

Table 2. Adverse events and outcomes

	DM Group (n=849)	Non-DM Group (n=572)	Risk ratio (95%CI)	P value
Primary composite endpoint	105 (12.4%)	60 (10.5%)	1.18 (0.87-1.59)	0.279
Additional composite endpoint	92 (10.8%)	42 (7.3%)	1.48 (1.04-2.09)	0.027
All-cause deaths	18 (2.1%)	6 (1.1%)	2.02 (0.81-5.06)	0.124
Acute myocardial infarction Related death	11 (1.3%) 2 (0.2%)	12 (2.1%) 0		
Cerebrovascular accident Related death	12 (1.4%) 1 (0.1%)	6 (1.1%) 0		
Other cardiovascular event Related death	11 (1.3%) 3 (0.4%)	15 (2.6%) 1 (0.2%)		
All infections Related death	78 (9.2%) 10 (1.2%)	35 (6.1%) 1 (0.2%)	1.50 (1.02-2.21)	0.036
Infection site				
Deep sternal wound	17 (2.0%)	6 (1.1%)	1.91 (0.76-4.81)	0.163
Superficial sternal wound	22 (2.6%)	15 (2.6%)		
Graft harvest site	22 (2.6%)	9 (1.6%)		
Blood stream	5 (0.6%)	2 (0.4%)		
Urinary tract	5 (0.6%)	1 (0.2%)		
Pneumonia	9 (1.1%)	8 (1.1%)		
Acute renal failure Related death	12 (1.4%) 1 (0.1%)	5 (0.9%) 0	1.62 (0.57-4.57)	0.359
Other deaths	1 (0.1%)	4 (0.7%)		

CI: confidence interval, DM: diabetes mellitus

Table 3. Results of the logistic regression for the additional composite endpoint

Variables	Odds ratio	95% CI	P value
Diabetes mellitus	1.28	0.85-1.92	0.235
Age (in 10-year increments)	1.01	0.81-1.26	0.935
Male gender	0.58	0.38-0.89	0.012
Body mass index	1.07	1.02-1.14	0.012
Congestive heart failure	0.94	0.51-1.67	0.843
Renal insufficiency	3.23	2.00-5.14	0.000
Chronic obstructive pulmonary disease	1.91	1.02-3.41	0.034
Peripheral artery disease	0.94	0.57-1.49	0.787
Left ventricular ejection fraction < 50%	1.39	0.89-2.13	0.139
Urgent	1.60	0.82-2.95	0.149
Emergency	1.13	0.34-3.13	0.823
Bilateral internal thoracic artery use	1.31	0.89-1.94	0.177
Intraoperative steroid use	0.66	0.42-1.01	0.060

CI: confidence interval

Table 4. Results of the logistic regression for all infections

Variables	Odds ratio	95% CI	P value
Diabetes mellitus	1.29	0.84-2.01	0.253
Age (in 10-year increments)	0.96	0.76-1.22	0.751
Male gender	0.52	0.33-0.83	0.005
Body mass index	1.08	1.02-1.14	0.014
Congestive heart failure	0.96	0.49-1.79	0.904
Renal insufficiency	3.13	1.86-5.16	0.000
Chronic obstructive pulmonary disease	1.85	0.93-3.46	0.064
Peripheral artery disease	0.85	0.49-1.40	0.533
Left ventricular ejection fraction < 50%	1.42	0.88-2.26	0.142
Urgent	1.37	0.65-2.69	0.386
Emergency	0.72	0.16-2.36	0.619
Bilateral internal thoracic artery use	1.37	0.90-2.09	0.144
Intraoperative steroid use	0.68	0.42-1.06	0.099

CI: confidence interval

Table 5. Results of the logistic regression for all cause death

Variables	Odds ratio	95% CI	P value
Diabetes mellitus	1.89	0.72-5.61	0.219
Age (in 10-year increments)	1.10	0.67-1.88	0.715
Male gender	0.66	0.25-1.97	0.429
Body mass index	0.90	0.78-1.04	0.169
Congestive heart failure	2.27	0.69-7.03	0.165
Renal insufficiency	3.04	1.12-7.80	0.023
Chronic obstructive pulmonary disease	4.22	1.24-12.60	0.013
Peripheral artery disease	1.56	0.55-4.07	0.374
Left ventricular ejection fraction < 50%	2.33	0.92-5.87	0.071
Urgent	3.15	0.89-10.32	0.065
Emergency	5.30	1.05-26.7	0.043
Bilateral internal thoracic artery use	1.85	0.71-4.81	0.204
Intraoperative steroid use	0.35	0.10-1.00	0.073

CI: confidence interval

Appendix I

Preoperative variables include age, gender, height, and weight. Preoperative co-morbidities included systemic hypertension, dyslipidemia, insulin-controlled DM, oral medication-controlled DM, diet-controlled-DM, congestive heart failure, renal insufficiency, chronic obstructive pulmonary disease, peripheral artery disease, cigarette smoking, cerebrovascular accidents, and advanced New York Heart Association functional class. Cardiovascular variables included left main coronary disease, number of diseased coronary arteries, left ventricular ejection fraction, unstable angina, acute MI, previous MI, history of atrial fibrillation and ventricular tachycardia or fibrillation, cardiogenic shock, PCI, and intra-aortic balloon pump insertion. Preoperative blood laboratory variables included random and fasting serum glucose, HbA1c, albumin, serum creatinine, blood urea nitrogen, total cholesterol, high density and low density lipoproteins, triglycerides, and C-reactive protein. Preoperative medications included digitalis, beta-blockers, nitrates, inotropic agents, oral hypoglycemics, insulin, diuretics, steroids and immunosuppressants. Intraoperative variables were operative status (elective, urgent or emergency), reoperative procedure, single or bilateral internal thoracic artery or other arterial conduit usage, saphenous vein grafts and their targets, use of cardiopulmonary bypass, application of aortic cross-clamping, aortic cross-clamp time, cardiopulmonary bypass time, administration of intravenous insulin and steroids, and blood transfusion.

Appendix II

Definitions of clinical events

Acute myocardial infarction: the presence of at least two of the following symptoms or findings:

- (1) CK-MB \geq 5% of total CK and total CK \geq 3x normal control, or CK-MB \geq 100 mg/dl.
- (2) typical symptoms.
- (3) typical ECG change (new onset of ST-T change in more than 2 consecutive leads on 12-lead ECG or abnormal Q wave).
- (4) New onset abnormal wall motion abnormality lasting \geq 24 hours on echocardiography.

Of note, a pathological diagnosis of acute myocardial infarction on autopsy does not require any of the above findings.

Cerebral infarction: including all the following symptoms and findings:

- (1) Apparent focal neurological deficits and symptoms or signs compatible with no other identified causes.
- (2) Neurological symptoms and signs lasting \geq 24 hours (excluded if patient died).

- (3) Radiological diagnosis on computed tomography or magnetic resonance image.

Acute renal failure: increased creatinine of more than twice the preoperative baseline and equal to or more than 2.0mg/dl, or newly requiring hemodialysis.

Infection: infection occurs within 30 days after surgery

1. **Deep sternal wound infection:** infection involving deep sternum and/or anterior mediastinum (fascia, sternum, mediastinum) and either:

- (1) Purulent drainage from the deep incision or the chest tube which is placed in the area communicating to the anterior mediastinum.
- (2) Organisms isolated from an aseptically obtained culture of fluid or tissue from the deep sternal wound or anterior mediastinum.
- (3) A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$), localized pain, or tenderness, unless site is culture-negative.
- (4) An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
- (5) Diagnosis of a deep incisional surgical site infection by a surgeon or attending physician.

