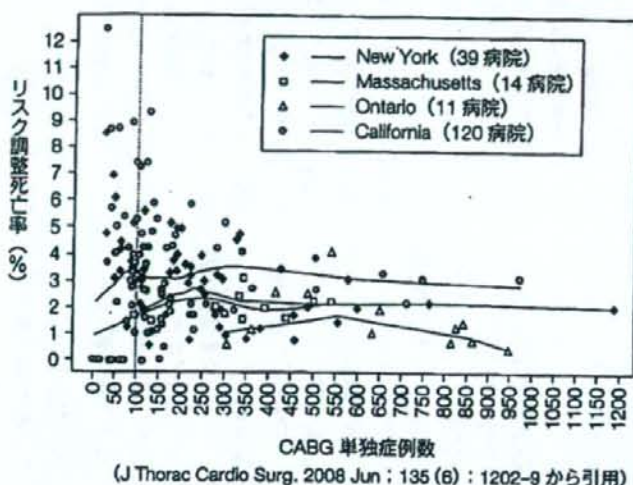


表4 施設における手術件数と予想リスク別死亡率の関係 (n = 4,581)

	予想リスク 1.5%未満			予想リスク 1.5%以上		
	16-30	31-50	≥51	16-30	31-50	≥51
患者数	432	921	1,252	462	724	790
調整前死亡率	0.69	0.98	0.16	7.36	5.25	3.92
リスク調整後死亡率	0.37	0.55	0.09	5.22	3.81	3.25
P値		NA			<.01	

注) 手術前のリスクは JACVSD の 30 日死亡率リスクモデルに基づき計算。結果はさらに一定のリスク像の集団に調整。

図2 米国における CABG 手術の症例数とリスク調整死亡率の分布



と65歳以上のいずれにおいても、手術件数によってリスク調整後死亡率に差があることが判明した。P値を見ると、特に65歳以上の群において、その傾向は強い

ことが分かった。さらに、患者の予想リスク別に解析したのが表4。予想リスクが1・5%未満の低い群では、手術件数が少ない施設(16~30件)と中程度の施設(31~50件)でリスク調整後死亡率に差は見られなかった。

しかし、予想リスクが1・5%以上の高い群では、手術件数に応じてリスク調整後死亡率に差が生じるこ

日本の良好な成績は医療保険制度も影響

これまで見てきたように、日本では、施設の年間手術件数が40件を超える辺りから死亡率は2%以下となり、成績は安定する。この水準は世界的にはどう評価できるのか。

JACVSDは、米国胸部外科医協会が構築したナショナルデータベースとは同じ考え方で設計されており、国際比較ができるのが特徴だ。

米国の多施設研究によれば、CABGの成績が安定するのは150件を超える辺りからとされる。しかも、図2に示したように、その平均死亡率は多くのステディで2~3%を示している。今回の論文で、日本の成績が良い理由の第一に挙げているのは、病院における勤務体制の違いだ。

日本では、術者は一つの病院に所属するのが一般的。

このため、個々の患者の容態について、他のスタッフと綿密にコミュニケーションをとることがよい成績をもたらしている」と指摘している。

さらに、医療保険制度も良好な成績の要因として挙げている。日本では、どの医療保険制度に加入しているようとも、必要なら多額の負担なしに1~2週間の入院が可能だ。さらに、術者は、病院や保険会社からの(経済的な)圧力を受けずに、最高水準の治療を提供することに専念できる。

論文では、こうした事情を紹介した上で、他の国にはない特徴であると指摘している。

この論文が掲載されたJTCSS誌では、エキスパート・コメントリーの中で、今回の結果についてコメント。日本が少ない手術数にもかかわらず良い成績を挙げていることに驚嘆の念を示している。



講演する高本氏

「内科も含めたデータベース構築を」

今回の論文の結果は、今月東京で開かれた第56回日本心臓病学会学術集会以も報告された。

高本氏、手術施設の集約化が必要と強調

会長講演でこの内容を紹介した高本氏は、手術件数の多い施設ほど成績は良いことが明らかになったことから、「日本心臓血管外科学会、日本胸部外科学会では「心臓外科の施設の集約をしよう」ということになっている。小さな施設はやはり成績が悪く、手術の質

を保證できない」として、手術施設の集約が必要であることを改めて訴えた。

また、術者ではなく、施設の手術件数が成績に影響を与えていることについて、「内科のバックアップなど、施設全体の力が成績に反映されたのではないかとコメントした。

高本氏はさらに、冠動脈疾患における外科と内科の連携を呼びかけた。

冠動脈疾患の治療にはPCI（経皮的冠動脈インターベンション）や薬物療法など内科医の果たす役割が大きいと、内科にはJACVSDに相当するデータベースはまだ整っていない。

高本氏は、「ぜひとも内科の先生方と連携したデータベースを作りたい。そのエビデンスを基に、よりよい成績を確立しなければならぬ」と強調した。

医療界から反発を受け手術の施設基準は撤廃

手術件数と成績の関係について考える時、思い起こされるのは平成14年度の診療報酬改定だ。

この改定で手術の施設基準が大幅に導入され、CABGについては年間100例以上の症例数があること、5年以上の経験を有する心臓血管外科医が2名以上常勤していることなどが定められ、この基準を満たさない場合は点数を30%減算するとされた。

しかし、CABGの手術を実施している施設のうち、症例数が年間100例以上なのは4割に満たなかった。また、症例数と成績の関係に明確なエビデンスがなかったことから、医療界は激しく反発した。

結局、16年改定で暫定的な見直しが行われ、さらに18年改定で施設基準そのものが撤廃された。

論文では、施設の手術件数が成績に影響することを指摘しつつも、「日本では、件数のみで成績を十分に予想することはできない」とも強調している。成績をモニタリングすることや、プロセス指標を遵守すること、手術を適切に選択することなど、様々な要素がよりよい成績に関係していると指摘している。

まずはエビデンスを蓄積して質の向上を

手術の施設基準が廃止された後、中医協は18年7月に「手術に係る施設基準等調査分科会」(福井次分科会長)を発足させた。現在、大江和彦委員(東大院教授)を中心に、関係学会の協力を得て調査が行われている。この分科会では、成績に応じた支払方式(Pay for Performance)を求める意見も根強い。しかし昨年2月、ゲストスピーカーとして分科会に出席した高本氏

は、データベース事業に参加することで医療の質が向上することを指摘、「まずはPay for Participation(参加に応じた支払い)を導入すべき」と提案した。

CABGのように、件数と成績に関係がある手術が存在するのは事実。しかし、14年改定の経緯を振り返れば、ごく近い将来に改めて手術の件数で一律に基準を設けて診療報酬に反映させることは現実的ではない。

各施設がデータベースの結果をベンチマークとして活用し、医療の質を高めることがまず求められる。一方、患者から見れば、例えば医療法の医療機能情報提供制度を利用すれば、各施設の手術件数が分り、どこで手術を受けるかを選択する判断材料となる。

いずれにせよ、まずは各治療法について信頼できるデータベースを構築し、エビデンスを積み上げることが必要と言えるだろう。

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Thoracic and cardiovascular surgery in Japan during 2006

Annual report by the Japanese Association for Thoracic Surgery

Committee for Scientific Affairs

Yuichi Ueda, MD · Yoshitaka Fujii, MD
Harushi Udagawa, MD

The Japanese Association for Thoracic Surgery has conducted annual surveys of thoracic surgery to reveal the statistics of the number of procedures according to the operative category throughout the country since 1986. Here we have summarized the results from our annual survey of thoracic surgery performed during 2006.

The incidence of hospital mortality was added to this survey to determine the nationwide status that could be useful not only for surgeons to compare their work with that of others but also for the Association to 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 operation regardless of the patient's location. Thirty-day mortality also includes death within 30 days of operation even though the patient is discharged from the hospital within 30 days of operation.

