FIFTH

REPORT OF THE

NATIONAL TRANSPLANT REGISTRY

2008

Editors
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August 2010

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Suggested citation of this report is as follows:
Hooi LS, Lela Yasmin Mansor (Eds). Fifth Report of the National Transplant Registry Malaysia 2008. Kuala Lumpur 2010.

The electronic version of this report can be downloaded at:
http://www.mst.org.my/ntrSite

Disclaimer

There is a potential that data for previous years printed in this report are different from what were printed in previous reports. This is because analysis for this report is based on the latest dataset in the web which may have been updated by SDP.

FORWARD

It is with great pleasure that the Malaysian Society of Transplantation presents the 5th Annual Report (2008) of the National Transplant Registry containing updated data and statistics on the entire range of transplant activities, from organ donation to transplantation, and its outcomes. Registries are the cornerstone of any clinical system and are the key to monitoring the performance of the system.

The National Transplant Registry was established in 2003 by the combined efforts of the Malaysian Society of Transplantation and the Ministry of Health Malaysia to collect and maintain a database of all transplant related activities in Malaysia. This database serves as an important national resource of transplant related information and helps in planning the development and delivery of future transplant services for the benefit of all Malaysians.

The NTR is an incredible resource of information for clinicians, researchers, health care planners and administrators. It helps us to better understand the need for transplantation and the need to improve the clinical care and overall clinical outcomes for all individuals who have had an organ or tissue transplant. The data provided by each transplant programme is verified and analysed as a whole and can be viewed online at http://www.mst.org.my.

I would like to thank Dr. Hooi Lai Seong, Datin Dr. Lela Yasmin Mansor and the various expert panels for their ongoing support and commitment to the registry in preparing, editing and proof reading this report. I would also like to thank all the source data providers from the public and private hospitals and university medical centres for collaborating and contributing their data to the National Transplant Registry over the years. The credit for the strength of our transplant registry goes entirely to the diligence of the transplant registry staff that have painstakingly dissected and verified the medical information to provide exceptional quality data. A special thanks to the members of the Expert Panels, the Transplant Registry Unit and the Governance Board for their tremendous contributions to the success of this registry.

It is hoped that with the continued cooperation and participation of all parties involved, it will be possible to ensure that the data remains available and worthy for studies in the future. It is thus vital that the quality of the data and the integrity of the current database be maintained and supported for these purposes.

I hope that in the coming years we will be able to secure adequate funding for the registry to go online in real time. A web-based registry will be able to seamlessly integrate and provide data of the various transplant activities in the country readily at any given point in time.

Datuk (Mr) Harjit Singh MBBS; FRCS Ed; FRCSI
President, Malaysian Society of Transplantation

ACKNOWLEDGEMENTS

The National Transplant Registry would like to record its appreciation to everyone who have helped made this report possible.

We would especially like to thank the following:

- Our source data providers that are the transplant surgeons, physicians and staff of all organ and tissue transplant centres and transplant follow up centres from the government, universities and private sectors, without whose commitment, hard work and timely data submission, there will be no report

- National Renal Registry for sharing the renal transplant data

- Clinical Research Centre, Hospital Kuala Lumpur

- Ministry of Health, Malaysia

- The members of the various expert panels for their expertise and for devoting their valuable time and effort in preparing and writing the various chapters

- Information technology personnel namely Ms Lim Jie Ying (database administrator), Mr Sebastian Thoo (programmer), Mr Rakesh A/L M. Jaya Prakasam (web application programmer) and Ms Azizah Alimat (desktop publisher)

- Statistician Ms Lena Yeap Lay Ling

- Roche (M) Sdn. Bhd. for their financial contribution to the registry yearly

- Many others, whose names are not listed here, for their support.

PARTICIPATING CENTRES

Discipline: Blood and Marrow Transplant

1. Ampang Puteri Specialist Hospital
2. Division of Haematology, Department of Medicine, University of Malaya Medical Centre
3. Haematology Department, Hospital Ampang
4. Haematology Department, Sime Darby Medical Centre Subang Jaya
5. Haemapoietic Stem Cell Transplant Unit, Hospital Universiti Sains Malaysia
6. Maybank BMT Centre, Universiti Kebangsaan Malaysia Medical Centre
7. Oncology-Haematology Department, Gleneagles Medical Centre, Penang
8. Oncology-Haematology Department, Lam Wah Ee Hospital
9. Paediatric BMT Unit, Department of Paediatrics, University of Malaya Medical Centre
10. Paediatric BMT Unit, Institute of Paediatrics, Hospital Kuala Lumpur
11. Paediatric BMT Unit, Sime Darby Medical Centre Subang Jaya

Discipline: Bone and Tissue Transplant

1. Bone Bank, Hospital Kuala Lumpur
2. Bone Bank, University of Malaya Medical Centre
3. Department of Orthopaedic & Traumatology, Hospital Kangar
4. Department of Orthopaedic Surgery, Hospital Sultanah Bahiyah
5. Department of Orthopaedic Surgery, Hospital Taiping
6. Department of Orthopaedic Surgery, University of Malaya Medical Centre
7. Department of Orthopaedics, Hospital Ipoh
8. Department of Orthopaedics, Hospital Kajang
9. Department of Orthopaedics, Hospital Kuantan
10. Department of Orthopaedics, Hospital Pulau Pinang
11. Department of Orthopaedics, Hospital Raja Perempuan Zainab II
12. Department of Orthopaedics, Hospital Seberang Jaya
13. Department of Orthopaedics, Hospital Sultanah Aminah
14. Department of Orthopaedics, Hospital Sultanah Nur Zahirah
15. Department of Orthopaedics, Hospital Tengku Ampuan Rahimah
16. Department of Orthopaedics, Hospital Universiti Sains Malaysia
17. Department of Orthopaedics, Sarawak General Hospital
18. Department of Orthopaedics, Sultanah Fatimah Specialist Hospital
19. Department of Orthopaedics, Traumatology and Rehabilitation, International Islamic University Malaysia
20. Department of Surgery, Hospital Raja Perempuan Zainab II
21. Hospital Fatimah, Ipoh
22. Institute of Orthopaedic & Traumatology, Hospital Kuala Lumpur
23. Island Hospital, Penang
24. Kota Bharu Medical Centre
25. Malaysian Nuclear Agency
26. National Tissue Bank, Universiti Sains Malaysia
27. Normah Medical Specialist Centre, Kuching
28. Ophthalmology Department, Hospital Kuala Lumpur
29. Ophthalmology Department, Hospital Sultanah Bahiyah
30. Ophthalmology Department, Hospital Sungai Buloh
31. Ophthalmology Department, Hospital Teluk Intan

Discipline: <u>Bone and Tissue Transplant</u>

32. Ophthalmology Department, Hospital Tengku Ampuan Afzan
33. Ophthalmology Department, Hospital Tengku Ampuan Rahimah
34. Ophthalmology Department, Hospital Universiti Sains Malaysia
35. Ophthalmology Department, Sri Kota Medical Centre
36. Timberland Medical Centre, Kuching
37. Wan Orthopaedic, Trauma & Sports Injury Centre, Seremban Specialist Hospital

