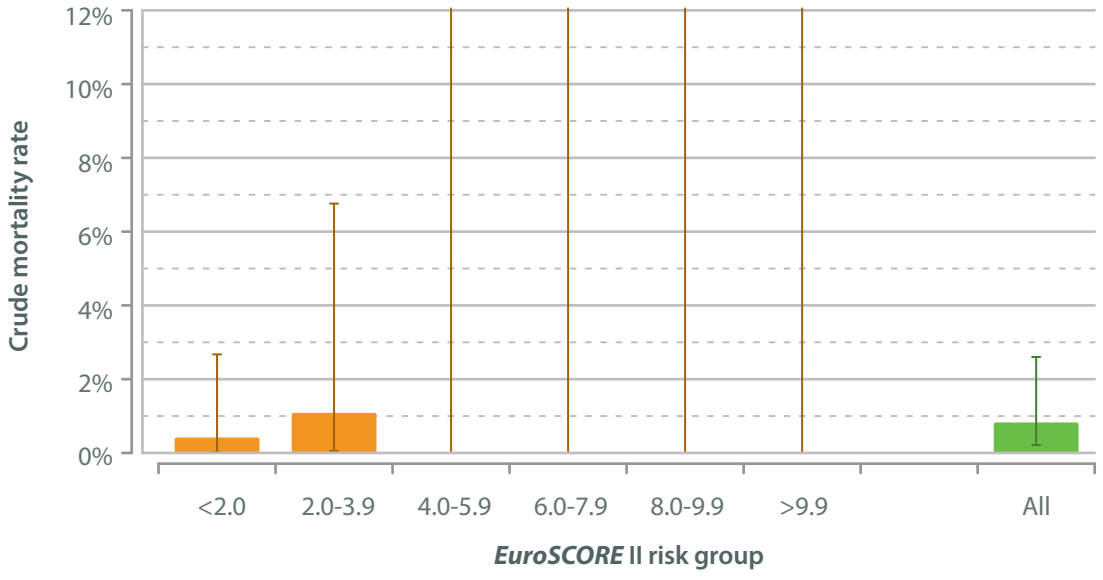
Table 18 shows the distribution of risk profiles in patients undergoing isolated AVR and the observed mortality rate. The overall observed mortality for isolated AVR in New Zealand was extremely low (0.8%), which is favourable when compared to internationally accepted outcomes. The 2015 ANZCTS publication of surgical outcomes (reference in footnote) reported a 1.8% mortality for isolated AVR in a similar cohort of patients.

As can be seen the majority of NZ patients (239) are in the low risk category (***EuroSCORE*** II <2% predicted mortality) with an observed mortality of 0.4% in low risk patients.

Table 18. First-time isolated AVR in 2016: ***EuroSCORE*** II risk score and in-hospital mortality

		In-hospital mortality			
		No	Yes	All	Mortality rate (95% CI)
EuroSCORE II	<2.0	238	1	**239**	0.4% (0.0-2.7%)
	2.0-3.9	91	1	**92**	1.1% (0.1-6.8%)
	4.0-5.9	18	0	**18**	0.0% (0.0-15.3%)
	6.0-7.9	1	0	**1**	0.0% (0.0-95.0%)
	8.0-9.9	3	0	**3**	0.0% (0.0-63.2%)
	>9.9	4	0	**4**	0.0% (0.0-52.7%)
	Unspecified	5	1	**6**	16.7% (0.9-63.5%)
	All	**360**	**3**	**363**	**0.8% (0.2-2.6%)**

Fig. 13 **First-time isolated AVR: In-hospital mortality and age;calendar year 2016 (n=357)**



Reported outcomes in groups with fewer numbers of patients are heavily influenced by those small numbers and therefore mortality rates have to be interpreted in the context of statistical variance. It was however reassuring to see very low mortality in the higher risk cohort of patients.

There was 1 death recorded in patients with a ***EuroSCORE*** II >2 and one deceased patient who did not have sufficient information to calculate ***EuroSCORE***.

As the registry grows we will be able to make more accurate assessment of outcomes in these higher risk cohorts.

Major morbidity compares favourably to international reported results [2]. This includes low incidence of deep sternal wound infection rates (NZ 0.6% *versus* ANZCTS 0.6%), return to theatre for bleeding (NZ 2.6% *versus* ANZCTS 3.7%).