2. **Superficial sternal wound infection:** infection involving only the skin or subcutaneous tissue of the incision and either:

- (1) Purulent drainage, with or without laboratory confirmation, from the superficial incision.
- (2) Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
- (3) At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless the incision is culture-negative.
- (4) Diagnosis of superficial incisional surgical site infection by the surgeon or attending physician.

3. **Graft harvest site infection:** surgical site(s) infection including saphenous vein and radial artery harvesting:

- (1) At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat.

- (2) Superficial incision is deliberately opened by the surgeon, or required resection of tissue or drainage, unless the incision is culture-negative.
- (3) Diagnosis of superficial incisional surgical site infection by the surgeon or attending physician.

4. **Blood stream infection:** the presence of a positive non-contaminated blood culture.

Contamination is diagnosed if one or more of the following organisms is identified in only one of a series of blood cultures: coagulase-negative staphylococci; *Propionibacterium acnes*; *Micrococcus* species; “viridans”-group streptococci; *Corynebacterium* species; or *Bacillus* species.

5. **Urinary tract infection:** defined as the presence of symptoms or signs compatible with no other identified source of infection along with either:

- (1) $>10^5/\text{mm}^3$ colony forming units/ml of at least one bacterial species in a single urine specimen.
- (2) purulent urine (> 10 white blood cells/field in a microscopic urinalysis).

6. **Pneumonia:** The clinical suspicion of pneumonia is based on clinical criteria; new or progressive radiological pulmonary infiltrate plus more than two of the following characteristics: temperature ($38^\circ\text{C} < \text{or} < 35.5^\circ\text{C}$), leukocyte count ($>12,000 \text{ cells}/\text{mm}^3$ or $<4,000 \text{ cells}/\text{mm}^3$) or purulent respiratory secretions. Ventilator-associated pneumonia is diagnosed in patients with microbiologic evaluation including the collection of at least one lower respiratory airway sample by sputum, tracheobronchial aspirate, bronchoscopy or by blind bronchoalveolar lavage. Blood cultures and cultures of pleural fluid specimens, if puncture was indicated, were also undertaken. Microbiologic confirmation of pneumonia was defined by the presence of ≥ 1 potentially pathogenic microorganism in the respiratory samples above the predefine thresholds (for bronchoalveolar lavage specimens, $>10^4$ colony forming units/ml; for sputum or tracheobronchial aspirate specimens, $>10^5$ colony forming units/ml); in pleural fluid specimens; or in blood cultures, if an alternative cause of bacteremia was ruled out.

Appendix III

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Thoracic and cardiovascular surgery in Japan during 2008

Annual report by The Japanese Association for Thoracic Surgery

Committee for Scientific Affairs

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The Japanese Association for Thoracic Surgery has conducted annual surveys of thoracic surgery throughout Japan since 1986 to determine the statistics regarding the number of procedures according to the operative category. Here we have summarized the results from our annual survey of thoracic surgery performed during 2008.

The incidence of hospital mortality was added to the survey to determine the nationwide status, which can be useful not only for surgeons, who can better compare their work with that of others, but also for the Association, which can gain a better understanding of present problems as well as future prospects. Thirty-day mortality (sometimes termed “operative mortality”) is death within 30 days of an operation regardless of the patient’s geographic location and even though the patient had been discharged from the hospital within those 30 days.

Hospital mortality is death within any time interval after an operation if the patient had not been discharged from the hospital. Hospital-to-hospital transfer is not

considered discharge; transfer to a nursing home or a rehabilitation unit is considered hospital discharge unless the patient subsequently dies of complications of the operation. (The definitions of terms are based on the published guidelines of the Ad Hoc Liaison Committee for Standardizing Definitions of Prosthetic Heart Valve Morbidity of the Society of Thoracic Surgeons and the American Association for Thoracic Surgery (Edmunds et al. *Ann Thorac Surg* 1996;62:932–5; *J Thorac Cardiovasc Surg* 1996;112:708–11).

Thoracic surgery was classified into three categories—cardiovascular, general thoracic, and esophageal surgery—and the pertinent data were examined and analyzed for each group. Access to the computerized data is offered to all members of this Association. We honor and value your continued kind support and contributions.

Abstract of the survey

We sent out survey questionnaire forms to the departments of each category in all 1,989 institutions nationwide in early April 2009. The response rates in each category by the end of December 2009 were 99.0%, 95.3%, and 95.7% for cardiovascular, general thoracic, and esophageal surgery, respectively.

This is the annual report by The Japanese Association for Thoracic Surgery from the Committee for Scientific Affairs.

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Questionnaires sent out and received back by the end of December 2009

	Sent out	Returned	Response rate
(A) Cardiovascular surgery	599	593	99.0%
(B) General thoracic surgery	785	748	95.3%
(C) Esophageal surgery	605	579	95.7%

Categories subclassified according to the number of operations performed

No. of operations performed	Category	
	Cardiovascular surgery	General thoracic surgery
0	62	33
1–24	53	136
25–49	101	143
50–99	162	202
100–149	96	118
150–199	42	55
≥200	77	61
Total	593	748

No. of operations performed	Esophageal surgery
0	78
1–4	184
5–9	121
10–19	92
20–29	36
30–39	25
40–49	11
≥50	32
Total	579

2008 Final report

(A) Cardiovascular surgery

First, we are very pleased with the high response rate to our survey of cardiovascular surgery (99%), which definitely enhances the quality of this annual report. We very much appreciate the enormous effort put into completing the survey at each participating institution.

Figure 1 shows the development of cardiovascular surgery in Japan over the last 23 years. Aneurysm surgery includes only operations for thoracic or thoracoabdominal aortic aneurysms. The number of pacemaker and assist device implantation operations is not included in the total number of surgical operations. A total of 57,941 cardiovascular operations were performed at 593 institutions during 2008 alone and included 11 cardiac transplantation operations, which were started from 1999.

The number of operations for thoracic aortic aneurysm consistently increased, by 9.1%, and that for valvular heart disease also increased, by 10%, compared with 2007. Surgery for congenital heart disease slightly increased, by 2.7%. Of great interest, the number of operations for ischemic heart disease increased by 2.8% in 2008 compared with 2007, after a consecutive decline for the last 5 years. We hope that this trend steadily continues.

Data for individual categories are summarized in Tables 1–7. In 7,328 open-heart operations performed for congenital heart disease, the overall hospital mortality was 2.6%, which has varied little since 2005. Mitral valve repair constituted 28.2% of all valvular heart disease operations (16,747), which is similar to that of the last 3 years. Aortic valve replacement with a bioprosthesis was performed in 5,417 cases, with the number consistently increasing. The hospital mortality rates associated with primary single valve replacement were

2.8% and 4.5% for aortic and mitral valve replacement, respectively, while that for primary mitral valve repair was 1.3%. However, hospital mortality rates for redo valve replacement were 7.4% and 6.4% for aortic and mitral procedures, respectively.

Isolated coronary artery bypass grafting (CABG) was performed in 17,764 cases which is an increase of 2.7% compared with 17,295 in 2007.

The operative and hospital mortality rates associated with primary elective CABG procedures in 14,943 cases were 0.7% and 1.2%, respectively. However, hospital mortality of primary emergency CABG in 2,487 cases was 7.4%, which was still high. Off-pump coronary bypass grafting (OPCAB) was performed in 11,222 cases, constituting 63.2% of the total isolated CABG procedures. The percentage of OPCAB cases among the total isolated CABG procedures has been at the same level since 2005.

A total of 1,466 patients underwent surgery for complications of myocardial infarction, including 505 operations for a left ventricular aneurysm or infarction and 386 operations for ischemic mitral regurgitation. Operations for thoracic aortic dissection were performed in 5,013 cases. For 3,283 type A acute aortic dissections,

hospital mortality was 13.0%, which was similar to that in 2007 (12.7%). Operations for a nondissected thoracic aneurysm were carried out in 5,985 cases, with an overall hospital mortality of 7.6%, which was equivalent to that in 2007 (7.6%). The hospital mortality associated with unruptured aneurysms was 5.0%, and that for ruptured aneurysms was 28.1%, which remains markedly high compared with that in 2007 (24.7%).