Hospital mortality is death within any time interval after operation if the patient is not 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 Society of Thoracic Surgeons and the American Association for Thoracic Surgery. (Edmunds et al. *Ann Thorac Surg* 1996;62:932–5)]

Thoracic surgery was classified into three categories—cardiovascular, general thoracic, 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.

Abstract of the survey

We sent out survey questionnaire forms to the departments of each category in all 1,877 institutions nationwide in early April 2007. The response rates by the end of December 2007 were 97.1%, 95.5%, and 93.5% for the cardiovascular, general thoracic, and esophageal categories, 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 2007

	Sent out	Returned	Response rate
(A) Cardiovascular surgery	560	544	97.1%
(B) General thoracic surgery	763	729	95.5%
(C) Esophageal surgery	554	518	93.5%

Categories subclassified according to the number of operations performed

No. of operations performed	Cardiovascular surgery	General thoracic surgery	Esophageal surgery
1–24	68	145	441
25–49	104	167	48
50–99	164	201	20
100–149	90	104	4
150–199	39	52	5
≥200	79	60	0
Total	544	729	518

2006 Final Report

(A) Cardiovascular surgery

Figure 1 shows the development of cardiovascular surgery in Japan over the last 20 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 53,741 cardiovascular operations were performed at 544 institutions during 2006 alone and included 10 cardiac transplantation operations, whose use was started in 2002. In comparison with 2005, the number of operations for thoracic aortic aneurysm increased by 4.7%, and that for valvular heart disease increased by 5.9%. Surgery for congenital heart disease increased by 1.9%. However, operations for ischemic heart disease decreased by 6.0%, which was similar to that in 2005 (7.1%).

Data for individual categories are summarized in Tables 1–7. For 7,386 open-heart operations performed for congenital heart disease, the hospital mortality was 2.9%, decreasing from 3.0% hospital mortality for this category in 2005. Mitral valve repair constituted 25.9% of all valvular heart disease operations (15,092), similar to that in 2005 (25.9%). Aortic valve replacement with a bioprosthesis was increasing. The hospital mortality for primary valve replacement was 3.6%, and that for primary valve repair was 0.8%. However, hospital mortality for redo operations was 9.6%, which although

somewhat lower than the 11.7% mortality in 2005 was still high. Isolated coronary artery bypass grafting was performed in 17,941 cases, with an overall hospital mortality of 2.5%. The hospital mortality for primary elective surgery was 1.2%. Hospital mortality of primary emergency operation was 10.9%, which was slightly higher than the 10.1% mortality in 2005. Off-pump coronary bypass grafting (OPCAB) was performed in 11,021 cases, which constituted 61.4% of the total number of isolated coronary bypass grafting. In comparison with 2005, the percentage of OPCAB among the total number of isolated coronary bypass grafting was the same level. Altogether, 910 patients underwent surgery for complications of myocardial infarction, including 502 operations for a left ventricular aneurysm and 332 operations for ischemic mitral regurgitation. Operations for a dissecting aneurysm were performed in 4,350 cases, with an overall hospital mortality of 12.3%, which was similar to that in 2005 (13.9%). Operations for a nondissecting aneurysm were carried out in 5,026 cases, with an overall hospital mortality of 8.8%, which was also similar to that in 2005 (9.9%). The hospital mortality for unruptured aneurysms was 6.2%, and that for ruptured aneurysms was 26.6%, which remained markedly high. The number of stent graft procedures has increased year by year. A total of 179 patients with a dissecting aortic aneurysm underwent stent graft placement (endovascular stent grafting 125 cases, open stent grafting 54 cases). The hospital mortality rate was 4.5%. A total of 482 patients with

nondissecting aortic aneurysm underwent stent graft placement (endovascular stent grafting 336 cases, open stent grafting 146 cases). The hospital mortality rate was 7.5%.

In summary, total cardiovascular operations of a similar number were performed during 2006 with steadily improving results in almost all categories compared with those in 2005.

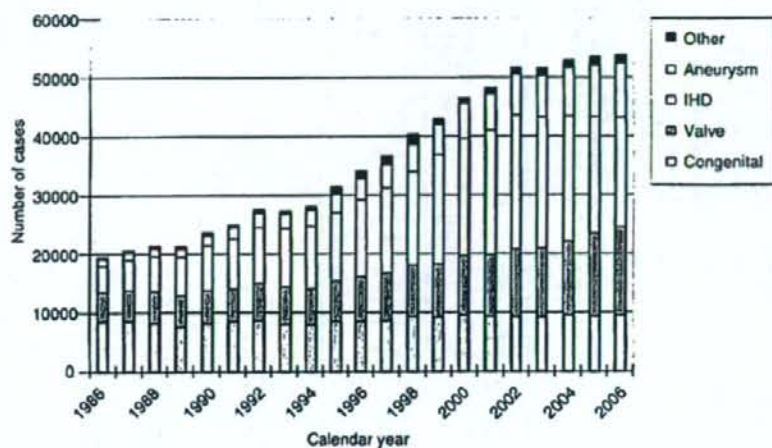


Fig. 1 Cardiovascular surgery

Table 1 Congenital (total 9,467)

(1) CPB(+) (total 7,386)