Reported results suggest that for isolated AVR all DHBs and NZ surgeons as a collective group are performing within accepted standards when benchmarked to results observed within the United Kingdom and Australia.

Table 19. First-time isolated AVR in 2016: hospital resource utillisation

		No	Yes	Rate
Resource utilisation	Same day admission	346	17	4.7% (2.8-7.5%)
		Count	**Median**	**Inter-quartile range**
	Ventilation time / hours	358	5.0	4.0-9.0
	Time on ICU / hours	357	23.0	20.0-34.0
	Post-operative stay / days	363	6.0	5.0-8.0
	Hospital stay / days	363	8.0	7.0-12.0

Table 20. Isolated aortic valve surgery in 2016: complications

		Complication			
		No	**Yes**	**Unspecified**	**Rate** (95% CI)
In-hospital	Deep sternal wound infection	360	2	1	0.6% (0.1-2.2%)
	Any return to theatre	342	21	0	5.8% (3.7-8.8%)
	Return to theatre for bleeding	353	10	0	2.8% (1.4-5.2%)
30-day	Readmission	330	33	0	9.1% (6.4-12.6%)
	Deep sternal wound infection	361	2	0	0.6% (0.1-2.2%)

Summary

- The New Zealand Cardiac Surgery Registry has been created to record and provide analysis of publicly funded cardiac surgical procedures.
- In our second year of data collection we have continued to bench mark against the ANZCTS dataset and used ***EuroSCORE*** II as the risk stratification tool.
- We note that the risk adjusted outcomes and other measures of quality of care (ventilator time, ICU and hospital stay) for all five units for the two most common procedures (CABG and AVR) performed by adult cardiac surgeons compare well with internationally accepted standards.
- The spectrum of different operations performed is not dissimilar to other developed countries.
- Other smaller volume procedure will be able to be analysed once 5 years of data has been compiled and statistically significant volumes are available.
- The New Zealand Cardiac Surgery Registry will allow us in the future to research improved quality measures. We are presently working with the Surgical Site Infection Improvement Programme (SSII) HQSCNZ.
- Plans are underway to include Transcatheter Aortic Valve Implantation (TAVI) data within the cardiac surgical registry.
- Uniformity in Mortality and Morbidity (M and M) audit presentations will allow all cardiac surgical units to conform to a similar structure for such meetings.
- The results of the data are very favourable for the quality of surgery being delivered nationally. The outcome of surgically treated isolated aortic valve replacement of over 99% stands out. We are aware that this can alter as the number of cases increase.
- It is important to note that a cardiac surgical team comprises of a number of Medical staff from different specialities both doctors and nurses, allied workers and others who all play a role in the care of the patient and impact on the overall outcome of the procedure. Whilst the operation is ultimately the largest intervention undertaken it is important to stress that each of the medical professionals involved (cardiologist, surgeon, perfusionist, intensive care specialist, anaesthetist, junior doctor, nurse, social worker, physiotherapist, pharmacist and occupational therapist) play an important role and can impact on the morbidity and mortality associated with the procedure for each individual patient.
- Whilst the registry and our regulatory bodies (NZMC, RACS) have processes in place to identify and further assess under-performing individuals an important aspect of a national report is that it remains confidential at an individual surgeon and patient level. In reporting unit results we are acknowledging that the outcomes presented are not just attributable to individuals, but are a product of the collaboration between and the contributions made by all members of the cardiosurgical team.
- The New Zealand Cardiac Surgical Registry is supported by a rigorous governance structure. Each individual surgeon maintains professional development and practice audit in keeping with standards set by the New Zealand Medical Council (NZMC), the Australasian Society of Cardiac and Thoracic Surgeons (ANZCTS) and the Royal Australasian College of Surgeons (RACS).