The number of stent graft procedures remarkably increased. A total of 331 patients with aortic dissection underwent stent graft placement: transluminal stent grafting (TEVAR) in 247 cases, open stent grafting in 82 cases. The hospital mortality rates of TEVAR for type B aortic dissection were 6.5% in acute dissection and 4.2% in chronic dissection. A total of 1,075 patients with a nondissected aortic aneurysm underwent stent graft placement (TEVAR in 823 cases; open stent grafting in 246 cases). The hospital mortality rates for TEVAR were 2.7% and 18.3% for nonruptured and ruptured aneurysms, respectively.

In summary, the total cardiovascular operations increased during the year 2008 by 5.3%. They were performed with steadily improving results in almost all categories compared with those in 2007.

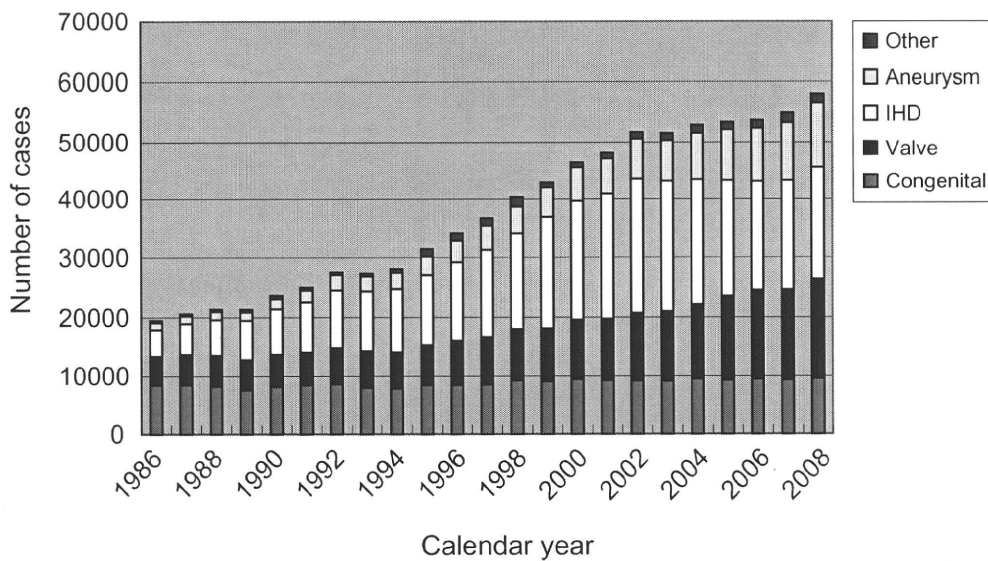


Fig. 1 General thoracic surgery. IHD, ischemic heart disease

Table 1 Congenital (total 9,595)

(1) CPB (+) (total 7,328)

in 2008

	Neonate			Infant			1–17 years			≥18 years			Total		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1 PDA	3	0	0	3	0	0	3	0	0	30	0	1 (3.3)	39	0	1 (2.6)
2 Coarctation (simple)	0	0	0	3	0	0	15	0	0	12	0	1 (8.3)	30	0	1 (3.3)
3 +VSD	38	1 (2.6)	3 (7.9)	33	0	1 (3.0)	6	0	0	0	0	0	77	1 (1.3)	4 (5.2)
4 +DORV	8	0	0	5	0	0	2	1 (50.0)	1 (50.0)	0	0	0	15	1 (6.7)	1 (6.7)
5 +AVSD	4	0	1 (25.0)	4	0	1 (25.0)	0	0	0	0	0	0	8	0	2 (25.0)
6 +TGA	7	2 (28.6)	2 (28.6)	2	0	0	0	0	0	0	0	0	9	2 (22.2)	2 (22.2)
7 +SV	8	1 (12.5)	1 (12.5)	5	1 (20.0)	1 (20.0)	1	0	0	0	0	0	14	2 (14.3)	2 (14.3)
8 +Others	3	0	0	3	0	0	5	0	0	3	0	0	14	0	0
9 Interrupt. of Ao (simple)	3	1 (33.3)	1 (33.3)	1	0	0	1	0	0	1	0	0	6	1 (16.7)	1 (16.7)
10 +VSD	28	3 (10.7)	4 (14.3)	19	1 (5.3)	1 (5.3)	4	0	0	0	0	0	51	4 (7.8)	5 (9.8)
11 +DORV	2	1 (50.0)	1 (50.0)	3	0	0	0	0	0	0	0	0	5	1 (20.0)	1 (20.0)
12 +Truncus	0	0	0	4	0	0	0	0	0	0	0	0	4	0	0
13 +TGA	2	0	2 (100.0)	2	0	0	1	0	0	0	0	0	5	0	2 (40.0)
14 +Others	10	0	0	3	1 (33.3)	1 (33.3)	1	1 (100.0)	1 (100.0)	1	0	0	15	2 (13.3)	2 (13.3)
15 Vascular ring	1	0	0	5	0	0	0	0	0	0	0	0	6	0	0
16 PS	1	0	0	8	0	0	21	0	0	7	0	0	37	0	0
17 PA-IVS or Critical PS	6	0	0	36	1 (2.8)	1 (2.8)	72	0	0	5	0	0	119	1 (0.8)	1 (0.8)
18 TAPVR	137	8 (5.8)	11 (8.0)	62	0	1 (1.6)	10	1 (10.0)	1 (10.0)	0	0	0	209	9 (4.0)	13 (6.0)
19 PAPVR ± ASD	0	0	0	14	0	0	60	0	0	28	1 (3.6)	1 (3.6)	102	1 (1.0)	1 (1.0)
20 ASD	5	0	0	58	0	0	784	0	0	796	3 (0.4)	3 (0.4)	1,643	3 (0.2)	3 (0.2)
21 Cor triatriatum	3	1 (33.3)	1 (33.3)	14	0	0	8	0	0	17	0	0	42	1 (2.4)	1 (2.4)
22 AVSD (partial)	1	0	0	22	0	0	50	0	0	29	0	0	102	0	0
23 AVSD (complete)	5	0	0	95	1 (1.1)	5 (5.3)	61	0	1 (1.6)	9	0	0	170	1 (0.6)	6 (3.5)
24 +TOF or DORV	0	0	0	8	2 (25.0)	2 (25.0)	19	0	0	5	0	0	32	2 (6.3)	2 (6.3)
25 +Others	2	1 (50.0)	2 (100.0)	8	0	0	7	0	0	4	0	0	21	1 (4.8)	2 (9.5)
26 VSD (subarterial)	2	0	0	117	0	0	230	0	0	45	0	0	394	0	0
27 VSD (perimemb./muscular)	6	0	0	767	5 (0.7)	6 (0.8)	437	0	0	103	0	0	1,313	5 (0.4)	6 (0.5)
28 VSD + PS	0	0	0	13	0	0	31	0	0	7	0	0	51	0	0
29 DCRV ± VSD	0	0	0	14	0	0	50	0	0	9	0	0	73	0	0
30 Aneurysm of sinus Valsalva	0	0	0	1	0	0	5	0	0	27	0	0	33	0	0
31 TOF	7	1 (14.3)	1 (14.3)	127	0	2 (1.6)	244	2 (0.8)	4 (1.6)	11	0	0	389	3 (0.8)	7 (1.8)
32 PA + VSD	5	0	0	53	0	0	90	1 (1.1)	1 (1.1)	2	0	0	150	1 (0.7)	1 (0.7)
33 DORV	10	2 (20.0)	2 (20.0)	84	2 (2.4)	4 (4.8)	109	1 (0.9)	1 (0.9)	1	0	0	204	5 (2.5)	7 (3.4)
34 TGA (simple)	109	3 (2.8)	3 (2.8)	13	1 (7.7)	2 (15.4)	7	0	0	3	0	0	132	4 (3.0)	5 (3.8)
35 +VSD	32	1 (3.1)	1 (3.1)	17	2 (11.8)	2 (11.8)	5	0	0	1	0	0	55	3 (5.5)	3 (5.5)
36 +VSD + PS	3	1 (33.3)	1 (33.3)	7	0	0	30	1 (3.3)	2 (6.7)	3	0	0	43	2 (4.7)	3 (7.0)
37 Corrected TGA	1	0	0	7	0	0	42	0	1 (2.4)	6	0	0	56	0	1 (1.8)
38 Truncus arteriosus	13	3 (23.1)	3 (23.1)	14	3 (21.4)	3 (21.4)	13	0	0	0	0	0	40	6 (15.0)	6 (15.0)
39 SV	32	5 (15.6)	6 (18.8)	166	9 (5.4)	16 (9.6)	282	3 (1.1)	3 (1.1)	29	1 (3.4)	3 (10.3)	509	18 (3.5)	28 (5.5)
40 TA	2	0	0	45	2 (4.4)	3 (6.7)	65	1 (1.5)	2 (3.1)	9	0	1 (11.1)	121	3 (2.5)	6 (5.0)
41 HLHS	48	9 (18.8)	12 (25.0)	97	12 (12.4)	12 (12.4)	57	1 (1.8)	2 (3.5)	0	0	0	202	22 (10.9)	26 (12.9)
42 Aortic valve lesion	6	2 (33.3)	2 (33.3)	19	1 (5.3)	2 (10.5)	64	0	0	18	0	0	107	3 (2.8)	4 (3.7)
43 Mitral valve lesion	1	0	0	47	1 (2.1)	2 (4.3)	72	0	2 (2.8)	20	0	0	140	1 (0.7)	4 (2.9)
44 Ebstein	9	1 (11.1)	2 (22.2)	8	1 (12.5)	1 (12.5)	25	0	0	10	0	0	52	2 (3.8)	3 (5.8)
45 Coronary disease	1	0	0	10	2 (20.0)	5 (50.0)	16	0	0	21	0	0	48	2 (4.2)	5 (10.4)
46 Others	15	1 (6.7)	1 (6.7)	38	0	2 (5.3)	39	0	2 (5.1)	13	3 (23.1)	3 (23.1)	105	4 (3.8)	8 (7.6)
47 Redo VSD	1	0	0	3	0	0	19	0	0	7	0	0	30	0	0
48 PS release	1	0	0	12	0	1 (8.3)	57	0	0	15	0	0	85	0	1 (1.2)
49 RV-PA conduit replace	0	0	0	3	0	0	42	0	0	27	1 (3.7)	2 (7.4)	72	1 (1.4)	2 (2.8)
50 Others	3	0	0	54	2 (3.7)	4 (7.4)	63	1 (1.6)	4 (6.3)	29	1 (3.4)	2 (6.9)	149	4 (2.7)	10 (6.7)
Total	584	48 (8.2)	63 (10.8)	2,156	50 (2.3)	81 (3.8)	3,225	14 (0.4)	28 (0.9)	1,363	10 (0.7)	17 (1.2)	7,328	122 (1.7)	189 (2.6)