in 2006

	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	0	0	0	4	1 (25.0)	1 (25.0)	0	0	0	26	0	0	30	1 (3.3)	1 (3.3)
2 Coarctation (simple)	4	0	0	7	0	0	11	0	0	8	0	0	30	0	0
3 + VSD	28	2 (7.1)	2 (7.1)	37	2 (5.4)	2 (5.4)	4	0	0	1	0	0	70	4 (5.7)	4 (5.7)
4 + DORV	5	3 (60.0)	3 (60.0)	4	0	1 (25.0)	1	0	0	0	0	0	10	3 (30.0)	4 (40.0)
5 + AVSD	4	0	0	3	0	0	0	0	0	0	0	0	7	0	0
6 + TGA	8	0	1 (12.5)	2	0	0	0	0	0	0	0	0	10	0	1 (10.0)
7 + SV	5	0	0	4	0	0	3	0	0	0	0	0	12	0	0
8 + Others	4	0	0	7	1 (14.3)	3 (42.9)	4	0	0	1	1 (100.0)	1 (100.0)	16	2 (12.5)	4 (25.0)
9 Interrupt. of Ao (simple)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 + VSD	41	4 (9.8)	4 (9.8)	9	1 (11.1)	1 (11.1)	4	0	0	4	0	0	56	5 (8.9)	5 (8.9)
11 + DORV	5	0	0	1	0	0	1	0	0	0	0	0	7	0	0
12 + Truncus	2	2 (100.0)	2 (100.0)	1	0	0	0	0	0	0	0	0	3	2 (66.7)	2 (66.7)
13 + TGA	3	2 (66.7)	2 (66.7)	1	0	0	0	0	0	0	0	0	4	2 (50.0)	2 (50.0)
14 + Others	8	0	0	3	2 (66.7)	3 (100.0)	1	0	0	0	0	0	12	2 (16.7)	3 (25.0)
15 Vascular ring	1	0	0	5	0	1 (20.0)	3	0	0	1	0	0	10	0	1 (10.0)
16 PS	3	0	0	9	0	0	24	2 (8.3)	2 (8.3)	10	0	1 (10.0)	46	2 (4.3)	3 (6.5)
17 PA-IVS or critical PS	12	2 (16.7)	2 (16.7)	40	1 (2.5)	1 (2.5)	62	0	0	3	0	0	117	3 (2.6)	3 (2.6)
18 TAPVR	103	6 (5.8)	7 (6.3)	49	7 (14)	9 (18.4)	8	0	0	0	0	0	160	13 (8)	16 (10)
19 PAPVR ± ASD	0	0	0	7	2 (28.6)	2 (28.6)	59	0	0	14	0	0	80	2 (2.5)	2 (2.5)
20 ASD	17	0	0	70	2 (2.9)	2 (2.9)	839	0	0	910	1 (0.1)	2 (0.2)	1,832	3 (0.2)	4 (0.2)
21 Cor triatriatum	1	1 (100.0)	1 (100.0)	8	0	0	3	0	0	1	0	0	13	1 (7.7)	1 (7.7)
22 AVSD (partial)	2	0	0	19	0	0	62	0	0	28	1 (3.6)	1 (3.6)	111	1 (0.9)	1 (0.9)
23 AVSD (complete)	2	1 (50.0)	1 (50.0)	92	2 (2.2)	3 (3.3)	58	0	0	3	0	0	155	3 (1.9)	4 (2.6)
24 + TOF or DORV	0	0	0	10	0	0	18	3 (16.7)	3 (16.7)	0	0	0	28	3 (10.7)	3 (10.7)
25 + Others	1	0	0	4	0	1 (25.0)	10	1 (10.0)	1 (10.0)	0	0	0	15	1 (6.7)	2 (13.3)
26 VSD (subarterial)	6	0	0	130	0	0	313	0	0	44	0	0	493	0	0
27 VSD (perimembranous/muscular)	18	0	0	668	2 (0.3)	2 (0.3)	432	2 (0.5)	2 (0.7)	93	0	0	1,211	4 (0.3)	5 (0.4)
28 VSD + PS	0	0	0	18	0	0	32	0	0	8	0	0	58	0	0
29 DCRV ± VSD	1	0	0	12	0	0	43	0	0	23	0	0	79	0	0
30 Aneurysm of sinus Valsalva	0	0	0	4	0	0	17	0	0	22	0	0	43	0	0
31 TOF	11	1 (9.1)	1 (9.1)	130	3 (2.3)	3 (2.3)	210	3 (1.4)	3 (1.4)	17	0	0	368	7 (1.9)	7 (1.9)
32 PA + VSD	4	1 (25.0)	1 (25.0)	41	0	1 (2.4)	77	0	0	6	0	0	128	1 (0.8)	2 (1.6)
33 DORV	8	2 (25.0)	2 (25.0)	79	2 (2.5)	3 (3.8)	93	2 (2.2)	2 (2.2)	5	0	0	185	6 (3.2)	7 (3.8)
34 TGA (simple)	48	3 (3.3)	5 (5.1)	7	0	0	6	0	0	3	0	0	114	3 (2.6)	5 (4.4)
35 + VSD	34	3 (8.8)	4 (11.8)	11	0	0	9	0	1 (11.1)	1	0	0	55	3 (5.5)	5 (9.1)
36 VSD + PS	2	1 (50.0)	1 (50.0)	9	1 (11.1)	1 (11.1)	23	0	1 (4.3)	0	0	0	34	2 (5.9)	3 (8.8)
37 Corrected TGA	0	0	0	15	0	0	33	0	0	10	1 (10.0)	1 (10.0)	58	1 (1.7)	1 (1.7)
38 Truncus arteriosus	6	0	1 (16.7)	14	0	1 (7.1)	3	0	0	0	0	0	23	0	2 (8.7)
39 SV	34	12 (35.3)	14 (41.2)	165	4 (2.4)	9 (5.5)	241	7 (2.9)	12 (5.0)	29	3 (10.3)	3 (10.3)	569	26 (4.6)	38 (6.7)
40 TA	6	0	0	26	0	0	83	0	0	23	1 (4.3)	2 (8.7)	138	1 (0.7)	2 (1.4)
41 HLHS	72	18 (25.0)	26 (36.1)	87	0	5 (5.7)	40	0	2 (5.0)	0	0	0	199	18 (9.0)	33 (16.6)
42 Aortic valve lesion	10	1 (10.0)	4 (40.0)	20	2 (10.0)	2 (10.0)	103	1 (1.0)	2 (1.9)	35	1 (2.9)	1 (2.9)	168	5 (3.0)	9 (5.4)
43 Mitral valve lesion	2	0	0	35	4 (11.4)	5 (14.3)	64	1 (1.6)	2 (3.1)	13	0	0	114	5 (4.4)	7 (6.1)
44 Ebstein	9	4 (44.4)	4 (44.4)	9	1 (11.1)	1 (11.1)	27	1 (3.7)	1 (3.7)	12	0	0	57	6 (10.5)	6 (10.5)
45 Coronary disease	1	0	0	16	0	0	11	0	0	17	1 (5.9)	1 (5.9)	45	1 (2.2)	1 (2.2)
46 Others	14	2 (14.3)	3 (21.4)	21	0	1 (4.8)	42	1 (2.4)	1 (2.4)	13	0	2 (15.4)	70	3 (3.3)	7 (7.5)
47 Rele VSD	1	0	0	7	1 (14.3)	1 (14.3)	18	0	0	9	1 (11.1)	1 (11.1)	35	2 (5.7)	2 (5.7)
48 PS release	0	0	0	12	0	0	58	0	0	16	0	0	86	0	0
49 RV-PA conduit replace	0	0	0	3	0	0	35	0	0	14	0	0	52	0	0
50 Others	7	1 (14.3)	1 (14.3)	46	3 (6.5)	3 (6.5)	66	1 (1.5)	1 (1.5)	29	0	0	148	5 (3.4)	5 (3.4)
Total	599	72 (12.0)	92 (15.4)	1,981	44 (2.2)	68 (3.4)	3,354	25 (0.7)	37 (1.1)	1,452	11 (0.8)	16 (1.1)	7,386	152 (2.1)	213 (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

(2) CPB(-) (total 2,081)