Definitions

1. **Deep sternal wound infection**: is a serious post-operative complication of cardiac surgery.
2. **Elective**: the procedure could be deferred without the risk of compromised cardiac outcome.
3. **Urgent**: not routine; there is a medical reason for operating this admission.
4. **Emergency**: unscheduled surgery required in next available theatre on same day due to refractory angina or cardiac compromise.
5. **Salvage**: the patient is undergoing CPR *en route* to the operating room, that is, prior to surgical incision.
6. **Euroscore II**: an internationally recognised tool used to predict mortality in patients undergoing cardiac surgery. It is a tool that is used to risk stratify patients. ***EuroSCORE*** II has been developed by studying large numbers of patients (22,381) undergoing cardiac surgery in 154 hospitals in 43 countries [2].
7. **MI**: myocardial infarction.
8. **Mortality**: includes all deaths at the 5 public hospitals where cardiac surgery is performed prior to discharge and within 30 days of the date of surgery.
9. **PTCA**: percutaneous transluminal coronary angioplasty.

2. Nashef SA, Roques F, Sharples LD, Nilsson J, Smith C, Goldstone AR, Lockowandt U. EuroSCORE II. *European Journal of Cardiothorac Surgery*. 2012; **41(4)**: 734-745.

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 1; Version 1.0 (13 Dec 2013)

Basic demographic data

All baseline data refer to the condition of the patient when they were originally diagnosed.

Unique patient identifier

Gender
- ○ Male
- ○ Female

Date of birth dd / mm / yyyy

Registry data

Admission information

Date of admission dd / mm / yyyy

Ethnicity 1
- ○ European
- ○ Maori
- ○ Pacific peoples
- ○ Asian
- ○ Middle Eastern / Latin American / African
- ○ Other ethnicity
- ○ Residual categories

Ethnicity 2
- ○ European not further defined
- ○ NZ European
- ○ Other European
- ○ NZ Maori
- ○ Pacific Island not further defined
- ○ Samoan
- ○ Cook Island Maori
- ○ Tongan
- ○ Niuean
- ○ Tokelauan
- ○ Fijian
- ○ Other Pacific Island
- ○ Asian not further defined
- ○ Southeast Asian
- ○ Chinese
- ○ Indian
- ○ Other Asian
- ○ Middle Eastern
- ○ Latin American / Hispanic
- ○ African
- ○ Other ethnicity
- ○ Don't know
- ○ Refused to answer
- ○ Response unidentifiable
- ○ Not stated

Date of surgery dd / mm / yyyy

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 2; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Admission information continued …

Elective Day of Surgery Admit Patient	○ No	○ Yes
Insurance	○ Public ○ Private health insurance	○ Self funded ○ Other
Operation number	○ 1 ○ 2 ○ 3	○ 4 ○ 5 ○ 6
Height	cm	
Weight	kg	

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 3; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Patient risk factors

Smoking history	○ No	○ Yes
Current smoker	○ No	○ Yes
Family history of CAD	○ No ○ Yes	○ Undiscovered
Diabetes	○ No	○ Yes
Diabetes control	○ None ○ Diet	○ Oral ○ Insulin
Hypercholesterolaemia	○ No	○ Yes
Renal: last pre-op creatinine		µmol l^{-1}
Renal: dialysis	○ No	○ Yes
Renal: transplant	○ No	○ Yes
Renal: impairment	○ Normal (CC >85 ml min^{-1}) ○ Moderate (CC 50-85 ml min^{-1})	○ Severe (CC <50 ml min^{-1})
Hypertension	○ No	○ Yes
Cerebrovascular disease	○ No	○ Yes
Cerebrovascular disease: type	○ Coma ○ CVA	○ RIND or TIA ○ Carotid test
Cerebrovascular disease: when	○ Recent	○ Remote
PVD / extra-cardiac arteriopathy	○ No	○ Yes
Respiratory / pulmonary disease	○ No	○ Yes
Respiratory / pulmonary disease: type	○ Mild ○ Moderate	○ Severe
Infective endocarditis	○ No ○ Active	○ Treated
Immunosuppressive treatment	○ No	○ Yes
Poor mobility due to any non-cardiac reason	○ No	○ Yes

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 4; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier

Date of surgery dd / mm / yyyy

Pre-operative cardiac status

Pre-operative cardiac status

Myocardial infarction	○ No	○ Yes
Myocardial infarction: type	○ NSTEMI	○ STEMI
Myocardial infarction: when	○ <= 6 hours ○ 6-24 hours ○ 1-30 days	○ 31-90 days ○ >90 days
Date of last MI (if known)	dd / mm / yyyy	
Angina: CCS classification	○ 0 ○ 1 ○ 2	○ 3 ○ 4
Treatment of angina: iv GTN	○ No	○ Yes
Treatment of angina: iv heparin	○ No	○ Yes
Treatment of angina: full dose heparinoids	○ No	○ Yes
History of congestive heart failure	○ No	○ Yes
CHF at current admission	○ No	○ Yes
Dyspnoea: NYHA classification	○ 1 ○ 2	○ 3 ○ 4
Cardiogenic shock	○ No	○ Yes
Resuscitation within 1 hour of operation	○ No	○ Yes
Critical pre-operative state	○ No	○ Yes