(), % mortality; CPB, cardiopulmonary bypass; PDA, patent ductus arteriosus; VSD, ventricular septal defect; DORV, double outlet right ventricle; AVSD, atrioventricular septal defect; TGA, transposition of great arteries; SV, single ventricle; Interrupt. of Ao., interruption of aorta; PS, pulmonary stenosis; PA-IVS, pulmonary atresia with intact ventricular septum; TAPVR, total anomalous pulmonary venous return; PAPVR, partial anomalous pulmonary venous return; ASD, atrial septal defect; TOF, tetralogy of Fallot; DCRV, double-chambered right ventricle; TA, tricuspid atresia; HLHS, hypoplastic left heart syndrome; RV-PA, right ventricle-pulmonary artery

(2) CPB (–) (total 2,267)

in 2008

	Neonate			Infant			1–17 years			≥18 years			Total		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1 PDA	375	9 (2.4)	10 (2.7)	214	2 (0.9)	2 (0.9)	85	0	0	16	0	0	690	11 (1.6)	12 (1.7)
2 Coarctation (simple)	17	1 (5.9)	1 (5.9)	17	0	0	5	0	0	4	0	0	43	1 (2.3)	1 (2.3)
3 +VSD	34	0	0	13	1 (7.7)	1 (7.7)	2	0	0	0	0	0	49	1 (2.0)	1 (2.0)
4 +DORV	13	0	1 (7.7)	0	0	0	0	0	0	0	0	0	13	0	1 (7.7)
5 +AVSD	9	0	1 (11.1)	3	0	0	0	0	0	0	0	0	12	0	1 (8.3)
6 +TGA	6	0	0	1	0	0	0	0	0	0	0	0	7	0	0
7 +SV	17	0	0	2	0	0	0	0	0	1	0	0	20	0	0
8 +Others	9	1 (11.1)	1 (11.1)	3	0	0	0	0	0	0	0	0	12	1 (8.3)	1 (8.3)
9 Interrupt. of Ao (simple)	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0
10 +VSD	18	1 (5.6)	1 (5.6)	2	0	1 (50.0)	1	0	0	0	0	0	21	1 (4.8)	2 (9.5)
11 +DORV	4	0	0	1	0	0	0	0	0	0	0	0	5	0	0
12 +Truncus	2	0	0	2	0	0	0	0	0	0	0	0	4	0	0
13 +TGA	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
14 +Others	5	0	1 (20.0)	1	0	0	0	0	0	0	0	0	6	0	1 (16.7)
15 Vascular ring	1	0	0	4	0	0	7	0	0	2	0	0	14	0	0
16 PS	4	0	0	1	0	0	0	0	0	0	0	0	5	0	0
17 PA-IVS or Critical PS	40	2 (5.0)	3 (7.5)	30	5 (16.7)	5 (16.7)	5	0	0	0	0	0	75	7 (9.3)	8 (10.7)
18 TAPVR	2	0	0	7	0	0	0	0	0	0	0	0	9	0	0
19 PAPVR ± ASD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 ASD	4	0	0	2	0	0	2	0	0	8	0	0	16	0	0
21 Cor triatriatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 AVSD (partial)	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
23 AVSD (complete)	21	0	0	57	1 (1.8)	1 (1.8)	2	0	0	1	0	0	81	1 (1.2)	1 (1.2)
24 +TOF or DORV	3	0	0	3	0	0	1	0	0	0	0	0	7	0	0
25 +Others	1	0	0	1	0	0	1	0	0	0	0	0	3	0	0
26 VSD(subarterial)	1	0	0	7	0	1 (14.3)	0	0	0	1	0	0	9	0	1 (11.1)
27 VSD(perimemb./muscular)	27	0	0	74	1 (1.4)	1 (1.4)	7	0	1 (14.3)	4	0	0	112	1 (0.9)	2 (1.8)
28 VSD + PS	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0
29 DCRV ± VSD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 Aneurysm of sinus Valsalva	0	0	0	3	0	0	0	0	0	1	0	0	4	0	0
31 TOF	25	0	0	114	2 (1.8)	2 (1.8)	17	0	0	3	0	0	159	2 (1.3)	2 (1.3)
32 PA + VSD	19	0	0	59	0	0	33	0	1 (3.0)	2	0	0	113	0	1 (0.9)
33 DORV	36	1 (2.8)	1 (2.8)	58	0	0	12	0	0	2	0	0	108	1 (0.9)	1 (0.9)
34 TGA (simple)	3	0	0	1	0	0	1	0	0	2	0	0	7	0	0
35 +VSD	2	0	0	4	0	0	0	0	0	0	0	0	6	0	0
36 +VSD + PS	7	0	0	5	0	0	1	0	0	0	0	0	13	0	0
37 Corrected TGA	3	0	0	9	0	0	8	0	0	0	0	0	20	0	0
38 Truncus arteriosus	12	1 (8.3)	2 (16.7)	2	0	0	1	0	0	0	0	0	15	1 (6.7)	2 (13.3)
39 SV	63	2 (3.2)	2 (3.2)	64	1 (1.6)	2 (3.1)	10	0	0	2	0	0	139	3 (2.2)	4 (2.9)
40 TA	17	0	0	34	1 (2.9)	2 (5.9)	5	0	0	2	0	0	58	1 (1.7)	2 (3.4)
41 HLHS	68	10 (14.7)	16 (23.5)	8	0	0	4	0	0	0	0	0	80	10 (12.5)	16 (20.0)
42 Aortic valve lesion	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
43 Mitral valve lesion	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0
44 Ebstein	3	1 (33.3)	1 (33.3)	4	1 (25.0)	1 (25.0)	1	0	0	0	0	0	8	2 (25.0)	2 (25.0)
45 Coronary disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 Others	41	2 (4.9)	2 (4.9)	110	1 (0.9)	2 (1.8)	77	0	0	11	0	0	239	3 (1.3)	4 (1.7)
47 Redo VSD	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0
48 PS release	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 RV-PA conduit replace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 Others	13	0	0	32	0	0	21	0	0	5	0	0	71	0	0
Total	930	31 (3.3)	43 (4.6)	957	16 (1.7)	21 (2.2)	313	0	2 (0.6)	67	0	0	2,267	47 (2.1)	66 (2.9)