Discipline: <u>Cornea Transplant</u>

1. Eye Clinic, Mahkota Medical Centre
2. Hope Eye Centre, Gleneagles Intan Medical Centre, Kuala Lumpur
3. International Specialist Eye Centre, Kuala Lumpur
4. K.C. Yeo Eye Specialist Centre, Melaka
5. Ophthalmology Department, 94 Hospital Angkatan Tentera Kem Terendak
6. Ophthalmology Department, Gleneagles Medical Centre, Penang
7. Ophthalmology Department, Hospital Batu Pahat
8. Ophthalmology Department, Hospital Bukit Mertajam
9. Ophthalmology Department, Hospital Duchess of Kent
10. Ophthalmology Department, Hospital Ipoh
11. Ophthalmology Department, Hospital Kangar
12. Ophthalmology Department, Hospital Kuala Lipis
13. Ophthalmology Department, Hospital Kuala Lumpur
14. Ophthalmology Department, Hospital Kuala Pilah
15. Ophthalmology Department, Hospital Melaka
16. Ophthalmology Department, Hospital Mentakab
17. Ophthalmology Department, Hospital Miri
18. Ophthalmology Department, Hospital Pakar Sultanah Fatimah
19. Ophthalmology Department, Hospital Pantai Indah
20. Ophthalmology Department, Hospital Pulau Pinang
21. Ophthalmology Department, Hospital Putrajaya
22. Ophthalmology Department, Hospital Queen Elizabeth, Kota Kinabalu
23. Ophthalmology Department, Hospital Raja Perempuan Zainab II
24. Ophthalmology Department, Hospital Selayang
25. Ophthalmology Department, Hospital Sibu
26. Ophthalmology Department, Hospital Sultan Ismail Pandan
27. Ophthalmology Department, Hospital Sultanah Aminah
28. Ophthalmology Department, Hospital Sultanah Bahiyah
29. Ophthalmology Department, Hospital Sultanah Nur Zahirah
30. Ophthalmology Department, Hospital Sungai Buloh
31. Ophthalmology Department, Hospital Sungai Petani
32. Ophthalmology Department, Hospital Taiping
33. Ophthalmology Department, Hospital Tawau
34. Ophthalmology Department, Hospital Teluk Intan
35. Ophthalmology Department, Hospital Tengku Ampuan Afzan
36. Ophthalmology Department, Hospital Tengku Ampuan Rahimah
37. Ophthalmology Department, Hospital Tuanku Ja'afar
38. Ophthalmology Department, Hospital Umum Sarawak
39. Ophthalmology Department, Hospital Universiti Kebangsaan Malaysia
40. Ophthalmology Department, Hospital Universiti Sains Malaysia

Discipline: Cornea Transplant

41. Ophthalmology Department, Sri Kota Medical Centre
42. Ophthalmology Department, University of Malaya Medical Centre
43. Pusat Pakar Mata Centre For Sight, PJ
44. Puteri Specialist Hospital, Johor Bahru
45. Sunway Medical Centre
46. Tan Eye Specialist Centre, Sunway Medical Centre
47. Tun Hussein Onn National Eye Hospital

Discipline: Heart and Lung Transplant

1. Cardiothoracic Department, Institut Jantung Negara
2. Institut Perubatan Respiratori, Hospital Kuala Lumpur

Discipline: Heart Valve Transplant

1. Cardiovascular Tissue Bank, Department of Cardiothoracic Surgery, Institut Jantung Negara

Discipline: Liver Transplant

1. Department of Paediatrics, University of Malaya Medical Centre
2. Hepatobiliary Department, Hospital Selayang
3. Paediatric Hepatology Unit, Hospital Selayang
4. Institute of Paediatrics, Hospital Kuala Lumpur
5. Sime Darby Medical Centre Subang Jaya

Discipline: Renal Transplant

1. C. S. Loo Kidney & Medical Specialist Centre
2. Damai Medical & Heart Clinic
3. Fan Medical Renal Clinic
4. Kidney Unit, Assunta Hospital
5. Klinik Dr Choo & Liew
6. Nephrology Clinic (Renal Transplant), Hospital Kuala Lumpur
7. Nephrology Clinic (Renal Transplant), Hospital Kuala Lumpur (Paed)
8. Renal Transplant Clinic, Hospital Batu Pahat
9. Renal Transplant Clinic, Hospital Bintulu
10. Renal Transplant Clinic, Hospital Duchess of Kent
11. Renal Transplant Clinic, Hospital Dungun
12. Renal Transplant Clinic, Hospital Kemaman
13. Renal Transplant Clinic, Hospital Kluang
14. Renal Transplant Clinic, Hospital Labuan
15. Renal Transplant Clinic, Hospital Likas
16. Renal Transplant Clinic, Hospital Melaka
17. Renal Transplant Clinic, Hospital Mersing
18. Renal Transplant Clinic, Hospital Miri

Discipline: <u>Renal Transplant</u>

19. Renal Transplant Clinic, Hospital Pakar Sultanah Fatimah
20. Renal Transplant Clinic, Hospital Pantai Penang
21. Renal Transplant Clinic, Hospital Pontian
22. Renal Transplant Clinic, Hospital Pulau Pinang
23. Renal Transplant Clinic, Hospital Queen Elizabeth
24. Renal Transplant Clinic, Hospital Raja Perempuan Zainab II
25. Renal Transplant Clinic, Hospital Raja Permaisuri Bainun
26. Renal Transplant Clinic, Hospital Segamat
27. Renal Transplant Clinic, Hospital Selayang
28. Renal Transplant Clinic, Hospital Serdang
29. Renal Transplant Clinic, Hospital Sibu
30. Renal Transplant Clinic, Hospital Sultan Ismail
31. Renal Transplant Clinic, Hospital Sultanah Aminah
32. Renal Transplant Clinic, Hospital Sultanah Bahiyah
33. Renal Transplant Clinic, Hospital Sultanah Nur Zahirah
34. Renal Transplant Clinic, Hospital Taiping
35. Renal Transplant Clinic, Hospital Tawau
36. Renal Transplant Clinic, Hospital Tengku Ampuan Afzan
37. Renal Transplant Clinic, Hospital Tengku Ampuan Rahimah
38. Renal Transplant Clinic, Hospital Tuanku Ja'afar
39. Renal Transplant Clinic, KPJ Ampang Puteri Specialist Hospital
40. Renal Transplant Clinic, KPJ Selangor Specialist Hospital
41. Renal Transplant Clinic, Normah Medical Specialist Centre
42. Renal Transplant Clinic, Prince Court Medical Centre
43. Renal Transplant Clinic, Pusat Perubatan Universiti Kebangsaan Malaysia
44. Renal Transplant Clinic, Renal Care (Ipoh Specialist Hospital)
45. Renal Transplant Clinic, Sabah Medical Centre
46. Renal Transplant Clinic, Sarawak General Hospital
47. Renal Transplant Clinic, Selangor Medical Centre
48. Renal Transplant Clinic, Sime Darby Medical Centre Subang Jaya
49. Renal Transplant Clinic, Sri Kota Medical Centre
50. Renal Transplant Clinic, Sunway Medical Centre
51. Renal Transplant Clinic, Universiti Sains Malaysia Hospital
52. Renal Transplant Clinic, University Malaya Medical Centre
53. Renal Transplant Clinic (Paed), Ward 8C&D, Hospital Sultan Ismail
54. Simon Wong Medical & Kidney Clinic, Timberland Medical Centre
55. Smartcare Dialysis Centre, Subang Jaya
56. Tan Medical Renal Clinic
57. Wee Kidney & Medical Specialist Clinic