Pre-operative cardiac status - arrhythmia

Arrhythmia	○ No	○ Yes
Arrhythmia: type	○ Sinus rhythm ○ Atrial ○ Heart block / pacing	○ Ventricular ○ Other abnormal rhythm
Atrial arrhythmia: type	○ Paraxysmal ○ Persistent	○ Permanent
Permanent pacemaker *in situ*	○ No	○ Yes

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 5; Version 1.0 (13 Dec 2013)

Unique patient identifier		
Date of surgery		dd / mm / yyyy

Medication at the time of surgery

Inotropes	○ No	○ Yes
iv nitrates	○ No	○ Yes
Anticoagulation therapy	○ No	○ Yes
Steroids	○ No	○ Yes
Thrombolysis (this admission)	○ No	○ Yes
Thrombolysis: interval		hours
Aspirin within 7 days of surgery	○ No	○ Yes
Aspirin: when	○ ≤2 days	○ 3-7 days
Clopidogrel within 7 days of surgery	○ No	○ Yes
Clopidogrel: when	○ ≤2 days	○ 3-7 days
IIb / IIIa blockade within 7 days of surgery	○ No	○ Yes
IIb / IIIa blockade: when	○ ≤2 days	○ 3-7 days
Aggrostat within 7 days of surgery	○ No	○ Yes
Aggrostat: when	○ ≤2 days	○ 3-7 days
Other antiplatelet therapy within 7 days of surgery	○ No ○ Yes	
Other antiplatelet: when	○ ≤2 days	○ 3-7 days

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 6; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Previous interventions (surgical or percutaneous)

Previous cardiothoracic intervention	○ No		○ Yes	
Previous surgery	○ No		○ Yes	
Type of previous surgery	☐ CABG ☐ Off-pump CABG ☐ Valve		☐ Congenital cardiac ☐ Aortic surgery (ascending / arch) ☐ Other cardiac	
Number of prior cardiac operations requiring cardiopulmonary bypass	○ 0 ○ 1 ○ 2 ○ 3		○ 4 ○ 5 ○ 6	○ 7 ○ 8 ○ 9
Number of prior cardiac operations without cardiopulmonary bypass	○ 0 ○ 1 ○ 2 ○ 3		○ 4 ○ 5 ○ 6	○ 7 ○ 8 ○ 9
Previous percutaneous intervention	○ No		○ Yes	
PTCA / stent	○ No		○ Yes	
PTCA / stent: which admission	○ Prior admission		○ This admission	
PTCA / stent: interval (same admission)	hours			
Other percutaneous interventions	☐ Non-surgical balloon valvuloplasty ☐ ASD device closure ☐ VSD device closure ☐ Percutaneous SVT / VT ablation			

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 7; Version 1.0 (13 Dec 2013)

Unique patient identifier

Date of surgery dd / mm / yyyy

Haemodynamic data

Cardiac catheterisation	○ No	○ Yes
Date of cardiac catheterisation	dd / mm / yyyy	
LVEF method	○ Not measured ○ LV gram ○ Radionuclide	○ Echo ○ MRI
EF	%	
EF estimate	○ Normal ○ Mild	○ Moderate ○ Severe
Left main stenosis >50%	○ No	○ Yes
Number of diseased coronary systems	○ None ○ One	○ Two ○ Three
PA systolic	mm Hg	
Pulmonary hypertension	○ No ○ Moderate	○ Severe

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 8; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier

Date of surgery dd / mm / yyyy

Operation status / category

Surgery data

Consultant surgeon

Operating surgeon
- ○ Consultant
- ○ Senior registrar
- ○ Trainee
- ○ Overseas fellow
- ○ Oversight