in 2006

	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	120	3 (0.9)	3 (0.9)	182	1 (0.5)	2 (1.1)	108	0	0	4	0	0	644	4 (0.7)	4 (0.7)
2 Coarctation (simple)	37	0	0	22	0	0	5	0	0	1	0	0	65	0	0
3 + VSD	48	0	0	10	0	0	0	0	0	0	0	0	58	0	0
4 + DORV	12	1 (8.3)	1 (8.3)	3	0	0	0	0	0	0	0	0	15	1 (6.7)	1 (6.7)
5 + AVSD	8	0	0	5	0	0	0	0	0	0	0	0	13	0	0
6 + TGA	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0
7 + SV	6	0	0	2	0	0	0	0	0	0	0	0	8	0	0
8 + Others	6	1 (16.7)	1 (16.7)	0	0	0	0	0	0	1	0	0	7	1 (14.3)	1 (14.3)
9 Interrupt. of Ao (simple)	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
10 + VSD	16	2 (12.5)	2 (12.5)	1	0	0	0	0	0	0	0	0	17	2 (11.8)	2 (11.8)
11 + DORV	4	0	0	0	0	0	0	0	0	0	0	0	4	0	0
12 + Truncus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 + TGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 + Others	7	0	0	0	0	0	0	0	0	0	0	0	7	0	0
15 Vascular ring	3	0	0	2	0	0	0	0	0	1	0	0	12	0	0
16 PS	1	0	0	1	0	0	1	0	0	0	0	0	3	0	0
17 PA-IVS or critical PS	37	1 (2.7)	2 (5.4)	26	1 (3.8)	0	4	0	0	0	0	0	67	2 (3.0)	3 (4.5)
18 TAPVR	1	0	0	1	0	1 (100)	0	0	0	0	0	0	2	0	0
19 PAPVR ± ASD	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
20 ASD	0	0	0	0	0	0	1	0	0	7	0	0	8	0	0
21 Cor triatriatum	1	0	0	1	0	0	0	0	0	2	0	0	5	0	0
22 AVSD (partial)	1	0	0	0	0	0	2	0	0	0	0	0	47	0	0
23 AVSD (complete)	10	0	0	35	0	1 (2.9)	2	0	0	0	0	0	47	0	0
24 + TOF or DORV	4	1 (25.0)	1 (25.0)	12	0	0	7	0	0	0	0	0	19	1 (5.3)	1 (5.3)
25 + Others	2	0	0	5	0	0	2	0	0	0	0	0	9	0	0
26 VSD (subarterial)	0	0	0	2	0	0	0	0	0	2	0	0	4	0	0
27 VSD (perimembranous)	16	0	1 (6.3)	65	0	0	5	0	0	1	0	0	87	0	2 (2.3)
28 VSD + PS	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
29 DCRV ± VSD	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
30 Aneurysm of sinus Valvula	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
31 TOF	14	0	0	109	0	1 (0.9)	20	0	0	1	0	0	144	0	1 (0.7)
32 PA + VSD	15	0	1 (6.7)	85	0	2 (2.3)	29	0	0	1	0	0	133	1 (0.8)	3 (2.3)
33 DORV	27	0	0	54	0	0	10	0	0	0	0	0	91	0	0
34 TGA (simple)	5	1 (20.0)	1 (20.0)	2	1 (50)	0	1	0	0	0	0	0	8	1 (12.5)	1 (12.5)
35 + VSD	5	0	0	4	0	0	0	0	0	0	0	0	9	0	0
36 VSD + PS	4	0	0	10	0	1 (10.0)	1	0	0	0	0	0	15	0	1 (6.7)
37 Corrected TGA	9	0	1 (11.1)	24	0	0	9	0	0	0	0	0	42	0	1 (2.4)
38 Truncus arteriosus	9	0	0	6	0	0	0	0	0	0	0	0	15	0	0
39 SV	46	3 (6.3)	2 (6.3)	78	4 (5.1)	2 (2.6)	23	0	0	1	0	0	150	3 (2.0)	3 (3.3)
40 TA	21	1 (4.3)	1 (4.3)	31	0	0	8	0	0	0	0	0	60	1 (1.7)	1 (1.7)
41 HLHS	16	4 (15.9)	8 (11.8)	19	1 (5.3)	2 (10.5)	1	0	0	0	0	0	85	4 (4.5)	10 (11.4)
42 Aortic valve lesion	4	0	0	2	0	0	0	0	0	0	0	0	6	0	0
43 Mitral valve lesion	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 Ebstein	3	3 (100.0)	3 (100.0)	6	0	0	0	0	0	0	0	0	9	3 (33.3)	3 (33.3)
45 Coronary disease	1	0	0	0	0	0	1	0	0	1	0	0	3	0	0
46 Others	33	0	0	59	1 (1.7)	0	73	0	0	12	0	0	177	0	0
47 Redo VSD	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0
48 PS release	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
49 RV-PA conduit replace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 Others	9	1 (11.1)	1 (11.1)	11	0	1 (9.1)	24	0	0	0	0	0	44	2 (4.5)	2 (4.5)
Total	823	22 (2.7)	30 (3.6)	883	14 (1.6)	13 (1.5)	339	0	0	34	0	0	2,081	26 (1.2)	42 (2.0)

(), % 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 procedures

in 2006

	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	152	12 (7.9)	14 (9.2)	397	1 (0.3)	1 (0.3)	68	1 (1.5)	1 (1.5)
2 PAB	250	8 (3.2)	9 (3.6)	202	1 (0.5)	3 (1.5)	12	0	0
3 Bidirectional Glenn or hemi-Fontan ± a	6	0	0	235	3 (1.3)	8 (3.4)	216	2 (0.9)	2 (0.9)
4 PA reconstruction/repair (including redo)	11	1 (9.1)	1 (9.1)	64	2 (3.1)	2 (3.1)	108	0	0
5 RVOT reconstruction/repair	9	0	0	122	0	0	195	3 (1.5)	3 (1.5)
6 Rastelli procedure	7	0	1 (14.3)	28	1 (3.6)	2 (7.1)	66	1 (1.5)	2 (3.0)
7 Arterial switch procedure	133	7 (5.3)	11 (8.3)	22	1 (4.5)	1 (4.5)	5	1 (20.0)	1 (20.0)
8 Atrial switch procedure	4	0	0	0	0	0	0	0	0
9 Double switch procedure	0	0	0	3	0	0	7	0	0
10 Repair of anomalous origin of CA	1	0	0	11	0	0	6	0	0
11 Closure of coronary AV fistula	2	0	0	4	0	0	9	0	0
12 Fontan/TCPC	0	0	0	10	0	0	336	4 (1.2)	7 (2.1)
13 Norwood procedure	79	19 (24.1)	28 (35.4)	52	4 (7.7)	9 (17.3)	17	1 (5.9)	3 (17.6)
14 Ventricular septation	0	0	0	2	0	0	1	0	0
15 Left side AV valve repair (including redo)	4	1 (25.0)	1 (25.0)	63	2 (3.2)	2 (3.2)	98	2 (2.0)	2 (2.0)
16 Left side AV valve replace (including redo)	1	1 (100)	1 (100)	19	2 (10.5)	3 (15.8)	37	0	0
17 Right side AV valve repair (including redo)	5	0	0	17	0	0	44	0	1 (2.3)
18 Right side AV valve replace (including redo)	0	0	0	1	0	0	5	1 (20.0)	1 (20.0)
19 Repair of supraortic stenosis	0	0	0	3	1 (33.3)	1 (33.3)	24	0	0
20 Repair of subaortic stenosis (including redo)	4	1 (25.0)	1 (25.0)	11	0	0	31	0	0
21 Aortic valve plasty ± VSD closure	6	0	0	15	0	0	17	0	0
22 Aortic valve replacement	0	0	0	1	0	0	32	0	0
23 AVR with annular enlargement	0	0	0	0	0	0	11	0	0
24 Aortic root replace (except Ross)	0	0	0	3	2 (66.7)	2 (66.7)	7	1 (14.3)	1 (14.3)
25 Ross procedure	0	0	0	2	0	0	34	0	0
Total	674	50 (7.4)	67 (9.9)	1,287	20 (1.6)	34 (2.6)	1,387	17 (1.2)	24 (1.7)

	≥18 Years			Total		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1 SP shunt	5	1 (20.0)	1 (20.0)	622	15 (2.4)	17 (2.7)
2 PAB	0	0	0	464	9 (1.9)	12 (2.6)
3 Bidirectional Glenn or hemi-Fontan ± a	15	0	0	472	5 (1.1)	10 (2.1)
4 PA reconstruction/repair (including redo)	6	0	0	189	3 (1.6)	3 (1.6)
5 RVOT reconstruction/repair	25	0	0	351	3 (0.9)	3 (0.9)
6 Rastelli procedure	5	0	0	106	2 (1.9)	5 (4.7)
7 Arterial switch procedure	1	0	0	161	9 (5.6)	13 (8.1)
8 Atrial switch procedure	0	0	0	5	0	0
9 Double switch procedure	0	0	0	10	0	0
10 Repair of anomalous origin of CA	4	0	0	22	0	0
11 Closure of coronary AV fistula	12	0	0	27	0	0
12 Fontan/TCPC	35	3 (8.6)	4 (11.4)	381	7 (1.8)	11 (2.9)
13 Norwood procedure	2	0	0	150	24 (16.0)	40 (26.7)
14 Ventricular septation	0	0	0	3	0	0
15 Left side AV valve repair (including redo)	14	0	0	179	5 (2.8)	5 (2.8)
16 Left side AV valve replace (including redo)	19	1 (5.3)	1 (5.3)	76	4 (5.3)	5 (6.6)
17 Right side AV valve repair (including redo)	25	1 (4.0)	2 (8.0)	91	1 (1.1)	3 (3.3)
18 Right side AV valve replace (including redo)	7	0	0	13	1 (7.7)	1 (7.7)
19 Repair of supraortic stenosis	2	0	0	29	1 (3.4)	1 (3.4)
20 Repair of subaortic stenosis (including redo)	3	0	0	49	1 (2.0)	1 (2.0)
21 Aortic valve plasty ± VSD closure	10	0	0	48	0	0
22 Aortic valve replacement	20	1 (5.0)	1 (5.0)	53	1 (1.9)	1 (1.9)
23 AVR with annular enlargement	2	0	0	13	0	0
24 Aortic root replace (except Ross)	5	0	0	15	3 (20.0)	3 (20.0)
25 Ross procedure	9	0	0	45	0	0
Total	226	7 (3.1)	9 (4.0)	3,574	94 (2.6)	134 (3.7)