ABOUT THE NATIONAL TRANSPLANT REGISTRY

The National Transplant Registry (NTR) is a Ministry of Health (MOH) supported registry whose aim is to collect information about organ and tissue transplantations in Malaysia. The information allows us to estimate the magnitude of transplant activity in the country. Such information besides being useful to transplantation practitioners may be used in assisting the MOH, non-governmental organisations, private providers and industry in program planning and evaluation of transplantation services.

The objectives of NTR are to:

1. Determine the frequency and distribution of all types of transplantation activity in Malaysia.
2. Determine the outcomes of transplantation.
3. Determine the factors influencing outcomes of transplantation.
4. Evaluate transplantation services in the country.
5. Stimulate and facilitate research on transplantation and its management.

The NTR receives data on organ / tissue transplantation from 3 main sources:

1. The individual doctors who provide transplantation services, who voluntarily report data to the NTR. Data collection will be from seven main types of transplantation services:
    - Blood and Marrow Transplant
    - Cornea Transplant
    - Heart and Lung Transplant
    - Liver Transplant
    - Renal Transplant
    - Heart Valve Transplant
    - Bone and Tissue Transplant
2. The National Vital Registration system (Jabatan Pendaftaran Negara). Their data is useful for determining or verifying mortality outcomes of transplant patients.
3. Information Documentation Unit of the MOH, which operates the Health Management Information System (HMIS).

NTR SPONSORS

- Medical Development Division, MOH
- National Transplant Coordinating Committee
- Malaysian Society Of Transplantation
- Clinical Research Centre, Hospital Kuala Lumpur

GOVERNANCE BOARD

The Governance Board is established to govern the NTR and the terms of reference are as follows:

1. Provide the necessary leadership and direction for the National Transplant Registry.
2. Ensure that the vision, objectives and goals of the National Transplant Registry are clearly established and that strategies are in place for achieving them.
3. Establish policies and procedures for the proper functioning of the National Transplant Registry.
4. Seek input and feedback from all stakeholders and end users with regards to their expectations and the performance of the National Transplant Registry.
5. Secure funding and financial support for the National Transplant Registry.
6. Galvanize the commitment of all interested parties to the National Transplant Registry.
7. Receive and review the annual report from the steering committee.

Current members of the Governance Board are as follows:

Chairperson
Dato' Dr Zaki Morad Mohd Zaher

Vice Chairperson
Datin Dr Fadhilah Zowyah Lela Yasmin Mansor

Members:

Datuk (Mr) Harjit Singh	Malaysian Society of Transplantation
Dr Teng Seng Chong	Medical Development Division, Ministry of Health
Tan Sri Dato' Seri Dr Mohd. Ismail Merican	Malaysian Liver Foundation
Mr Rohan Malek	Malaysian Urological Association
Dr Hooi Lai Seong	Malaysian Society of Nephrology
Dr Aizai Azan Abdul Rahim	National Heart Association of Malaysia
Dr Suzina Sheikh Ab. Hamid	Malaysian National Tissue Bank
Dr Abdul Malik Hussein	Malaysian Orthopaedic Association
Dr Tan Chwee Choon	National Kidney Foundation of Malaysia
Dato' Dr Chang Kian Meng	Malaysian Society of Haematology
Dato' Dr M.Venugopal Balchand	Malaysian Association of Thoracic & Cardiovascular Surgeons
Dr Goh Pik Pin	Clinical Research Centre, Hospital Kuala Lumpur & Malaysian Society of Ophthalmology
Dr Jamaiyah Haniff	Clinical Research Centre, Hospital Kuala Lumpur

Secretariat:
Ms Leong Wei Chee

EXPERT PANEL

NTR has established seven groups of Expert Panel comprising members of the medical profession and allied health with expert knowledge in these various disciplines:

- Blood and Marrow Transplant
- Cornea Transplant
- Heart and Lung Transplant
- Liver Transplant
- Renal Transplant
- Heart Valve Transplant
- Bone and Tissue Transplant

The role of the Expert Panel is:

1. To undertake quality control of the clinical registry form and the data dictionary as deemed necessary.
2. To undertake quality control of the reported data.
3. To undertake literature review on the relevant area.
4. To interpret the results generated by NTR's statisticians.
5. To write the section of the NTR report relevant to the panel's expertise.
6. To specify the data reporting procedure.
7. To facilitate access to source documents for Transplant Registry Unit (TRU) staff to do data verification.

List of Expert Panel members for each respective discipline:

Discipline: <u>Blood and Marrow Transplant</u>

Co-chairperson (Adult)	Dr Alan Teh Kee Hean
Co-chairperson (Paeds)	Prof Dr Chan Lee Lee
Members	Prof Gan Gin Gin @ Gan Shiaw Sze
	Dr Hishamshah Mohd Ibrahim
	Prof Madya Dr S Fadilah Abdul Wahid
	Dr Ong Tee Chuan

Discipline: <u>Cornea Transplant</u>

Chairperson	Dr Shamala Retnasabapathy
Members	Prof Dato' Dr Veera Ramani
	Dr Choong Yean Yaw
	Dr Michael Law Sie Haur
	Dr Thiageswari Umapathy
	Dr Chandramalar Santhirathelagan
	Associate Prof Dr Mohtar Ibrahim

Discipline: Heart and Lung Transplant

Chairperson	Mr Mohamed Ezani Hj Md. Taib
Members	Dato' Dr David Chew Soon Ping
	Dr Aizai Azan Abdul Rahim
	Dr Abdul Rais Sanusi
	Dr Ashari Yunus

Discipline: Liver Transplant

Chairperson	Dr Ganesalingam A/L Kanagasabai
Members	Dr Lim Kin Foong
	Dr Haniza Omar
	Dr Lim Chooi Bee
	Prof Dr Lee Way Seah

Discipline: Renal Transplant

Chairperson	Dr Goh Bak Leong
Members	Dato' Dr Zaki Morad Mohd Zaher
	Dato' Dr (Mr) Rohan Malek
	Dr Fan Kin Sing
	Dr S Prasad Menon
	Dr Lily Mushahar
	Dr Lim Soo Kun

Discipline: Bone and Tissue Transplant

Chairperson	Dr Suzina Sheikh Ab Hamid
Members	Dr Abdul Malik Mohamed Hussein
	Assoc Prof Dr Ahmad Hafiz Zulkifly
	Dr Thiageswari Umapathy
	Dr Ewe Teong Wan
	Dr Norimah Yusof
	Assoc Prof Dr Vivek Ajit Singh

Discipline: Cadaveric Organ and Tissue Donations

Chairperson	Datin Dr Fadhilah Zowyah Lela Yasmin Mansor
Members	Dr Hooi Lai Seong
	Dr Omar Sulaiman
	Dr Muhammed Anis Bin Abdul Wahab
	Matron Jamaliah Kario
	Staff Nurse Santi A/P Krishanan

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REPORT SUMMARY

1. BLOOD AND MARROW TRANSPLANTATION

There were 181 new transplantations done in Malaysia in 2008 with 12 transplant centres.