Operative urgency / status
- ○ Elective
- ○ Urgent
- ○ Emergency
- ○ Salvage

Direct transfer from cath lab to theatre ○ No ○ Yes

Coronary artery bypass ○ No ○ Yes

Valve surgery ○ No ○ Yes

Valve type
- ☐ Aortic
- ☐ Mitral
- ☐ Tricuspid
- ☐ Pulmonary

Redo valve ○ No ○ Yes

Reason for repeat valve placement
- ☐ Prosthetic / homograft valve failure
- ☐ Thrombosis
- ☐ Dehiscence
- ☐ Embolism
- ☐ Infection
- ☐ Haemolysis
- ☐ Prior valve repair
- ☐ Other reason

Aortic procedure ○ No ○ Yes

Other cardiac procedures ○ No ○ Yes

Other non-cardiac procedures ○ No ○ Yes

Aortic procedure

Aortic aneurysm repair (type)
- ○ No repair
- ☐ Ascending
- ☐ Arch
- ☐ Descending
- ☐ Thoracic / abdominal

Aortic dissection repair (type)
- ○ No repair
- ○ Ascending
- ○ Descending

Aortic dissection: when ○ Acute ○ Non-acute

Acute traumatic aortic transsection ○ No ○ Yes

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 9; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH MANATŪ HAUORA

Unique patient identifier

Date of surgery dd / mm / yyyy

Other cardiac surgery

Atrial arrhythmia surgery
- ○ No
- ○ Yes

Atrial arrhythmia surgery: lesion set
- ○ Cox Maze III
- ○ Radial
- ○ Mini-Maze
- ○ Left atrial reduction
- ○ Pulmonary vein isolation
- ○ Left atrial only
- ○ Right atrial only
- ○ Other

Atrial arrhythmia surgery: energy source
- ○ Cut & sew
- ○ Unipolar RF
- ○ Bipolar RF
- ○ Cryoablation
- ○ Microwave
- ○ Laser
- ○ Ultrasound
- ○ Other

Type of other cardiac surgery
- ☐ AF ablation surgery
- ☐ ASD
- ☐ Atrial myxoma
- ☐ Cardiac transplant
- ☐ Cardiac trauma
- ☐ Cardiac trauma - iatrogenic
- ☐ Cardiac tumour
- ☐ Epicardial pacemaker
- ☐ Left ventricular reconstruction
- ☐ LV aneurysm
- ☐ LVOT myectomy of HOCM
- ☐ LV rupture
- ☐ Pericardiectomy
- ☐ Peripheral vascular
- ☐ Permanent LV epicardial lead
- ☐ Primary VAD
- ☐ Pulm. thromboendarterectomy
- ☐ Pulmonary embolectomy
- ☐ Pulmonary transplant
- ☐ VSD (acquired)
- ☐ Other congenital
- ☐ Other

Other non-cardiac surgery

Carotid endarterectomy
- ○ No
- ○ Yes

Lung resection
- ○ No
- ○ Yes

Other vascular surgery
- ○ No
- ○ Yes

Other thoracic surgery
- ○ No
- ○ Yes

Other surgery
- ○ No
- ○ Yes

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 10; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

CPB and support

Minimally invasive

Minimally invasive techniques attempted	○ No	○ Yes
Minimally invasive techniques indication	○ Choice ○ Contraindication	○ Catheter
Performed off pump	○ No	○ Yes
Robotically assisted	○ No	○ Yes

CPB and mechanical support

Cardiopulmonary bypass used	○ No	○ Yes
Cardioplegia used	○ No	○ Yes
Cumulative cross clamp time	min	
Cumulative cardiopulmonary bypass time	min	
IABP	○ No	○ Yes
IABP: when inserted	○ Pre-op ○ Intra-op	○ Post-op
IABP: indication	○ Haemodynamic instability ○ PTCA support ○ Unstable angina	○ CPB wean ○ Prophylactic
Rota-pump	○ No	○ Yes
Rota-pump: when inserted	○ Pre-op ○ Intra-op	○ Post-op
Rota-pump: indication	○ Haemodynamic instability ○ PTCA support ○ Unstable angina	○ CPB wean ○ Prophylactic
Other mechanical support	○ No	○ Yes
Other mechanical support: when inserted	○ Pre-op ○ Intra-op	○ Post-op
Other mechanical support: indication	○ Haemodynamic instability ○ PTCA support ○ Unstable angina	○ CPB wean ○ Prophylactic