(), % 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 operation for arrhythmia in (3): 35,145]
 (1) Valvular heart disease (total 15,092)

in 2006

	Valve*	Cases	Operation				Replace		Repair		Redo		
			Mechanical	Bioprostheses	Repair	With CABG	30-Day mortality	Hospital mortality	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
Isolated	A	6,361	2,707	3,599	55	1,240	125 (2.0)	174 (2.8)	4 (7.3)	5 (9.1)	272	17 (6.3)	21 (7.7)
	M	4,320	1,304	658	2,358	595	65 (3.3)	105 (5.4)	28 (1.2)	43 (1.8)	341	23 (6.7)	32 (9.4)
	T	240	20	73	147	10	5 (5.4)	11 (11.8)	3 (2.0)	5 (3.4)	52	3 (5.8)	7 (13.5)
	P	6	1	4	1	1	0 (0.0)	0 (0.0)	0	1 (100.0)	0	0	0
A + M	A	1,172	657	490	25	163	72 (6.1)	101 (8.6)			74	11 (14.9)	14 (18.9)
	M		486	221	465								
A + T	A	189	92	94	3	22	8 (4.2)	12 (6.3)			30	1 (3.3)	3 (10.0)
	T		4	8	177								
M + T	M	2,173	779	474	920	199	57 (26.6)	91 (4.2)			235	12 (5.1)	20 (8.5)
	T		8	47	2,188								
A + M + T	A	586	329	250	7	42	27 (4.6)	48 (8.2)			55	2 (3.6)	5 (9.1)
	M		273	145	168								
	T		0	16	570								
Others		45	18	13	14	3	2 (4.4)	3 (6.7)			13	1 (7.7)	1 (7.7)
Total		15,092	6,678	6,092	7,098	2,275	361 (2.4)	545 (3.6)	35 (10.5)	54 (0.8)	1,072	70 (6.5)	103 (9.6)

(), % mortality; CABG, coronary artery bypass grafting; A, aortic valve; M, mitral valve; T, tricuspid valve; P, pulmonary valve

(2) Ischemic heart disease [total 18,856 (A) + (B) + (C)]

(A) Isolated CABG [total 17,941 (a) + (b)]

(a) On-pump CABG (including planned on-pump beating-heart CABG at the time of incision) (total 6,920)

in 2006

	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	169	2 (1.2)	5 (3.0)	46	3 (6.5)	4 (8.7)	19	0	0
2VD	898	7 (0.8)	9 (1.0)	129	10 (7.8)	14 (10.9)	25	1 (4.0)	1 (4.0)
3VD	2,878	32 (1.1)	52 (1.8)	485	47 (9.7)	57 (11.8)	67	3 (4.5)	6 (9.0)
LMT	1,524	19 (1.2)	28 (1.8)	613	45 (7.3)	64 (10.4)	28	0	0
Kawasaki	13	0	0	0	0	0	1	0	0
Total	5,482	60 (1.1)	94 (1.7)	1,273	105 (8.2)	139 (10.9)	140	4 (2.9)	7 (5.0)
Hemodialysis	321	7 (2.2)	13 (4.0)	69	13 (18.8)	18 (26.1)	10	1 (10.0)	2 (20.0)

	Redo, emergency			Arterial graft only	Arterial graft + SVG	SVG only	Others	Uncertain
	Cases	30-Day mortality	Hospital deaths					
1VD	8	0	0	166	19	56	1	0
2VD	6	3 (50.0)	3 (50.0)	340	628	90	0	0
3VD	6	0	0	587	2,707	138	4	0
LMT	5	1 (20.0)	2 (40.0)	510	1,520	136	4	0
Kawasaki	0	0	0	12	1	0	1	0
Total	25	4 (16.0)	5 (20.0)	1,615	4,875	420	10	0
Hemodialysis	1	0	1 (100.0)	60	298	35	0	8

(), % 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 11,021)

(Includes cases of planned off-pump CABG in which (during surgery) the change is made to an on-pump CABG or on-pump beating-heart procedure) in 2006

	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	862	3 (0.3)	8 (0.9)	82	6 (7.3)	7 (8.5)	62	1 (1.6)	1 (1.6)
2VD	2,038	10 (0.5)	19 (0.9)	223	8 (3.6)	12 (5.4)	49	0	0
3VD	4,060	43 (1.1)	66 (1.6)	386	24 (6.2)	32 (8.3)	47	0	0
LMT	2,564	24 (0.9)	33 (1.3)	562	21 (3.7)	33 (5.9)	40	0	1 (2.5)
Kawasaki	11	0	0	0	0	0	0	0	0
Total	9,535	80 (0.8)	126 (1.3)	1,253	59 (4.7)	84 (6.7)	198	1 (0.5)	2 (1.0)
Hemodialysis	672	22 (3.3)	38 (5.7)	97	7 (7.2)	12 (12.4)	12	0	0

	Redo, emergency			Arterial graft only	Arterial graft + SVG	SVG only	Others	Uncertain
	Cases	30-Day mortality	Hospital deaths					
1VD	11	0	0	861	51	94	4	7
2VD	8	0	0	1,229	977	98	1	14
3VD	8	0	0	1,790	2,621	78	6	5
LMT	8	0	0	1,532	1,529	110	2	1
Kawasaki	0	0	0	9	2	0	0	0
Total	35	0	0	5,421	5,180	380	13	27
Hemodialysis	1	0	0	281	448	49	1	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

(c) Includes cases of conversion (during surgery) from off-pump CABG to on-pump CABG or on-pump beating-heart CABG (total 204) in 2006

	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	56	3 (5.4)	3 (5.4)	12	2 (16.7)	2 (16.7)	1	0	0	0	0	0
Conversion to on-pump beating-heart CABG	148	10 (6.8)	12 (8.1)	32	6 (18.8)	9 (28.1)	3	0	0	0	0	0
Total	204	13 (6.4)	15 (7.4)	44	8 (18.2)	11 (25.0)	4	0	0	0	0	0
Hemodialysis	25	3 (12.0)	3 (12.0)	7	1 (14.3)	2 (28.6)	0	0	0	0	0	0

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

(B) Operations for complications of MI (total 910)

in 2006

	Chronic			Acute			Concomitant operation		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	CABG	MVP	MVR
Infarctectomy or aneurysmectomy	502	25 (5.0)	41 (8.2)	27	7 (25.9)	9 (33.3)	402	192	15
VSP closure	42	3 (7.1)	5 (11.9)	230	71 (30.9)	92 (40.0)	89	9	3
Cardiac rupture									
(1) Papillary muscle rupture	10	3 (30.0)	3 (30.0)	159	57 (35.8)	63 (39.6)	20	0	1
(2) Ischemic	18	0	1 (5.6)	45	17 (37.8)	23 (51.1)	28	10	36
Mitral regurgitation	332	23 (6.9)	38 (11.4)	35	13 (37.1)	16 (45.7)	320	270	36
Others	6	0	0	5	0	0	7	1	0
Total	910	54 (5.9)	88 (9.7)	501	165 (32.9)	203 (40.5)	866	482	91

(), % mortality; MI, myocardial infarction; CABG, coronary artery bypass grafting; MVP, mitral valve repair; MVR, mitral valve replacement

Acute, within 2 weeks from the onset of myocardial infarction

(C) TMLR (total 5)

in 2006

	Cases	30-Day mortality	Hospital mortality
Isolated	4	0	0
With CABG	1	0	0
Total	5	0	0