The majority of all transplants were for malignant disorders and most of these are haematological malignancies like leukaemia and lymphoma. The main non-malignant disorders transplanted were thalassaemia and aplastic anaemia.

Mean age of new transplant patients in 2008 was 28 $\pm$ 17 years; 55% were male, 42% Malay, 39% Chinese, 7% Indian and 12% others. Autologous transplants accounted for 36%. Eighty-four percent of the transplant source was from peripheral blood stem cells and 89% were from Human Leukocyte Antigen (HLA) identical donors.

In 2008 71 of transplant recipients died. Underlying disease and infection were the commonest causes of death accounting for 51% and 20% respectively.

2. CORNEAL TRANSPLANTATION

There were 46 centres which provided cornea transplantation data.

Two hundred and thirty new cornea transplantations were reported in Malaysia in 2008. Mean age of new transplant recipients in 2008 was 46 $\pm$ 20 years. Of these, 62% were male. Thirty-four percent of recipients were Malay, 36% were Chinese, 18% were Indian and 12% were other races.

The primary diagnoses for cornea transplantation recipients in 2008 were pseudophakic bullous keratopathy (20%), keratoconus (16%), corneal scar (13%), microbial keratitis (8%) and corneal perforation (8%).

Forty-six percent of recipients were legally blind before their transplant surgery.

In 2008, 65% of donated corneas were from the USA, 16% from Sri Lanka and 18% from local sources. The mean age of the donors was 56 $\pm$ 17 years.

The commonest cornea transplantation surgery performed was penetrating keratoplasty (82%) i.e. transplantation of a full thickness cornea tissue. Graft survival at 1 year was 77%, 63% at 3 years.

3. HEART AND LUNG TRANSPLANTATION

There were a total of 18 patients with heart transplantations reported to the Registry between 1997 and 2008; none were done in 2008. Eight grafts were functioning at the end of 2008 and all were followed up in Institut Jantung Negara.

The transplant patient survival rate was 63% and 44% at 1 year and 3 years respectively.

There were no lung transplants in 2008. At the end of the year there were 2 patients with lung transplants surviving with functioning graft and they were followed up at Institut Perubatan Respiratori (IPR).

4. LIVER TRANSPLANTATION

There were a total of 100 liver transplantations reported to the Registry between 1993 and 2008; 57 grafts were functioning by the end of 2008.

There were 5 new liver transplantations done in Malaysia in 2008. There were 5 follow-up centres for liver transplant recipients in 2008.

Mean age of all transplant patients was 9 $\pm$ 14 years (range 3 months to 74 years); 53% were male, 51% Chinese, 39% Malay, 8% Indian, 72% were for biliary atresia. Majority were living donor liver transplantations (75%).

At the time of transplantation the main immunosuppressive drugs used were tacrolimus (77%) and steroids (63%).

Transplant patient survival rate for the cohort 1993 to 1998 was 71% at 1 year; survival rate for the cohort 1999 to 2008 was 69% at 1 year.

5. RENAL TRANSPLANTATION

There were 57 follow-up centres for renal transplant recipients in 2008. There were 88 new renal transplants in 2008, 3 per million population per year.

The number of functioning renal transplants in 2008 was 1730. The transplant prevalence rate was 62 per million population.

In 2008, the mean age for new transplant recipients was 34$\pm$15 years, 58% were male, 15% had diabetes, 4% were anti-HCV positive at the time of transplantation.

Ninety-seven percent of prevalent renal transplant recipients were on prednisolone, 69% on cyclosporine, 24% on tacrolimus, 53% mycophenolate mofetil and 28% on azathioprine.

In 2008, 48 (3%) of prevalent transplant recipients died and 32 (2%) lost their grafts. Infection, died at home and cancer were the commonest causes of death accounting for 26%, 23% and 19% respectively. Cardiovascular disease was the fourth commonest cause at 13%. Renal allograft rejection accounted for 72% of graft loss.

The overall transplant patient survival rate from 1995 to 2008 was 95%, 91%, 88% and 81% at 1 year, 3 years, 5 years and 10 years respectively, while the overall graft survival rate for these years was 91%, 85%, 80% and 66% respectively.

6. HEART VALVE TRANSPLANTATION

There were a total of 200 heart valve homografts reported to the Registry between 1996 and 2008; 168 grafts were functioning at the end of 2008. Ninety-three were aortic and 107 were pulmonary valves.

Mean age of all heart valve transplant patients was 11 $\pm$ 10 years (range 1 month to 70 years); 50% were male, 62% Malay.

7. BONE AND TISSUE TRANSPLANTATION

In 2008, 108 bone allografts, 9 frozen tendons, 36 frozen skin and 2081 amniotic membranes were supplied by Tissue Bank, USM.

Fourteen hospitals used the bone grafts and 13 centres used the amniotic membranes. Characteristics were reported for only 21 of the recipients.

8. CADAVERIC ORGAN AND TISSUE DONATION

There were 26 donors in 2008 of which 13 were brain dead multi-organ and tissue donors and 13 were post cardiac death tissue donors. The donation rate was 0.94 donations per million population.

The mean age of the donors was 30.8 $\pm$ 19.1 years, age range 2 – 71 years of age. Sixty-nine percent were male, 65% were Chinese, 23% Indian, 12% others.

Two donors carried the donor pledge card. Ten of the donors died from accidents, 15 died from medical causes. Fifty-eight percent of donations took place in MOH hospitals, 23% in private hospitals and 12% from University hospitals.

CHAPTER 1

BLOOD AND MARROW TRANSPLANTATION

Editors:
Dr Alan Teh Kee Hean
Prof Dr Chan Lee Lee

Expert Panel
Dr Alan Teh Kee Hean (co-chairperson)
Prof Dr Chan Lee Lee (co-chairperson)
Dr Gan Gin Gin
Dr Hishamshah Mohd Ibrahim
Prof Dr S. Fadilah Abdul Wahid
Dr Ong Tee Chuan

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1.0 INTRODUCTION

Haematopoietic Stem Cell Transplantation (HSCT) activity in Malaysia continued to increase at a steady pace which was reflected in the increased number of transplants performed year on year. This 5th annual report attempts to provide an accurate record of the total number of HSCT performed in 2008. Overall access to HSCT remained low at 6 per million population.