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 11; Version 1.0 (13 Dec 2013)

Unique patient identifier		
Date of surgery		dd / mm / yyyy

CPB and support continued …

Other support

Intra-operative TOE	○ No	○ Yes
Intra-operative TOE: type	○ Non-elective	○ Elective
Intra-operative antifibrinolytic use	○ No	○ Yes
Intra-operative antifibrinolytic use: type	○ Trasylol ○ Tranexamic acid	○ Other

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 12; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier		
Date of surgery		dd / mm / yyyy

Coronary bypass

Intra-operative decision to graft coronary artery	○ No ○ Yes	
IMA used	○ No	○ Yes
Which IMA used	☐ Left	☐ Right
Number of distal arterial grafts		integer: 0-9
Number of IMA distal anastomoses		integer: 0-6
Number of RA conduits harvested		integer: 0-2
Number of radial distal anastomoses		integer: 0-6
Number of vein distal anastomoses		integer: 0-9
Number of GEPA distal anastomoses		integer: 0-6
Were arterial T or Y grafts used	○ No	○ Yes
Total number of distal anastomoses		integer: 0-30

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 13; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH MANATŪ HAUORA

Unique patient identifier

Date of surgery dd / mm / yyyy

Aortic valve surgery

Aortic valve procedure
- ○ Replacement
- ○ Repair / reconstruction without annuloplasty
- ○ Root reconstruction with valve conduit (Bentall procedure)
- ○ Root reconstruction with valve sparing (David procedure)
- ○ Resuspension aortic valve
- ○ Resection sub-aortic stenosis
- ○ Repair paravalvular leak
- ○ Valvotomy
- ○ Ross procedure
- ○ Inspection only
- ○ Decalcification of valve only

Implant - type
- ○ None
- ○ Mechanical
- ○ Bioprosthesis
- ○ Autograft
- ○ Homograft / allograft
- ○ Ring / band

Implant - manufacturer's model number select from table

Implant - serial number select from table

Implant - size mm

Explant - type
- ○ None
- ○ Mechanical
- ○ Bioprosthesis
- ○ Autograft
- ○ Homograft / allograft
- ○ Ring / band

Explant - manufacturer's model number select from table

Explant - serial number select from table

Explant - size mm

Aortic stenosis
- ○ No
- ○ Yes

Aortic regurgitation / insufficiency
- ○ None
- ○ Trivial
- ○ Mild
- ○ Moderate
- ○ Severe

Aortic pathology / aetiology
- ○ Rheumatic
- ○ Congenital
- ○ Ischaemic
- ○ Idiopathic calcific
- ○ Myxomatous degen
- ○ Failed prior repair
- ○ Prosthetic valve failure
- ○ Peri-prosthetic leak
- ○ Prosthetic valve thrombosis
- ○ Active infection
- ○ Previous infection
- ○ Marfans
- ○ Annuloaortic ectasia
- ○ Other degenerative disease
- ○ Dissection
- ○ Tumour
- ○ Trauma
- ○ Iatrogenic
- ○ Other

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 14; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier

Date of surgery dd / mm / yyyy

Mitral valve surgery

Mitral valve procedure
- ○ Annuloplasty only
- ○ Replacement
- ○ Repair / reconstruction with annuloplasty
- ○ Repair / reconstruction without annuloplasty
- ○ Commissurotomy with annuloplasty ring
- ○ Commissurotomy without annuloplasty ring
- ○ Repair paravalvular leak
- ○ Inspection only
- ○ Decalcification of valve only

Implant - type
- ○ None
- ○ Mechanical
- ○ Bioprosthesis
- ○ Autograft
- ○ Homograft / allograft
- ○ Ring / band

Implant - manufacturer's model number select from table

Implant - serial number select from table

Implant - size mm

Explant - type
- ○ None
- ○ Mechanical
- ○ Bioprosthesis
- ○ Autograft
- ○ Homograft / allograft
- ○ Ring / band

Explant - manufacturer's model number select from table

Explant - serial number select from table

Explant - size mm

Mitral stenosis
- ○ No
- ○ Yes

Mitral regurgitation / insufficiency
- ○ None
- ○ Trivial
- ○ Mild
- ○ Moderate
- ○ Severe