(), % mortality; CPB, cardiopulmonary bypass; PDA, patent ductus arteriosus; VSD, ventricular septal defect; DORV, double outlet right ventricle; AVSD, atrioventricular septal defect; TGA, transposition of great arteries; SV, single ventricle; Interrupt. of Ao., interruption of aorta; PS, pulmonary stenosis; PA-IVS, pulmonary atresia with intact ventricular septum; TAPVR, total anomalous pulmonary venous return; PAPVR, partial anomalous pulmonary venous return; ASD, atrial septal defect; TOF, tetralogy of Fallot; DCRV, double-chambered right ventricle; TA, tricuspid atresia; HLHS, hypoplastic left heart syndrome; RV-PA, right ventricle pulmonary artery

(3) Main procedure

in 2008

		Neonate			Infant			1–17 years		
		Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1	SP Shunt	248	5 (2.0)	6 (2.4)	409	15 (3.7)	16 (3.9)	76	1 (1.3)	1 (1.3)
2	PAB	323	14 (4.3)	25 (7.7)	213	2 (0.9)	5 (2.3)	11	0	0
3	Bidirectional Glenn or hemi-Fontan ± α	3	0	0	266	4 (1.5)	10 (3.8)	162	2 (1.2)	3 (1.9)
4	PA reconstruction/repair (including redo)	14	0	0	104	1 (1.0)	3 (2.9)	86	0	1 (1.2)
5	RVOT reconstruction/repair	15	2 (13.3)	2 (13.3)	100	1 (1.0)	1 (1.0)	205	2 (1.0)	3 (1.5)
6	Rastelli procedure	10	1 (10.0)	1 (10.0)	28	0	0	89	1 (1.1)	2 (2.2)
7	Arterial switch procedure	145	6 (4.1)	7 (4.8)	37	3 (8.1)	5 (13.5)	3	1 (33.3)	1 (33.3)
8	Atrial switch procedure	3	0	0	3	0	0	3	0	0
9	Double switch procedure	0	0	0	0	0	0	8	0	0
10	Repair of anomalous origin of CA	0	0	0	7	1 (14.3)	3 (42.9)	12	0	0
11	Closure of coronary AV fistula	1	0	0	1	0	0	17	0	0
12	Fontan/TCPC	1	0	0	40	4 (10.0)	5 (12.5)	351	2 (0.6)	3 (0.9)
13	Norwood procedure	49	7 (14.3)	9 (18.4)	64	13 (20.3)	15 (23.4)	11	0	0
14	Ventricular septation	0	0	0	8	0	0	9	0	0
15	Left side AV valve repair (including redo)	1	0	0	62	3 (4.8)	4 (6.5)	70	0	0
16	Left side AV valve replace (including redo)	0	0	0	18	1 (5.6)	2 (11.1)	39	0	1 (2.6)
17	Right side AV valve repair (including redo)	3	1 (33.3)	1 (33.3)	18	1 (5.6)	1 (5.6)	30	0	0
18	Right side AV valve replace (including redo)	0	0	0	0	0	0	5	1 (20.0)	1 (20.0)
19	Common AV valve repair (including redo)	7	2 (28.6)	2 (28.6)	28	1 (3.6)	1 (3.6)	22	0	2 (9.1)
20	Common AV valve replace (including redo)	1	1 (100.0)	1 (100.0)	2	0	0	9	0	1 (11.1)
21	Repair of supraaortic stenosis	0	0	0	3	0	0	8	0	0
22	Repair of subaortic stenosis (including redo)	2	0	0	13	0	0	30	0	2 (6.7)
23	Aortic valve plasty ± VSD closure	5	1 (20.0)	1 (20.0)	12	0	0	14	0	0
24	Aortic valve replacement	0	0	0	6	0	0	24	0	0
25	AVR with annular enlargement	0	0	0	1	0	0	8	0	0
26	Aortic root replace (except ross)	0	0	0	1	0	0	6	0	0
27	Ross procedure	2	1 (50.0)	1 (50.0)	6	0	1 (16.7)	9	0	0
	Total	833	41 (4.9)	56 (6.7)	1,450	50 (3.4)	71 (4.9)	1,317	10 (0.8)	21 (1.6)

		≥18 years			Total		
		Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1	SP Shunt	3	0	0	736	21 (2.9)	23 (3.1)
2	PAB	0	0	0	547	16 (2.9)	30 (5.5)
3	Bidirectional Glenn or hemi-Fontan ± α	6	0	1 (16.7)	437	6 (1.4)	14 (3.2)
4	PA reconstruction/repair (including redo)	16	0	0	220	1 (0.5)	4 (1.8)
5	RVOT reconstruction/repair	26	1 (3.8)	1 (3.8)	346	6 (1.7)	7 (2.0)
6	Rastelli procedure	12	1 (8.3)	2 (16.7)	139	3 (2.2)	5 (3.6)
7	Arterial switch procedure	0	0	0	185	10 (5.4)	13 (7.0)
8	Atrial switch procedure	2	0	0	11	0	0
9	Double switch procedure	0	0	0	8	0	0
10	Repair of anomalous origin of CA	4	0	0	23	1 (4.3)	3 (13.0)
11	Closure of coronary AV fistula	27	0	0	46	0	0
12	Fontan/TCPC	24	1 (4.2)	2 (8.3)	416	7 (1.7)	10 (2.4)
13	Norwood procedure	2	0	0	126	20 (15.9)	24 (19.0)
14	Ventricular septation	0	0	0	17	0	0
15	Left side AV valve repair (including redo)	25	0	0	158	3 (1.9)	4 (2.5)
16	Left side AV valve replace (including redo)	22	0	0	79	1 (1.3)	3 (3.8)
17	Right side AV valve repair (including redo)	30	0	0	81	2 (2.5)	2 (2.5)
18	Right side AV valve replace (including redo)	16	1 (6.3)	1 (6.3)	21	2 (9.5)	2 (9.5)
19	Common AV valve repair (including redo)	4	0	0	61	3 (4.9)	5 (8.2)
20	Common AV valve replace (including redo)	1	0	0	13	1 (7.7)	2 (15.4)
21	Repair of supraaortic stenosis	0	0	0	11	0	0
22	Repair of subaortic stenosis (including redo)	5	1 (20.0)	1 (20.0)	50	1 (2.0)	3 (6.0)
23	Aortic valve plasty ± VSD closure	1	0	0	32	1 (3.1)	1 (3.1)
24	Aortic valve replacement	18	0	0	48	0	0
25	AVR with annular enlargement	0	0	0	9	0	0
26	Aortic root replace (except ross)	4	0	0	11	0	0
27	Ross procedure	0	0	0	17	1 (5.9)	2 (11.8)
	Total	248	5 (2.0)	8 (3.2)	3,848	106 (2.8)	157 (4.1)