1.1 STOCK AND FLOW

In 2008 a total of 181 HSCT were performed. Two new centres namely Hospital Pulau Pinang and Hospital Universiti Sains Malaysia started autologous HSCT making a total of 12 transplant centres operating in Malaysia. The Adult Transplant team which operated in Hospital Kuala Lumpur shifted to Hospital Ampang in December 2006, has performed the most number of HSCT in 2008 contributing 31% of the total national transplant activity.

Table 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2008

Year	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
New transplant patients	8	6	22	5	12	21	19	25	30	28	33
Deaths	1	1	6	6	1	2	9	5	17	11	15
Lost to follow-up	0	0	0	0	0	0	0	0	0	0	0
Alive at 31st December	7	12	28	27	38	57	67	87	100	117	135

Year	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
New transplant patients	49	62	94	108	114	128	140	148	136	149	181
Deaths	17	16	31	47	34	56	52	61	42	50	71
Lost to follow-up	0	0	0	0	0	0	0	0	0	0	0
Alive at 31st December	167	213	276	337	417	489	577	664	758	857	967

Figure 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2008

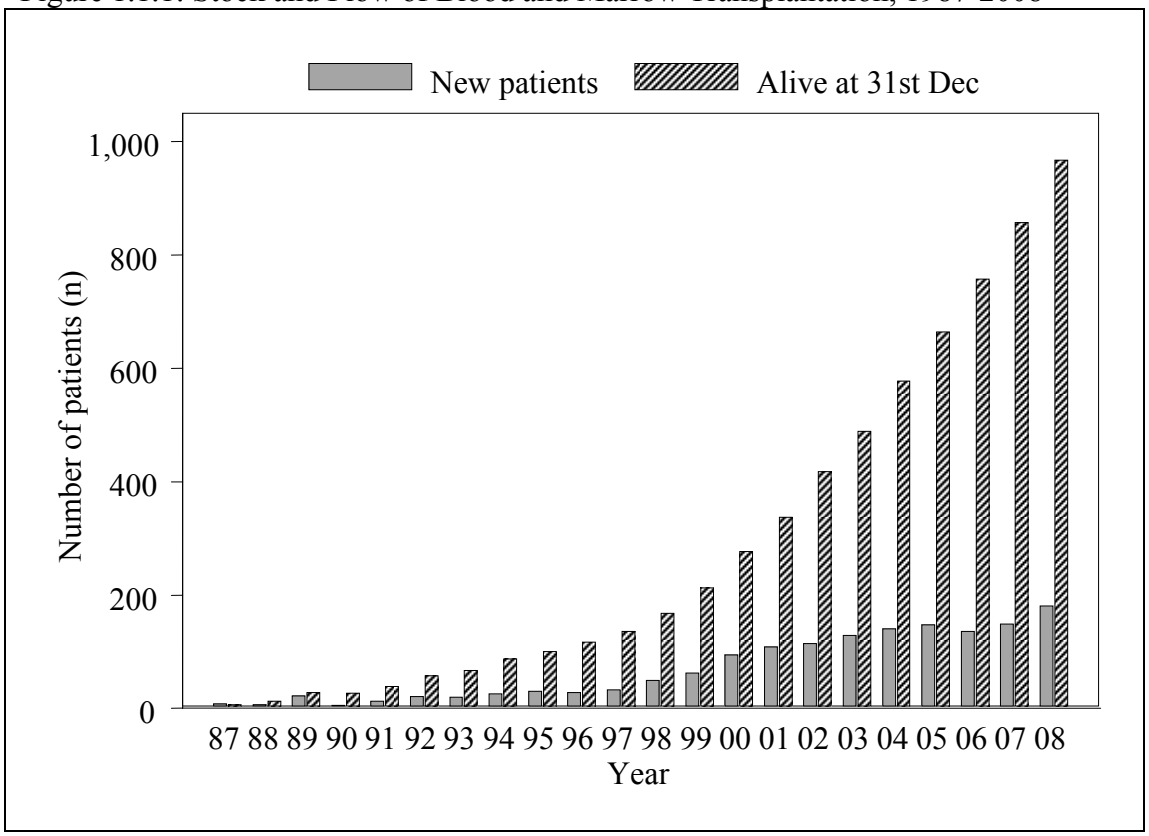


Table 1.1.2: New Transplant Rate per million population (pmp), 1987-2008

Year	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
New transplant patients	8	6	22	5	12	21	19	25	30	28	33
New transplant rate, pmp	1	0	1	0	1	1	1	1	1	1	2

Year	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
New transplant patients	49	62	94	108	114	128	140	148	136	149	181
New transplant rate, pmp	2	3	4	5	5	5	5	6	5	5	7

Figure 1.1.2: New Transplant Rate per million population (pmp), 1987-2008

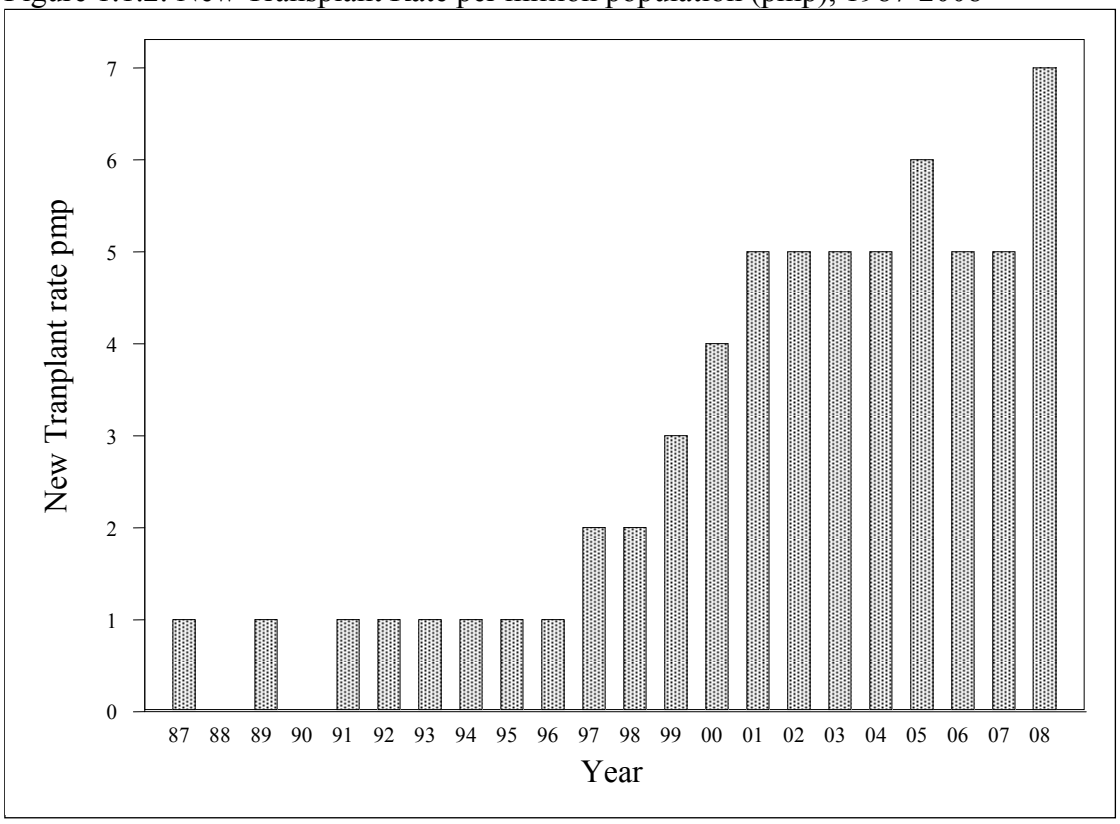


Table 1.1.3: Distribution of Patients by Transplant Centre, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KLP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UKM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJA	0	0	0	0	1	5	0	0	0	0	0	0	0	0
UMA	0	0	0	0	0	0	0	0	0	0	0	0	1	5
UMP	8	100	6	100	21	95	5	100	12	100	21	100	18	95
GMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**