Mitral pathology / aetiology
- ○ Functional or isolated annular dilataion
- ○ Rheumatic
- ○ Congenital
- ○ Ischaemic
- ○ Idiopathic calcific
- ○ Myxomatous degen
- ○ Failed prior repair
- ○ Prosthetic valve failure
- ○ Peri-prosthetic leak
- ○ Prosthetic valve thrombosis
- ○ Active infection
- ○ Previous infection
- ○ Marfans
- ○ Other degenerative disease
- ○ Tumour
- ○ Trauma
- ○ Iatrogenic
- ○ Other

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 15; Version 1.0 (13 Dec 2013)

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Tricuspid valve surgery

Tricuspid valve procedure	○ Annuloplasty only ○ Replacement ○ Repair / reconstruction with annuloplasty ○ Repair / reconstruction without annuloplasty ○ Commissurotomy with annuloplasty ring ○ Commissurotomy without annuloplasty ring ○ Repair paravalvular leak ○ Valvectomy (no replacement) ○ Inspection only
Implant - type	○ None ○ Mechanical ○ Bioprosthesis ○ Autograft ○ Homograft / allograft ○ Ring / band
Implant - manufacturer's model number	select from table
Implant - serial number	select from table
Implant - size	mm
Explant - type	○ None ○ Mechanical ○ Bioprosthesis ○ Autograft ○ Homograft / allograft ○ Ring / band
Explant - manufacturer's model number	select from table
Explant - serial number	select from table
Explant - size	mm
Tricuspid stenosis	○ No ○ Yes
Tricuspid regurgitation / insufficiency	○ None ○ Trivial ○ Mild ○ Moderate ○ Severe
Tricuspid pathology / aetiology	○ Rheumatic ○ Congenital ○ Ischaemic ○ Idiopathic calcific ○ Myxomatous degen ○ Failed prior repair ○ Prosthetic valve failure ○ Peri-prosthetic leak ○ Prosthetic valve thrombosis ○ Active infection ○ Previous infection ○ Marfans ○ Other degenerative disease ○ Tumour ○ Trauma ○ Iatrogenic ○ Functional ○ Other

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 16; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Pulmonary valve surgery

Pulmonary valve procedure	○ Replacement ○ Repair / reconstruction without annuloplasty ○ Commissurotomy without annuloplasty ring ○ Repair paravalvular leak
Implant - type	○ None ○ Autograft ○ Mechanical ○ Homograft / allograft ○ Bioprosthesis ○ Ring / band
Implant - manufacturer's model number	select from table
Implant - serial number	select from table
Implant - size	mm
Explant - type	○ None ○ Autograft ○ Mechanical ○ Homograft / allograft ○ Bioprosthesis ○ Ring / band
Explant - manufacturer's model number	select from table
Explant - serial number	select from table
Explant - size	mm
Pulmonary stenosis	○ No ○ Yes
Pulmonary regurgitation / insufficiency	○ None ○ Trivial ○ Moderate ○ Mild ○ Severe
Pulmonary pathology / aetiology	○ Rheumatic ○ Active infection ○ Congenital ○ Previous infection ○ Ischaemic ○ Marfans ○ Idiopathic calcific ○ Other degenerative disease ○ Myxomatous degen ○ Tumour ○ Failed prior repair ○ Trauma ○ Prosthetic valve failure ○ Iatrogenic ○ Peri-prosthetic leak ○ Functional ○ Prosthetic valve thrombosis ○ Other

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 17; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier		
Date of surgery		dd / mm / yyyy

Post-operative data

RBC blood bank products	○ No	○ Yes
Non-RBC blood bank products	○ No	○ Yes
Peri-operative transfusion: bank RBC		units
Peri-operative transfusion: platelets		units
Peri-operative transfusion: Novo 7		units
Peri-operative transfusion: FFP		units
Peri-operative transfusion: Cryo		units
ICU admission: date and time		dd / mm / yyyy
Extubation: date and time		dd / mm / yyyy
ICU discharge: date and time		dd / mm / yyyy
Readmitted to ICU	○ No	○ Yes
Reintubated	○ No	○ Yes
Reintubation: date and time		dd / mm / yyyy
Reextubation: date and time		dd / mm / yyyy
ICC loss (first 4 hours post surgery)		dd / mm / yyyy