TMLR, transmyocardial laser revascularization

(3) Operations for arrhythmia (total 3,233)

in 2006

	Cases	30-Day mortality	Hospital mortality	Concomitant operation						
				Isolated	Congenital	Valve	IHD	Others		
Maze	2,944	47 (1.6)	71 (2.4)	27	151	2,484	272	33	23	2
For WPW	2	0	0	0	2	0	0	0	0	0
For ventricular tachyarrhythmia	51	5 (9.8)	5 (9.8)	2	1	5	45	2	4	0
Others	236	4 (1.7)	6 (2.5)	124	6	86	21	4	5	0
Total	3,233	56 (1.7)	82 (2.5)	153	160	2,575	338	39	32	2

(), % mortality; WPW, Wolff-Parkinson-White syndrome; IHD, ischemic heart disease

Except for 153 isolated cases, all remaining 3,080 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 133)

in 2006

	CPB(+)			CPB(-)		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
Total	47	5 (10.6)	6 (12.8)	86	7 (8.1)	12 (14.0)

(), % mortality

(5) Cardiac tumors (total 424)

in 2006

	Cases	30-Day mortality	Hospital mortality	Concomitant operation			
				AVR	MVR	CABG	Others
Myxoma	300	2 (0.7)	2 (0.7)	2	5	16	27
Others	124	4 (3.2)	8 (6.5)	3	6	4	21
Total	424	6 (1.4)	10 (2.4)	5	11	20	48

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

(6) HOCM and DCM (total 168)

in 2006

	Cases	30-Day mortality	Hospital mortality	Concomitant operation			
				AVR	MVR	MVP	CABG
Myectomy	65	1 (1.5)	2 (3.1)	34	19	8	6
Myotomy	7	1 (14.3)	2 (28.6)	3	2	2	1
No resection	27	4 (14.8)	5 (18.5)	1	6	18	0
Volume reduction surgery of the left ventricle	69	5 (7.2)	9 (13.0)	5	5	45	12
Total	168	11 (6.5)	18 (10.7)	43	32	73	19

(), % 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 operations (total 319)

in 2006

	Cases	30-Day mortality	Hospital mortality
Total	319	25 (7.8)	28 (8.8)

(), % mortality

Table 3 Thoracic aortic aneurysm (total 9,326)

(1) Dissection (total 4,350)

in 2006

Replaced site	Stanford type: acute						Stanford type: chronic		
	A			B			A		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1. Ascending Ao	1,865	195 (10.5)	241 (12.9)	11	1 (9.1)	2 (18.2)	257	12 (4.7)	14 (5.4)
2. Ascending Ao + arch	1,012	121 (12.0)	145 (14.3)	21	5 (23.8)	7 (33.3)	246	13 (5.3)	19 (7.7)
3. Arch + descending Ao	12	3 (25.0)	3 (25.0)	17	7 (41.2)	7 (41.2)	32	2 (6.3)	2 (6.3)
4. Descending Ao	20	1 (5.0)	1 (5.0)	45	6 (13.3)	9 (20.0)	52	4 (7.7)	5 (9.6)
5. Thoracoabdominal Ao	4	0	0	14	5 (35.7)	5 (35.7)	21	3 (14.3)	4 (19.0)
6. Extraanatomical bypass	9	1 (11.1)	1 (11.1)	20	7 (35.0)	7 (35.0)	0	0	0
7. Stent graft**	32	1 (3.1)	2 (6.3)	28	2 (7.1)	2 (7.1)	18	0	1 (5.6)
1) Transluminal**	6	0	0	21	2 (9.5)	2 (9.5)	9	0	1 (11.1)
2) Open stent: a) With total arch**	4	0	0	3	0	0	1	0	0
b) Without total arch**	22	1 (4.5)	2 (9.1)	4	0	0	8	0	0
Total	2,954	322 (10.9)	393 (13.3)	156	33 (21.2)	39 (25.0)	626	34 (5.4)	45 (7.2)

Replaced site	Stanford type: chronic			Concomitant operation					Redo		
	B			AVP	AVR	MVP	MVR	CABG	Cases	30-Day mortality	Hospital mortality
	Cases	30-Day mortality	Hospital mortality								
1. Ascending Ao	10	0	0	213	189	5	9	140	77	10 (13.0)	12 (15.6)
2. Ascending Ao + arch	44	6 (13.6)	7 (15.9)	114	94	3	3	64	57	5 (8.8)	6 (10.5)
3. Arch + descending Ao	54	8 (14.8)	9 (16.7)	1	2	0	0	1	19	2 (10.5)	2 (10.5)
4. Descending Ao	244	18 (7.4)	19 (7.8)	0	1	0	0	4	23	5 (21.7)	5 (21.7)
5. Thoracoabdominal Ao	154	17 (11.0)	22 (14.3)	1	1	1	0	0	23	4 (17.4)	5 (21.7)
6. Extraanatomical bypass	7	0	0	0	0	0	0	0	1	0	0
7. Stent graft**	101	1 (1.0)	3 (3.0)	0	0	0	0	2	11	0	1 (9.1)
1) Transluminal**	89	0	2 (2.2)	0	0	0	0	0	10	0	1 (10.0)
2) Open stent: a) With total arch**	4	0	0	0	0	0	0	0	0	0	0
b) Without total arch**	8	1 (12.5)	1 (12.5)	0	0	0	0	2	1	0	0
Total	614	50 (8.1)	60 (9.8)	329	287	9	12	211	211	26 (12.3)	31 (14.7)

(), % mortality; 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

(2) Nondissection (total 5,026 = 4,382 + 644)

in 2006

Replaced site	Unruptured			Ruptured			Concomitant operation				
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality	AVP	AVR	MVP	MVR	CABG
1. Ascending Ao	1,356	35 (2.6)	47 (3.5)	51	10 (19.6)	12 (23.5)	148	976	58	41	158
2. Ascending Ao + arch	1,544	70 (4.5)	100 (6.5)	302	38 (18.8)	51 (25.2)	39	139	9	11	294
3. Arch + descending Ao	237	26 (11.0)	34 (14.3)	63	23 (36.5)	28 (44.4)	2	5	2	0	26
4. Descending Ao	535	24 (4.5)	31 (5.8)	154	31 (20.1)	42 (27.3)	0	0	0	0	12
5. Thoracoabdominal Ao	311	28 (9.0)	36 (11.6)	70	16 (22.9)	23 (32.9)	0	0	0	0	1
6. Extraanatomical bypass	16	2 (12.5)	2 (12.5)	5	1 (20.0)	1 (20.0)	0	0	0	0	1
7. Stent graft**	383	10 (2.6)	22 (5.7)	99	6 (6.1)	14 (14.1)	1	3	1	0	20
1) Transluminal**	253	2 (0.8)	5 (2.0)	83	5 (6.0)	12 (14.5)	0	0	0	0	1
2) Open stent a) With total arch**	31	1 (3.2)	6 (19.4)	6	0	0	0	0	0	0	2
b) Without total arch**	99	7 (7.1)	11 (11.1)	10	1 (10.0)	2 (20.0)	1	3	1	0	17
Total	4,382	195 (4.5)	272 (6.2)	644	125 (19.4)	171 (26.6)	190	1,123	70	52	512

Replaced site	Re-do			CPB (-)		
	Cases	30-Day mortality	Hospital mortality	Cases	30-Day mortality	Hospital mortality
1. Ascending Ao	136	15 (11.0)	22 (16.2)	0	0	0
2. Ascending Ao + arch	82	11 (13.4)	15 (18.3)	0	0	0
3. Arch + descending Ao	7	2 (28.6)	4 (57.1)	3	1 (33.3)	1 (33.3)
4. Descending Ao	43	9 (20.9)	13 (30.2)	6	0	0
5. Thoracoabdominal Ao	29	5 (17.2)	5 (17.2)	5	1 (20.0)	1 (20.0)
6. Extraanatomical bypass	0	0	0	6	1 (16.7)	1 (16.7)
7. Stent graft**	38	1 (2.6)	3 (7.9)	129	3 (2.3)	6 (4.7)
1) Transluminal**	28	0	2 (7.1)	129	3 (2.3)	6 (4.7)
2) Open stent a) With total arch**	4	0	0	0	0	0
b) Without total arch**	6	1 (16.7)	1 (16.7)	0	0	0
Total	335	43 (12.8)	62 (18.5)	149	6 (4.0)	9 (6.0)