Year	1994		1995		1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0	0	0	0	0	0	0	0	0	0	6	10	15	16
KLP	4	16	10	33	10	36	9	27	16	33	19	31	16	17
UKM	0	0	0	0	0	0	0	0	0	0	2	3	9	10
SJA	0	0	0	0	0	0	0	0	0	0	5	8	19	20
UMA	4	16	7	23	6	21	9	27	15	30	11	18	13	14
UMP	17	68	13	43	11	39	15	46	18	37	19	31	22	23
GMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJP	0	0	0	0	1	4	0	0	0	0	0	0	0	0
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**25**	**100**	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**

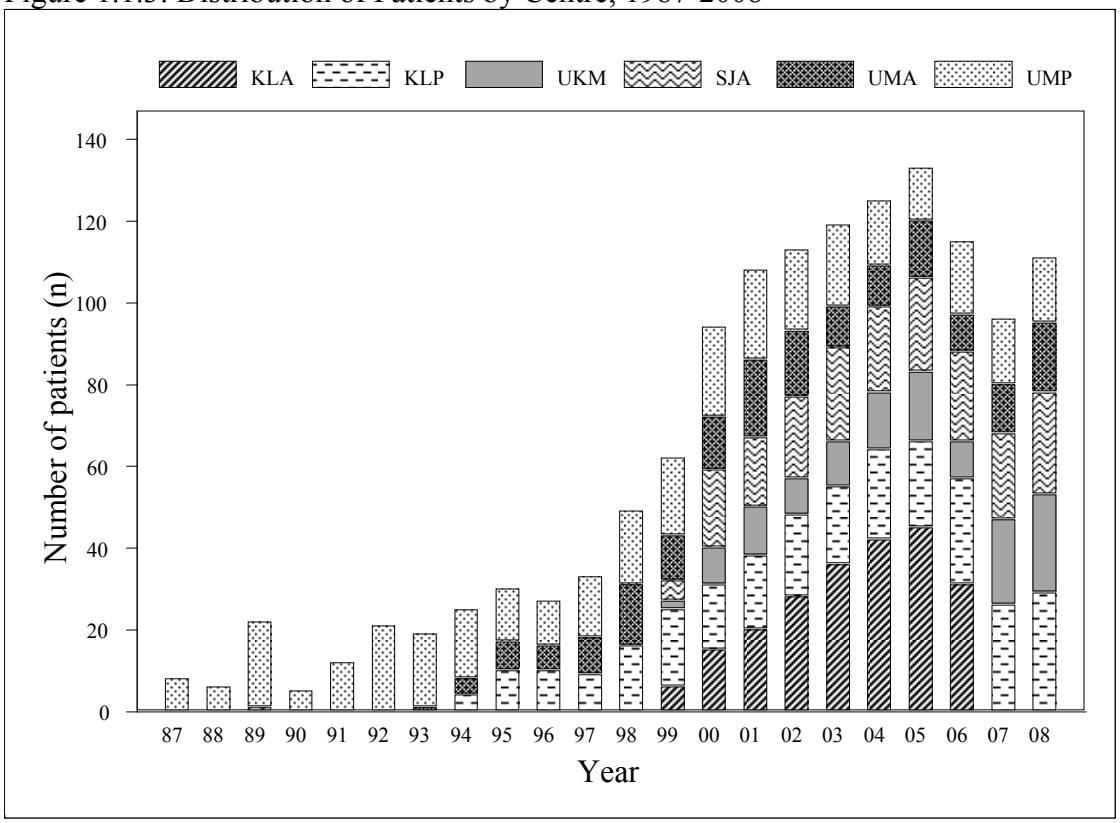
Year	2001		2002		2003		2004		2005		2006		2007	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	20	19	28	25	36	28	42	30	45	30	31	23	0	0
KLP	18	17	20	18	19	15	22	16	21	14	26	19	26	17
UKM	12	11	9	8	11	9	14	10	17	11	9	7	21	14
SJA	17	16	20	18	23	18	21	15	23	16	22	16	21	14
UMA	19	18	16	14	10	8	10	7	14	9	9	7	12	8
UMP	22	20	20	18	20	16	16	11	13	9	18	13	16	11
GMC	0	0	0	0	0	0	2	1	2	1	4	3	2	1
LWE	0	0	0	0	0	0	6	4	1	1	2	1	1	1
SJP	0	0	1	1	9	7	6	4	12	8	6	4	5	3
HUSM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASH	0	0	0	0	0	0	0	0	0	0	1	1	1	1
HA	0	0	0	0	0	0	0	0	0	0	8	6	44	30
HPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	1	1	0	0	0	0	0	0
TOTAL	**108**	**100**	**114**	**100**	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**