Returned to theatre

Return to theatre	○ No	○ Yes
Reason for re-operation	☐ Valve dysfunction ☐ Bleeding / tamponade ☐ Graft occlusion	☐ Sternal infection ☐ Other cardiac ☐ Other non-cardiac

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 18; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier		
Date of surgery		dd / mm / yyyy

Complications

Renal and neurological complications

New renal failure	○ No	○ Yes
Haemofiltration	○ No	○ Yes
Highest post-op creatinine		µmol l^{-1}
Perioperative cardiogenic shock	○ No	○ Yes
New neurological status	○ No	○ Yes
Stroke permanent	○ No	○ Yes
Stroke transient	○ No	○ Yes
New continuous coma (≥24 hours)	○ No	○ Yes

Cardiac complications

Perioperative AMI	○ No	○ Yes
Cardiac inotrope use: >4 hours post-operatively	○ No ○ Yes	
Cardiac inotrope use: low cardiac output syndrome	○ No ○ Yes	
Cardiac inotrope use: low SVR syndrome	○ No	○ Yes
New cardiac arrhythmia	○ No	○ Yes
New heart block (requiring PPM)	○ No	○ Yes
New other brady arrhythmia (requiring PPM)	○ No	○ Yes
Cardiac arrest	○ No	○ Yes
New atrial arrhythmia (requiring Rx)	○ No	○ Yes
New ventricular tachycardia	○ No	○ Yes

Powered by
Dendrite Clinical Systems

Appendix

New Zealand Ministry of Health
NZ Adult Cardiac Surgical Database
Baseline section; Page 19; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH MANATŪ HAUORA

Unique patient identifier		
Date of surgery		dd / mm / yyyy

Complications continued …

Pulmonary, infection, vascular and other complications

Prolonged ventilation >24 hours	○ No	○ Yes
Pulmonary embolism	○ No	○ Yes
Pneumonia	○ No	○ Yes
Reintubation and ventilation	○ No	○ Yes
Deep sternal wound infection	○ No	○ Yes
Deep thoracotomy wound infection	○ No	○ Yes
Septicaemia	○ No	○ Yes
Aortic dissection (complication)	○ No	○ Yes
Acute limb ischaemia	○ No	○ Yes
Anti-coagulant complication	○ No	○ Yes
GIT complication	○ No	○ Yes
Multi-system failure	○ No	○ Yes

Powered by
Dendrite Clinical Systems

New Zealand Ministry of Health

NZ Adult Cardiac Surgical Database

Baseline section; Page 20; Version 1.0 (13 Dec 2013)

MINISTRY OF HEALTH
MANATŪ HAUORA

Unique patient identifier	
Date of surgery	dd / mm / yyyy

Discharge / mortality

Discharge	○ Home ○ Hospital in the home ○ Rehabilitation unit / hospital ○ Local or referring hospital ○ Hospital mortality
Date of discharge	dd / mm / yyyy
Mortality post discharge	○ No ○ Yes
Mortality date	dd / mm / yyyy
Mortality location	○ Operating room ○ Hospital ○ Home ○ Other facility
Mortality: primary cause	○ Cardiac ○ Neurological ○ Renal ○ Vascular ○ Infection ○ Respiratory failure ○ Multisystem failure ○ Pulmonary embolism ○ Aortic dissection ○ Valvular ○ Other ○ Unknown
Mortality: subsequent cause	○ Cardiac ○ Neurological ○ Renal ○ Vascular ○ Infection ○ Respiratory failure ○ Multisystem failure ○ Pulmonary embolism ○ Aortic dissection ○ Valvular ○ Other ○ Unknown
Cognisant patient withdraws from treatment	○ No ○ Yes

Readmission

Readmitted ≤30 days from surgery	○ No ○ Yes
Reason for readmission	○ Anticoagulant complication ○ Arrhythmia ○ Congestive heart failure ○ Valve dysfunction ○ Pericardial effusion ○ Cardiac tamponade ○ Deep sternal infection ○ Other incisional complication ○ Respiratory complication including pneumonia ○ Myocardial infarction ○ Recurrent angina ○ Other complication related to cardiac surgery ○ Other readmission unrelated to cardiac surgery

Powered by
Dendrite Clinical Systems