(), % mortality; SP, systemic–pulmonary; PAB, pulmonary artery banding; PA, pulmonary artery; RVOT, right ventricular outflow tract; CA, coronary artery; AV fistula, arteriovenous fistula; TCPC, total cavopulmonary connection; AV valve, atrioventricular valve; VSD, ventricular septal defect; AVR, aortic valve replacement

Table 2 Acquired [total (1) + (2) + (4) + (5) + (6) + (7) + isolated ope. for arrhythmia in (3): 37,257]

(1) Valvular heart disease (total 16,747)

in 2008

	Valve	Cases	Operation					30-Day mortality		Hospital mortality		Redo		
			Mechanical	Bioprosthesis	Ross procedure	Repair	With CABG	Replace	Repair	Replace	Repair	Cases	30-Day mortality	Hospital mortality
Isolated	A	7,050	2,653	4,308	1	88	1,502	130 (1.9)	1 (1.1)	198 (2.8)	2 (2.3)	270	12 (4.4)	20 (7.4)
	M	4,406	1,096	706		2,604	710	51 (2.8)	23 (0.9)	81 (4.5)	35 (1.3)	390	13 (3.3)	25 (6.4)
	T	271	22	60		189	35	4 (4.9)	3 (1.6)	6 (7.3)	4 (2.1)	56	1 (1.8)	2 (3.6)
	P	10	2	6		2	1	0	0	0	0	6	0	0
A + M	A	1,190	560	597	3	30	159	43 (3.6)		70 (5.9)		78	5 (6.4)	10 (12.8)
M	M		407	248	3	532								
A + T	A	237	97	124		16	27	9 (3.8)		12 (5.1)		38	4 (10.5)	4 (10.5)
T	T		2	5		230								
M + T	M	2,708	821	594		1,293	264	51 (1.9)		93 (3.4)		242	5 (2.1)	10 (4.1)
T	T		6	50		2,652								
A + M + T	A	800	394	388		18	93	29 (3.6)		43 (5.4)		51	6 (11.8)	7 (13.7)
M	M		309	197		294								
T	T		2	6		792								
Others		75	19	27	1	28	3	10 (13.3)		14 (18.7)		19	2 (10.5)	4 (21.1)
Total		16,747	6,390	7,316	8	8,768	2,794	354 (2.1)		558 (3.3)		1,150	48 (4.2)	82 (7.1)

(), % mortality; CABG, coronary artery bypass grafting; A, aortic valve; M, mitral valve; T, tricuspid valve; P, pulmonary valve
 Number of redo cases is included in total case number of 16,747

(2) Ischemic heart disease [total (A) + (B) + (C): 19,237]

(A) Isolated CABG [total (a) + (b): 17,764]

(a-1) On-pump arrest CABG (total 4,743)

in 2008

	Primary, elective			Primary, emergency			Redo, elective		
	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths
1VD	101	0	0	16	2 (12.5)	2 (12.5)	4	0	0
2VD	642	5 (0.8)	7 (1.1)	78	10 (12.8)	15 (19.2)	8	1 (12.5)	1 (12.5)
3VD	2,078	20 (1.0)	28 (1.3)	235	9 (3.8)	14 (6.0)	28	2 (7.1)	2 (7.1)
LMT	1,160	9 (0.8)	14 (1.2)	369	16 (4.3)	20 (5.4)	17	0	2 (11.8)
Total	3,981	34 (0.9)	49 (1.2)	698	37 (5.3)	51 (7.3)	57	3 (5.3)	5 (8.8)
Kawasaki	11	0	0	2	1 (50.0)	1 (50.0)	0	0	0
Hemodialysis	195	9 (4.6)	11 (5.6)	48	6 (12.5)	6 (12.5)	2	0	0

	Redo, emergency			Arterial graft only	Artery graft + SVG	SVG only	Others	Uncertain
	Cases	30-Day mortality	Hospital deaths					
1VD	0	0	0	69	14	37	1	0
2VD	0	0	0	181	492	49	3	3
3VD	3	2 (66.7)	2 (66.7)	193	2,032	113	0	6
LMT	4	0	0	230	1,218	87	7	8
Total	7	2 (28.6)	2 (28.6)	673	3,756	286	11	17
Kawasaki	0	0	0	8	3	1	1	0
Hemodialysis	0	0	0	22	200	20	0	3

(), % mortality; CABG, coronary artery bypass grafting; 1VD, one-vessel disease; 2VD, two-vessel disease; 3VD, three-vessel disease; LMT, left main trunk; SVG, saphenous vein graft
 LMT includes LMT alone or LMT with other branch diseases

(a-2) On-pump beating CABG (total 1,799)

in 2008

	Primary, elective			Primary, emergency			Redo, elective		
	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths
1VD	29	1 (3.4)	1 (3.4)	15	1 (6.7)	2 (13.3)	4	0	0
2VD	194	4 (2.1)	7 (3.6)	71	12 (16.9)	13 (18.3)	12	1 (8.3)	1 (8.3)
3VD	623	8 (1.3)	15 (2.4)	163	21 (12.9)	32 (19.6)	13	0	0
LMT	417	3 (0.7)	9 (2.2)	230	26 (11.3)	28 (12.2)	10	1 (10.0)	1 (10.0)
Total	1,263	16 (1.3)	32 (2.5)	479	60 (12.5)	75 (15.7)	39	2 (5.1)	2 (5.1)
Kawasaki	4	0	0	0	0	0	1	0	0
Hemodialysis	85	1 (1.2)	3 (3.5)	38	7 (18.4)	8 (21.1)	3	1 (33.3)	1 (33.3)

	Redo, emergency			Arterial graft only	Artery graft + SVG	SVG only	Others	Uncertain
	Cases	30-Day mortality	Hospital deaths					
1VD	7	0	0	28	4	22	1	0
2VD	2	0	0	92	149	37	0	1
3VD	4	1 (25.0)	1 (25.0)	123	646	32	0	2
LMT	5	1 (20.0)	2 (40.0)	157	453	49	2	1
Total	18	2 (11.1)	3 (16.7)	400	1,252	140	3	4
Kawasaki	0	0	0	5	0	0	0	0
Hemodialysis	0	0	0	14	98	10	0	4

(), % mortality; CABG, coronary artery bypass grafting; 1VD, one-vessel disease; 2VD, two-vessel disease; 3VD, three-vessel disease; LMT, left main trunk; SVG, saphenous vein graft

LMT includes LMT alone or LMT with other branch diseases

(b) Off-pump CABG (total 11,222)