(), % mortality; 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

Table 4 Pulmonary thromboembolism (total 88)

in 2006

	Cases	30-Day mortality	Hospital mortality
Acute	66	17 (25.8)	21 (31.8)
Chronic	22	3 (13.6)	3 (13.6)
Total	88	20 (22.7)	24 (27.3)

(), % mortality

Table 5 Assisted circulation (total 1,424)

in 2006

	Sites	VAD								
		Device			Results					
		Centrifugal	VAS	Others	Not weaned			Weaned		
					Ongoing	Deaths	Transplant	Alive	Deaths	Transplant
After cardiotomy	Left	15	11	1	3	21 (80.8)	0	3	0	0
	Right	5	1	0	0	2 (33.3)	0	2	2 (33.3)	0
	Biventricular									
	Right	3	2	0	0	5 (100.0)	0	0	0	0
	Left	0	5	0	0					
Congestive heart failure	Left	21	40	8	32	24 (39.3)	1	10	2 (3.3)	0
	Right	6	0	0	0	2	0	4	0	0
	Biventricular									
	Right	6	6	0	2	7 (37.5)	0	3	0	0
	Left	2	10	0						
Respiratory failure										
Total		58	75	9	37	61 (45.9)	1	22	4 (3.0)	0

	Sites	Heart-lung assist					
		Method		Results			
		PCPS	Others	Not weaned		Weaned	
				Deaths	Transplant	Deaths	Transplant
After cardiotomy	Left						
	Right						
	Biventricular						
	Right	461	36	294 (59.2)	0	72 (14.5)	131
	Left						
Congestive heart failure	Left						
	Right	651	46	352 (50.5)	3	91 (13.1)	251
	Biventricular						
	Right						
	Left						
Respiratory failure		79	9	29 (33.0)	0	17 (19.2)	42
Total		1,191	91	675 (52.7)	3	180 (14.0)	424

(), % mortality; VAS, ventricular assist system; VAD, ventricular assist device

Table 6 Heart transplantation (total 10)

in 2006

	Cases	30-Day mortality	Hospital mortality
Heart transplantation	10	0	0
Heart and lung transplantation	0	0	0
Total	10	0	0

(), % mortality

Table 7 Pacemaker + ICD (total 16,955)

in 2006

	Pacemaker			ICD
	Univentricular	Biventricular	CRTD	
Initial	7,876	1,872	67	1,052
Exchange	4,898	785	29	376
Total	12,774	2,657	96	1,428

ICD, implantable cardioverter-defibrillator; CRTD, cardiac resynchronization therapy device with incorporated ICD device

(B) General thoracic surgery

It is notable that the overall volume of surgery performed in our country keeps increasing and has now approached 60,000 per year. This increase has been attributed mainly to the steady increase in the number of surgeries for primary lung cancer, which comprises 45% of the total. As the future Japanese population will be constituted of more elderly people, this trend will remain unchanged for many years to come unless measures to prevent lung cancer have a significant effect. In all, 67% of cases were adenocarcinomas. More and more resections are performed using video-assisted thoracic surgery (VATS); this year 70% of wedge resections and 41% of lobectomies were done using VATS. The 30-day mortality remains as low as 0.3% for lobectomy performed for primary lung cancer; and we are proud of our thoracic surgeons for this significant achievement. The low mortality indicates not only good surgical practice but also the appropriate choice of surgical patients and superb postoperative care. Further improvement in thoracic surgery may require a good training program established nationwide (especially for VATS techniques).

Tumors of colorectal origin consistently comprise 47.1% of cases operated on for metastatic pulmonary tumor, the largest group by a wide margin. A total of 1,440 patients with thymoma were operated on during 2006, which shows a steady increase since the last year. This figure includes patients with myasthenia gravis.

Pneumothorax comprises 21% of all general thoracic surgeries. There were only 13 cases of lung transplantation in 2006, a disappointingly small number, probably due to the shortage of donors with brain death. In Japan, lung transplantation from living donors outnumbers that from donors with brain death.

A total of 33,495 operations were performed using VATS in general thoracic surgery, comprising 56.6% of the total. This procedure will be used more in the coming years, and whether VATS yields the same overall results as open thoracic surgery remains to be seen. Fewer tracheobronchoplasties were performed this year than in the previous year, possibly reflecting a decrease in the more centrally located tumors.

The overall mortality associated with general thoracic surgery is quite low. However, we should maintain our efforts to decrease the mortality further while maintaining the curability of our operations.

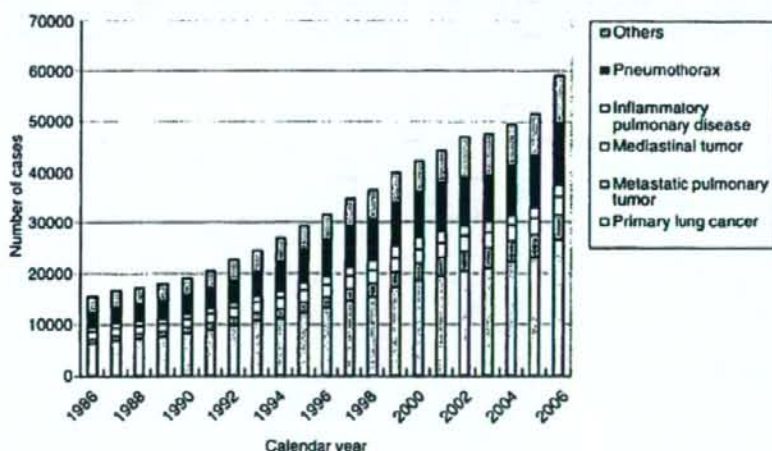


Fig. 1 General thoracic surgery

Table 1 Total entry cases of general thoracic surgery during 2006 in 2006

	Cases	%
Benign pulmonary tumor	1,075	1.8
Nonneoplastic benign disease	2,660	4.5
Primary lung cancer	26,531	44.8
Other primary malignant pulmonary tumor	331	0.6
Metastatic pulmonary tumor	4,912	8.3
Tracheal tumor	70	0.1
Mesothelioma	318	0.5
Chest wall tumor	702	1.2
Mediastinal tumor	3,704	6.3
Thymectomy for MG without thymoma	347	0.6
Inflammatory pulmonary disease	2,383	4.0
Empyema	1,517	2.6
Bullous disease excluding pneumothorax	756	1.3
Pneumothorax	12,396	20.9
Chest wall deformity	352	0.6
Diaphragmatic hernia including traumatic	126	0.2
Chest trauma excluding diaphragmatic hernia	336	0.6
Lung transplantation	13	0.0
Others	691	1.2
Total	59,220	100.0

MG, myasthenia gravis

Table 2 in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
1. Benign pulmonary tumor	1,075	0 (0.0)	0 (0.0)	759
Hamartoma	433	0 (0.0)	0 (0.0)	336
Others	642	0 (0.0)	0 (0.0)	423

(), % mortality

Table 3 in 2006

	Cases	30-Day mortality	Hospital mortality
2. Nonneoplastic benign disease	2,660	9 (0.3)	10 (0.4)