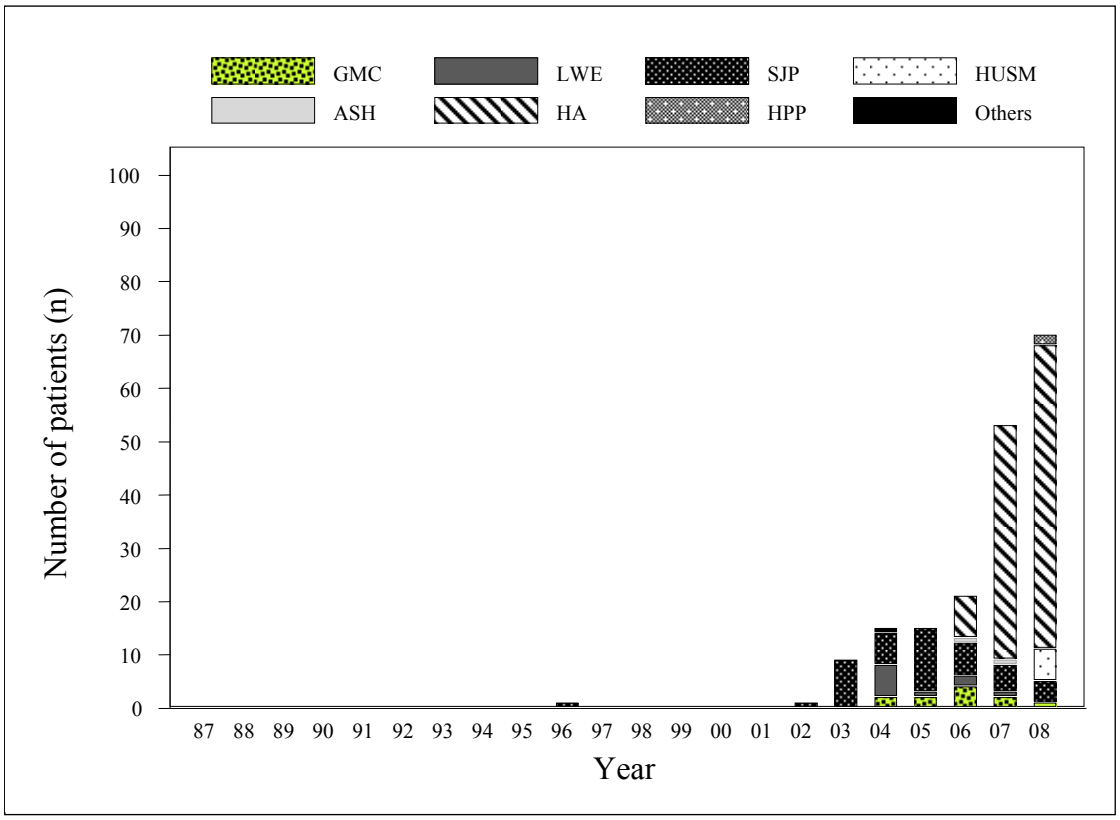
Year	2008		Total	
	No.	%	No.	%
KLA	0	0	223	15
KLP	29	16	265	17
UKM	24	13	128	8
SJA	25	14	197	13
UMA	17	9	173	11
UMP	16	9	347	23
GMC	1	1	11	1
LWE	0	0	10	1
SJP	4	2	44	3
HUSM	6	3	6	0
ASH	0	0	2	0
HA	57	31	109	7
HPP	2	1	2	0
Others	0	0	1	0
TOTAL	**181**	**100**	**1518**	**100**

*Others include Royal Perth Australia Hospital

KLA	Hospital Kuala Lumpur, (Adult)
KLP	Hospital Kuala Lumpur, Institute Paediatrics (Paed)
UKM	Pusat Perubatan Universiti Kebangsaan Malaysia
SJA	Sime Darby Medical Centre, Subang Jaya (Adult)
UMA	University of Malaya Medical Centre (Adult)
UMP	University of Malaya Medical Centre (Paed)
GMC	Gleneagles Medical Centre, Penang
LWE	Lam Wah Ee Hospital, Penang
SJP	Sime Darby Medical Centre, Subang Jaya (Paed)
HUSM	Hospital Universiti Sains Malaysia
ASH	Ampang Puteri Specialist Hospital
HA	Hospital Ampang
HPP	Hospital Pulau Pinang

Figure 1.1.3: Distribution of Patients by Centre, 1987-2008





1.2 RECIPIENTS' CHARACTERISTICS

Out of the 181 HSCT, the male:female ratio was 55:45. The ethnic breakdown was 42%, 39%, 7%, 11% and 1% for Malay, Chinese, Indian, Bumiputra East Malaysians and Others respectively. Patients aged younger than 20 years formed 37% of patients transplanted while those aged greater than 60 years was only 2%. The commonest indications for HSCT were acute leukaemia, lymphoma and hypoplastic anaemia.

Table 1.2.1: Distribution of Patients by Gender, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Gender	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	7	88	4	67	12	55	3	60	7	58	13	62	13	68	16	64
Female	1	13	2	33	10	45	2	40	5	42	8	38	6	32	9	36
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Gender	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	11	37	15	54	18	55	33	67	36	58	54	57	66	61	62	54
Female	19	63	13	46	15	45	16	33	26	42	40	43	42	39	52	46
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Gender	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	71	55	84	60	71	48	80	59	90	60	99	55	865	57
Female	57	45	56	40	77	52	56	41	59	40	82	45	653	43
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**