(The present section also includes cases of planned off-pump CABG in which, during surgery, the change is made to on-pump CABG or an on-pump beating-heart procedure)

in 2008

	Primary, elective			Primary, emergency			Redo, elective		
	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths	Cases	30-Day mortality	Hospital deaths
1VD	818	4 (0.5)	7 (0.9)	76	1 (1.3)	3 (3.9)	59	1 (1.7)	3 (5.1)
2VD	1,921	11 (0.6)	15 (0.8)	177	4 (2.3)	7 (4.0)	33	1 (3.0)	2 (6.1)
3VD	4,255	20 (0.5)	47 (1.1)	452	16 (3.5)	20 (4.4)	49	1 (2.0)	2 (4.1)
LMT	2,705	19 (0.7)	32 (1.2)	626	24 (3.8)	30 (4.8)	32	0	2 (6.3)
Total	9,699	54 (0.6)	101 (1.0)	1,331	45 (3.4)	60 (4.5)	173	3 (1.7)	9 (5.2)
Kawasaki	8	0	0	0	0	0	0	0	0
Hemodialysis	640	12 (1.9)	24 (3.8)	114	15 (13.2)	19 (16.7)	18	1 (5.6)	2 (11.1)

	Redo, emergency			Arterial graft only	Artery graft + SVG	SVG only	Others	Uncertain
	Cases	30-Day mortality	Hospital deaths					
1VD	6	0	1 (16.7)	818	55	82	0	4
2VD	3	0	0	1,004	1,054	67	0	9
3VD	6	0	1 (16.7)	1,259	3,414	73	4	12
LMT	4	0	0	1,240	2,030	95	1	1
Total	19	0	2 (10.5)	4,321	6,553	317	5	26
Kawasaki	0	0	0	3	4	1	0	0
Hemodialysis	2	0	0	204	523	36	1	10

(), % mortality; CABG, coronary artery bypass grafting; 1VD, one-vessel disease; 2VD, two-vessel disease; 3VD, three-vessel disease; LMT, left main trunk; SVG, saphenous vein graft

LMT includes LMT alone or LMT with other branch diseases

(c) Includes cases of conversion, during surgery, from off-pump CABG to on-pump CABG or on-pump beating-heart CABG (total 215) in 2008

	Primary, elective			Primary, emergency			Redo, elective			Redo, emergency		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
Conversion to on-pump CABG arrest heart	40	2 (5.0)	2 (5.0)	5	0	1 (20.0)	2	1 (50.0)	1 (50.0)	0	0	0
Conversion to on-pump beating-heart CABG	136	6 (4.4)	9 (6.6)	27	3 (11.1)	3 (11.1)	5	0	0	0	0	0
Total	176	8 (4.5)	11 (6.3)	32	3 (9.4)	4 (12.5)	7	1 (14.3)	1 (14.3)	0	0	0
Hemodialysis	16	0	1 (6.3)	4	0	0	2	1 (50.0)	1 (50.0)	0	0	0

(), % mortality; CABG, coronary artery bypass grafting

(B) Operation for complications of MI (total 1,466) in 2008

	Chronic			Acute			Concomitant operation		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	CABG	MVP	MVR
Infarctectomy or aneurysmectomy	482	23 (4.8)	36 (7.5)	23	5 (21.7)	7 (30.4)	364	180	12
VSP closure	56	3 (5.4)	6 (10.7)	252	68 (27.0)	88 (34.9)	104	10	6
Cardiac rupture	10	2 (20.0)	2 (20.0)	194	68 (35.1)	72 (37.1)	32	1	1
Mitral regurgitation									
1) Papillary muscle rupture	5	1 (20.0)	1 (20.0)	35	4 (11.4)	6 (17.1)	17	2	27
2) Ischemic	360	10 (2.8)	23 (6.4)	26	7 (26.9)	8 (30.8)	311	286	48
Others	17	5 (29.4)	5 (29.4)	6	0	2 (33.3)	9	4	1
Total	930	44 (4.7)	73 (7.8)	536	152 (28.4)	183 (34.1)	837	483	95

(), % mortality; MI, myocardial infarction; CABG, coronary artery bypass grafting; MVP, mitral valve repair; MVR, mitral valve replacement; VSP, ventricular septal perforation
Acute, within 2 weeks from the onset of myocardial infarction

(C) TMLR (total 7) in 2008

	Cases	30-Day mortality	Hospital mortality
Isolated	1	0	0
With CABG	6	0	0
Total	7	0	0

TMLR, transmyocardial laser revascularization

(3) Operation for arrhythmia (total 3,512) in 2008

	Cases	30-Day mortality	Hospital mortality	Concomitant operation						
				Isolated	Congenital	Valve	IHD	Others	Multiple combination	
									2 Categories	3 Categories
Maze	3,277	44 (1.3)	62 (1.9)	18	165	2,888	408	146	326	22
For WPW	3	0	0	0	0	3	0	0	0	0
For ventricular tachyarrhythmia	97	4 (4.1)	8 (8.2)	31	2	9	56	5	6	1
Others	135	1 (0.7)	1 (0.7)	0	8	90	44	7	12	1
Total	3,512	49 (1.4)	71 (2.0)	49	175	2,990	508	158	344	24

(), % mortality; WPW, Wolff-Parkinson-White syndrome; IHD, ischemic heart disease
Except for 49 isolated cases, all remaining 3,643 cases are doubly allocated, one for this subgroup and the other for the subgroup corresponding to the concomitant operations

(4) Operation for constrictive pericarditis (total 122)

in 2008

	CPB (+)			CPB (-)		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
Total	57	6 (10.5)	8 (14.0)	65	2 (3.1)	2 (3.1)

(), % mortality; CPB, cardio-pulmonary Bypass

(5) Cardiac tumor (total 502)

in 2008

	Cases	30-Day mortality	Hospital mortality	Concomitant operation			
				AVR	MVR	CABG	Others
Myxoma	358	1 (0.3)	1 (0.3)	3	5	16	29
Others	144	2 (1.4)	5 (3.5)	5	6	10	15
Total	502	3 (0.6)	6 (1.2)	8	11	26	44

(), % mortality; AVR, aortic valve replacement; MVR, mitral valve replacement; CABG, coronary artery bypass grafting

(6) HOCM and DCM (total 186)

in 2008

	Cases	30-Day mortality	Hospital mortality	Concomitant operation			
				AVR	MVR	MVP	CABG
Myectomy	78	1 (1.3)	3 (3.8)	41	19	5	11
Myotomy	7	2 (28.6)	2 (28.6)	2	1	4	0
No resection	40	1 (2.5)	3 (7.5)	3	8	26	3
Volume reduction surgery of the left ventricle	61	3 (4.9)	8 (13.1)	2	7	36	8
Total	186	7 (3.8)	16 (8.6)	48	35	71	22

(), % mortality; HOCM, hypertrophic obstructive cardiomyopathy; DCM, dilated cardiomyopathy; AVR, aortic valve replacement; MVR, mitral valve replacement; MVP, mitral valve repair; CABG, coronary artery bypass grafting

(7) Other open-heart operation (total 414)

in 2008

	Cases	30-Day mortality	Hospital mortality
Total	414	29 (7.0)	30 (7.2)

(), % mortality

Table 3 Thoracic aortic aneurysm (total 10,998)