(), % mortality

Table 4

in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
3. Primary malignant pulmonary tumor	26,854	104 (0.4)	231 (0.9)	
Lung cancer	26,531	103 (0.4)	230 (0.9)	
Adenocarcinoma	17,905	58 (0.3)	114 (0.6)	
Squamous cell carcinoma	5,886	31 (0.5)	87 (1.5)	
Large-cell carcinoma (LCNEC)	835 (274)	3 (0.4) (0) (0.0)	7 (0.8) (1) (0.4)	
Small-cell carcinoma	490	4 (0.8)	7 (1.4)	
Adenosquamous carcinoma	375	0 (0.0)	4 (1.1)	
Carcinoid	167	1 (0.6)	0 (0.0)	
Adenoid cystic carcinoma	34	0 (0.0)	0 (0.0)	
Mucoepidermoid carcinoma	24	0 (0.0)	0 (0.0)	
Carcinosarcoma	36	0 (0.0)	1 (2.8)	
Unclassified	89	1 (1.1)	2 (2.2)	
Multiple lung cancer	402	2 (0.5)	2 (0.5)	
Others	278	3 (1.1)	6 (2.2)	
Wedge resection	3,107	7 (0.2)	13 (0.4)	2,173
Segmental excision	1,804	3 (0.2)	5 (0.3)	897
Sleeve segmental excision	16	0 (0.0)	2 (12.5)	5
Lobectomy	20,158	70 (0.3)	162 (0.8)	8,199
Sleeve lobectomy	451	3 (0.7)	7 (1.6)	42
Pneumonectomy	647	13 (2.0)	31 (4.8)	22
Sleeve pneumonectomy	21	0 (0.0)	0 (0.0)	0
Pleuropneumonectomy	10	0 (0.0)	0 (0.0)	0
Others	317	4 (1.3)	7 (2.2)	80
Sarcoma	43	2 (4.7)	2 (4.7)	
AAH	175	0 (0.0)	1 (0.6)	
Others	113	1 (0.9)	0 (0.0)	

(), % mortality; VATS, video-assisted thoracic surgery; LCNEC, large-cell neuroendocrine carcinoma; AAH, atypical adenomatous hyperplasia

Table 5

in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
4. Metastatic pulmonary tumor	4,912	9 (0.2)	19 (0.4)	2,982
Colorectal	2,312	2 (0.1)	4 (0.2)	1,393
Hepatobiliary/pancreatic	187	1 (0.5)	1 (0.5)	113
Uterine	213	0 (0.0)	0 (0.0)	145
Mammary	310	0 (0.0)	0 (0.0)	224
Ovarian	50	0 (0.0)	0 (0.0)	33
Testicular	65	0 (0.0)	0 (0.0)	43
Renal	399	0 (0.0)	0 (0.0)	267
Skeletal	142	0 (0.0)	1 (0.7)	69
Soft tissue	215	1 (0.5)	2 (0.9)	116
Otorhinolaryngological	260	1 (0.4)	3 (1.2)	166
Pulmonary	295	3 (1.0)	6 (2.0)	133
Others	464	1 (0.2)	2 (0.4)	280

(), % mortality

Table 6

in 2006

	Cases	30-Day mortality	Hospital mortality
5. Tracheal tumor	70	0 (0.0)	1 (1.4)

(), % mortality

Table 7

in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
6. Tumor of pleural origin	318	3 (0.9)	7 (2.2)	103
Solitary fibrous tumor	91	0 (0.0)	0 (0.0)	51
Malignant pleural mesothelioma	227	3 (1.3)	7 (3.1)	52

(), % mortality

Table 8

in 2006

	Cases	30-Day mortality	Hospital mortality
7. Chest wall tumor	702	1 (0.1)	4 (0.6)

(), % mortality

Table 9

in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
8. Mediastinal tumor	3,704	7 (0.2)	14 (0.4)	1,449
Thymoma	1,440	2 (0.1)	2 (0.1)	295
Thymic cancer	185	1 (0.5)	5 (2.7)	17
Germ cell tumor	239	1 (0.4)	2 (0.8)	58
Benign	168	0 (0.0)	1 (0.6)	49
Malignant	71	1 (1.4)	1 (1.4)	9
Neurogenic tumor	478	0 (0.0)	0 (0.0)	334
Congenital cyst	630	0 (0.0)	1 (0.2)	433
Goiter	94	0 (0.0)	0 (0.0)	13
Lymphatic tumor	232	2 (0.9)	3 (1.3)	127
Others	406	1 (0.2)	1 (0.2)	172

(), % mortality

Table 10

in 2006

	Cases	30-Day mortality	Hospital mortality
9. Thymectomy for myasthenia gravis	593	0 (0.0)	2 (0.3)
With thymoma	246	0 (0.0)	0 (0.0)

(), % mortality

Table 11 in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
10. Inflammatory pulmonary disease	2,383	7 (0.3)	14 (0.6)	1,474
Tuberculous infection	646	1 (0.2)	2 (0.3)	404
Fungal infection	334	1 (0.3)	4 (1.2)	141
Bronchiectasis	112	0 (0.0)	1 (0.9)	47
Others	1,291	5 (0.4)	7 (0.5)	882

(), % mortality

Table 12 in 2006

	Cases	30-Day mortality	Hospital mortality	Radical surgery
11. Empyema	1,517	15 (1.0)	50 (3.3)	995

(), % mortality

Table 13 in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
12. Descending necrotizing mediastinitis	80	4 (5.0)	7 (8.8)	35

(), % mortality

Table 14 in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
13. Bullous disease	756	0 (0.0)	1 (0.1)	520
Emphysematous bulla	580	0 (0.0)	1 (0.2)	413
Bronchogenic cyst	97	0 (0.0)	0 (0.0)	69
Emphysema with volume reduction surgery	35	0 (0.0)	0 (0.0)	25
Others	44	0 (0.0)	0 (0.0)	13

(), % mortality

Table 15 in 2006

	Cases	30-Day mortality	Hospital mortality	By VATS
14. Pneumothorax	12,396	15 (0.1)	32 (0.3)	11,289
Primary spontaneous	11,503	6 (0.1)	15 (0.1)	10,582
Secondary	893	9 (1.0)	17 (1.9)	707

(), % mortality

Table 16 in 2006

	Cases	30-Day mortality	Hospital mortality
15. Chest wall deformity	352	0 (0.0)	0 (0.0)
Funnel chest	317	0 (0.0)	0 (0.0)
Others	35	0 (0.0)	0 (0.0)

(), % mortality

Table 17 in 2006

	Cases	30-Day mortality	Hospital mortality	Traumatic
16. Diaphragmatic hernia	126	3 (2.4)	4 (3.2)	40

(), % mortality

Table 18 in 2006

	Cases	30-Day mortality	Hospital mortality
17. Chest trauma	336	32 (9.5)	32 (9.5)

(), % mortality

Table 19 in 2006

	Cases	30-Day mortality	Hospital mortality
18. Other respiratory surgery	691	2 (0.3)	4 (0.6)
Arteriovenous malformation	86	0 (0.0)	0 (0.0)
Pulmonary sequestration	101	0 (0.0)	0 (0.0)
Others	504	2 (0.4)	4 (0.8)

(), % mortality

Table 20 in 2006

	Cases	30-Day mortality	Hospital mortality
19. Lung transplantation	13	1 (7.7)	2 (15.4)
Single lung	3	0 (0.0)	0 (0.0)
Bilateral lungs	2	0 (0.0)	1 (50.0)
Living donor	8	1 (12.5)	1 (12.5)

(), % mortality

Table 21 in 2006

	Cases	30-Day mortality	Hospital mortality
20. Video-assisted thoracic surgery	33,495	37 (0.1)	70 (0.2)

(), % mortality

Table 22 in 2006

	Cases	30-Day mortality	Hospital mortality
21. Tracheobronchoplasty	607	7 (1.2)	12 (2.0)
Trachea	62	3 (4.8)	4 (6.5)
Carinal reconstruction	6	0 (0.0)	0 (0.0)
Sleeve pneumonectomy	82	0 (0.0)	1 (1.2)
Bronchus	430	4 (0.9)	7 (1.6)
Others	27	0 (0.0)	0 (0.0)

(), % mortality