(1) Dissection (total 5,013)

in 2008

Stanford type	Acute						Chronic		
	A			B			A		
Replaced site	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1. Ascending Ao	1,951	189 (9.7)	222 (11.4)	3	1 (33.3)	1 (33.3)	244	5 (2.0)	6 (2.5)
2. Aortic root	166	27 (16.3)	30 (18.1)	1	1 (100.0)	1 (100.0)	66	9 (13.6)	11 (16.7)
3. Ascending Ao + arch	1,016	119 (11.7)	144 (14.2)	19	5 (26.3)	6 (31.6)	240	7 (2.9)	10 (4.2)
4. Arch + descending Ao	21	4 (19.0)	4 (19.0)	23	5 (21.7)	5 (21.7)	27	3 (11.1)	5 (18.5)
5. Aortic root + ascending Ao + arch	73	16 (21.9)	17 (23.3)	6	2 (33.3)	2 (33.3)	30	4 (13.3)	5 (16.7)
6. Descending Ao	11	1 (9.1)	2 (18.2)	60	9 (15.0)	13 (21.7)	78	4 (5.1)	4 (5.1)
7. Thoracoabdominal Ao	1	0	0	5	0	2 (40.0)	21	1 (4.8)	1 (4.8)
8. Extraanatomical bypass	14	6 (42.9)	6 (42.9)	27	6 (22.2)	6 (22.2)	0	0	0
9. Stent graft* ^a	30	3 (10.0)	3 (10.0)	36	4 (11.1)	5 (13.9)	36	0	5 (13.9)
1) Transluminal* ^b	8	0	0	31	2 (6.5)	2 (6.5)	18	0	4 (22.2)
2) Open stent: a) With total arch* ^c	3	0	0	3	1 (33.3)	1 (33.3)	4	0	0
b) Without total arch* ^d	19	3 (15.8)	3 (15.8)	2	1 (50.0)	2 (100.0)	14	0	1 (7.1)
3) Unspecified	0	0	0	0	0	0	0	0	0
10. Unspecified	0	0	0	0	0	0	2	1	1
Total	3,283	365 (11.1)	428 (13.0)	180	33 (18.3)	41 (22.8)	744	34 (4.6)	48 (6.5)

Stanford type	Chronic			Concomitant operation					Redo		
	B			AVP	AVR	MVP	MVR	CABG	Cases	30-Day mortality	Hospital mortality
Replaced site	Cases	30-Day mortality	Hospital mortality								
1. Ascending Ao	8	0	1 (12.5)	228	72	9	11	135	52	11 (21.2)	13 (25.0)
2. Aortic root	5	0	0	20	134	5	0	51	44	12 (27.3)	13 (29.5)
3. Ascending Ao + arch	56	3 (5.4)	3 (5.4)	89	32	5	3	72	50	8 (16.0)	9 (18.0)
4. Arch + descending Ao	80	7 (8.8)	12 (15.0)	2	8	0	0	10	34	3 (8.8)	6 (17.6)
5. Aortic root + ascending Ao + arch	8	2 (25.0)	3 (37.5)	16	30	1	1	13	13	1 (7.7)	1 (7.7)
6. Descending Ao	290	17 (5.9)	23 (7.9)	11	1	0	0	5	54	2 (3.7)	4 (7.4)
7. Thoracoabdominal Ao	122	13 (10.7)	17 (13.9)	2	0	0	0	0	37	3 (8.1)	5 (13.5)
8. Extraanatomical bypass	8	2 (25.0)	2 (25.0)	0	0	0	2	0	2	1 (50.0)	1 (50.0)
9. Stent graft* ^a	229	6 (2.6)	9 (3.9)	5	0	1	0	5	38	0	5 (13.2)
1) Transluminal* ^b	190	5 (2.6)	8 (4.2)	2	0	0	0	0	34	0	5 (14.7)
2) Open stent: a) With total arch* ^c	22	0	0	0	0	0	0	0	0	0	0
b) Without total arch* ^d	15	1 (6.7)	1 (6.7)	3	0	1	0	5	4	0	0
3) Unspecified	2	0	0	0	0	0	0	0	0	0	0
10. Unspecified	0	0	0	0	0	0	0	0	0	0	0
Total	806	50 (6.2)	70 (8.7)	373	277	21	17	291	324	41 (12.7)	57 (17.6)

(), % mortality; Ao, aorta; AVP, aortic valve repair; AVR, aortic valve replacement; MVP, mitral valve repair; MVR, mitral valve replacement; CABG, coronary artery bypass grafting

Acute, within 2 weeks from the onset

*a = *b + *c + *d + unspecified

(2) Non-dissection (total 5,985)

in 2008

Replaced site	Unruptured			Ruptured			Concomitant operation		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	AVP	AVR	MVP
1. Ascending Ao	836	15 (1.8)	20 (2.4)	43	10 (23.3)	10 (23.3)	46	522	31
2. Aortic root	677	18 (2.7)	22 (3.2)	15	2 (13.3)	3 (20.0)	100	442	30
3. Ascending Ao + arch	1,790	74 (4.1)	113 (6.3)	218	55 (25.2)	68 (31.2)	28	124	16
4. Arch + descending Ao	165	10 (6.1)	13 (7.9)	38	11 (28.9)	12 (31.6)	2	1	4
5. Aortic root + ascending Ao + arch	86	6 (7.0)	6 (7.0)	4	3 (75.0)	3 (75.0)	7	50	5
6. Descending Ao	452	18 (4.0)	22 (4.9)	157	32 (20.4)	39 (24.8)	1	6	0
7. Thoracoabdominal Ao	348	24 (6.9)	35 (10.1)	64	18 (28.1)	25 (39.1)	0	0	0
8. Extraanatomical bypass	11	0	0	6	3 (50.0)	3 (50.0)	0	0	0
9. Stent graft**	952	22 (2.3)	33 (3.5)	123	20 (16.3)	25 (20.3)	2	6	4
1) Transluminal** ^b	730	12 (1.6)	20 (2.7)	93	14 (15.1)	17 (18.3)	0	0	0
2) Open stent: a) With total arch** ^c	74	0	0	2	0	0	0	1	0
b) Without total arch** ^d	142	10 (7.0)	13 (9.2)	28	6 (21.4)	8 (28.6)	2	5	4
3) Unspecified	6			0					
Total	5,317	187 (3.5)	264 (5.0)	668	154 (23.1)	188 (28.1)	186	1,151	90

Replaced site	Concomitant operation		Redo			CPB(-)		
	MVR	CABG	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1. Ascending Ao	27	100	70	8 (11.4)	10 (14.3)	2	0	0
2. Aortic root	14	73	92	9 (9.8)	12 (13.0)	2	0	0
3. Ascending Ao + arch	6	340	60	9 (15.0)	11 (18.3)	0	0	0
4. Arch + descending Ao	0	26	13	3 (23.1)	3 (23.1)	2	1 (50.0)	1 (50.0)
5. Aortic root + ascending Ao + arch	1	7	11	1 (9.1)	1 (9.1)	0	0	0
6. Descending Ao	0	19	41	7 (17.1)	7 (17.1)	9	0	1 (11.1)
7. Thoracoabdominal Ao	0	6	26	5 (19.2)	6 (23.1)	5	2 (40.0)	3 (60.0)
8. Extraanatomical bypass	0	1	2	2 (100.0)	2 (100.0)	9	3 (33.3)	3 (33.3)
9. Stent graft**	19	29	76	2 (2.6)	4 (5.3)	302	10 (3.3)	12 (4.0)
1) Transluminal** ^b	19	2	69	2 (2.9)	3 (4.3)	290	7 (2.4)	9 (3.1)
2) Open stent: a) With total arch** ^c	0	4	2	0	0	4	0	0
b) Without total arch** ^d	0	23	5	0	1 (20.0)	8	3 (37.5)	3 (37.5)
3) Unspecified						0		
Total	67	601	391	46 (11.8)	60 (15.3)	331	16 (4.8)	20 (6.0)

(), % mortality; Ao, aorta; AVP, aortic valve repair; AVR, aortic valve replacement; MVP, mitral valve repair; MVR, mitral valve replacement; CABG, coronary artery bypass grafting
 *a = *b + *c + *d + unspecified

Table 4. Pulmonary thromboembolism (total 80)

in 2008

	Cases	30-Day mortality	Hospital mortality
Acute	54	15 (27.8)	15 (27.8)
Chronic	26	3 (11.5)	5 (19.2)
Total	80	18 (22.5)	20 (25.0)

(), % mortality