Figure 1.2.1: Distribution of Patients by Gender, 1987-2008

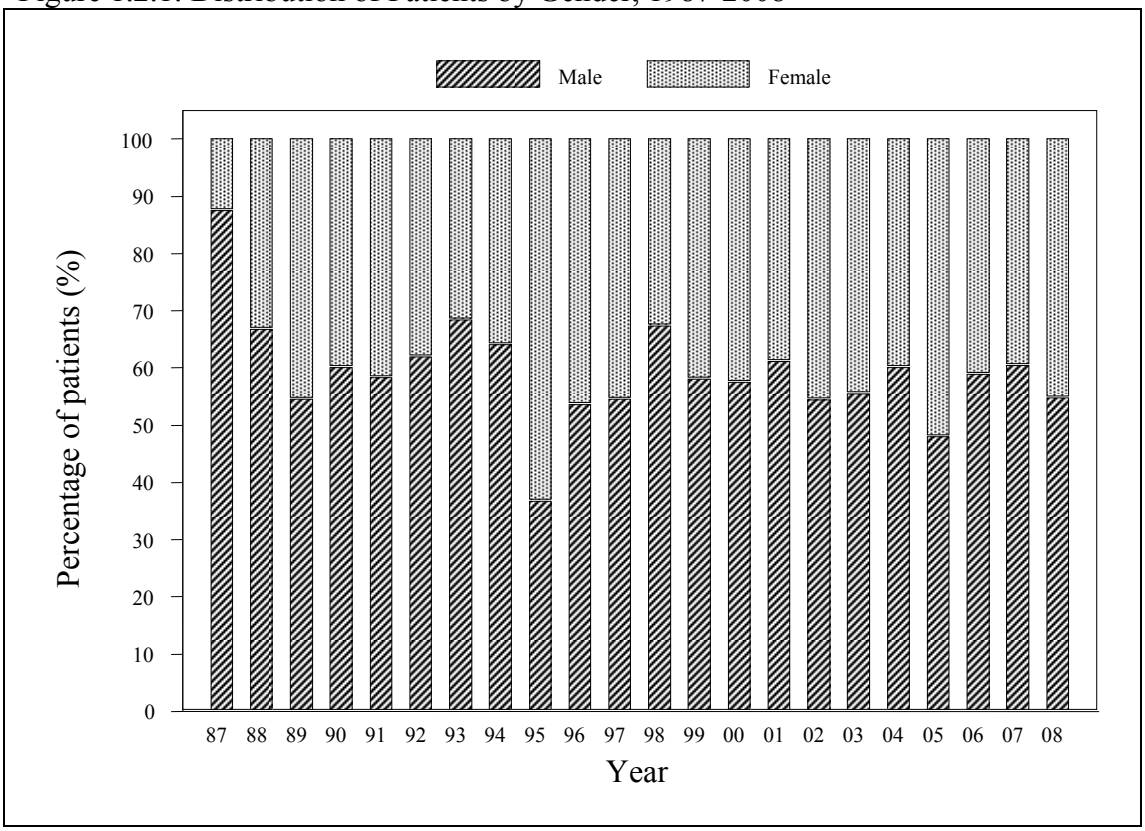


Table 1.2.2: Distribution of Patients by Ethnic Group, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Race	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Malay	2	25	4	67	13	59	2	40	4	33	4	19	3	16	9	36
Chinese	5	63	2	33	8	36	3	60	7	58	10	48	10	53	12	48
Indian	1	13	0	0	0	0	0	0	1	8	4	19	1	5	0	0
Bumiputra Sabah	0	0	0	0	1	5	0	0	0	0	2	10	3	16	4	16
Bumiputra Sarawak	0	0	0	0	0	0	0	0	0	0	0	0	2	10	0	0
Others	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Race	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Malay	7	23	8	29	9	27	20	41	31	50	33	35	47	44	37	32
Chinese	14	47	11	39	20	61	24	49	26	42	48	51	48	44	65	57
Indian	3	10	6	21	0	0	4	8	4	6	7	8	8	7	8	7
Bumiputra Sabah	1	3	0	0	1	3	0	0	0	0	3	3	1	1	1	1
Bumiputra Sarawak	0	0	3	11	0	0	0	0	0	0	0	0	1	1	1	1
Others	5	17	0	0	3	9	1	2	1	2	3	3	3	3	2	2
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Race	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Malay	46	36	51	37	53	36	61	45	59	40	77	42	580	38
Chinese	65	51	63	45	69	47	50	37	59	40	71	39	690	45
Indian	6	5	9	6	14	10	11	8	18	12	12	7	117	8
Bumiputra Sabah	4	3	9	6	5	3	7	5	6	4	14	8	62	4
Bumiputra Sarawak	4	3	7	5	5	3	2	1	1	1	5	3	31	2
Others	3	2	1	1	2	1	5	4	6	4	2	1	38	3
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**

Figure 1.2.2: Distribution of Patients by Ethnic Group, 1987-2008

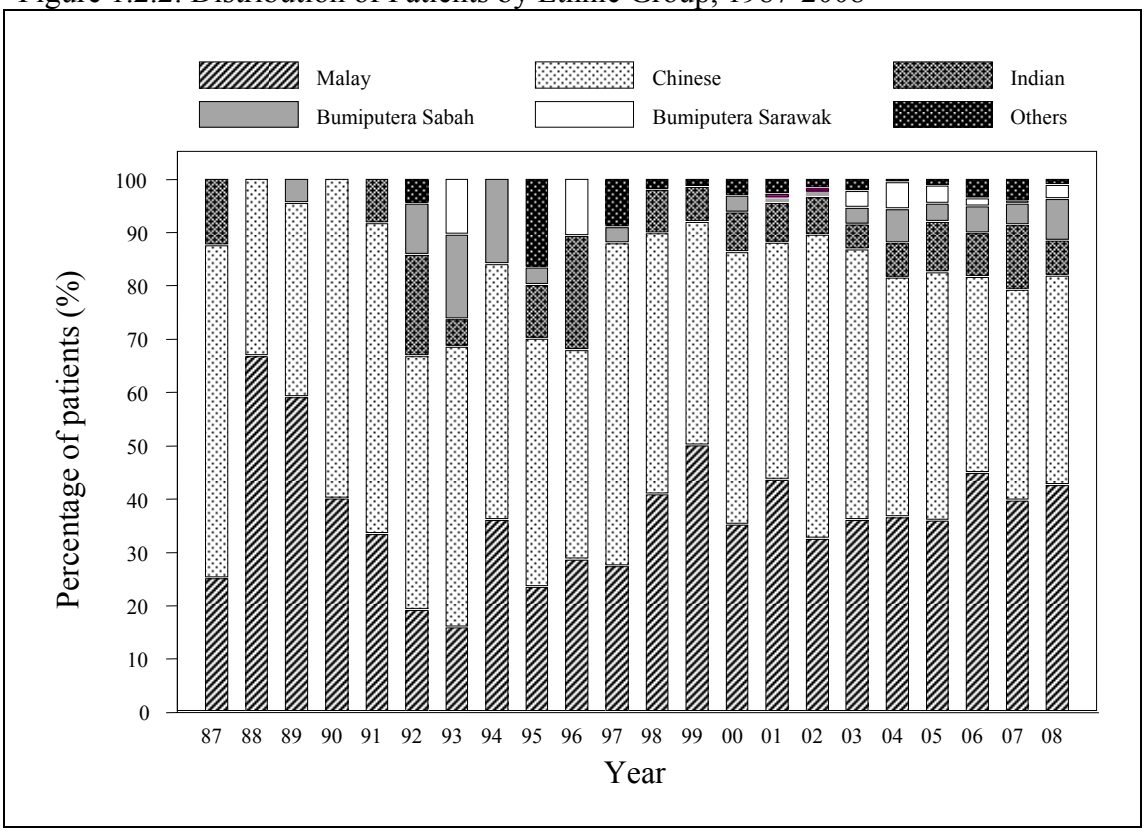


Table 1.2.3: Distribution of Patients by Age Group, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Age group	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-9	4	50	4	67	17	77	5	100	10	83	15	71	9	47	11	44
10-19	4	50	2	33	5	23	0	0	2	17	6	29	10	53	11	44
20-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	12
40-59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
≥60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**
Mean	9		7		8		6		6		7		9		11	
SD	4		3		3		3		4		4		5		7	
Median	9		7.5		8		6		6		6		10		11	
Minimum	2		2		1		2		1		1		1		1	
Maximum	15		10		13		9		13		14		17		29	

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Age group	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-9	12	40	13	46	19	58	21	43	28	45	27	29	23	21	30	26
10-19	13	43	12	43	8	24	16	33	15	24	27	29	28	26	25	22
20-39	4	13	3	11	5	15	12	24	12	20	19	20	40	37	36	32
40-59	1	3	0	0	1	3	0	0	7	11	20	21	16	15	23	20
≥60	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**
Mean	13		11		12		13		17		23		23		23	
SD	9		9		12		10		15		17		16		16	
Median	11		11		6		10		11		18		22		21.5	
Minimum	3		1		1		5 months		1		1		1 month		1	
Max	41		37		45		39		57		61		64		55	

Year	2003		2004		2005		2006		2007		2008		Total	
Age group	**No.**	**%**	**No.**	**%.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-9	42	33	26	19	29	20	40	29	38	26	25	14	448	30
10-19	18	14	41	29	32	22	29	21	22	15	42	23	368	24
20-39	47	37	52	37	50	34	38	28	35	23	63	35	419	28
40-59	21	16	19	14	36	24	25	18	43	29	47	26	259	17
≥60	0	0	2	1	1	1	4	3	11	7	4	2	24	2
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**
Mean	22		23		26		24		29		28		22	
SD	15		15		16		18		20		17		17	
Median	22.5		20		23.5		19		28		25		18	
Minimum	5 months		1		1		1		1		2		1 month	
Maximum	52		70		66		69		68		66		70	

Figure 1.2.3: Distribution of Patients by Age Group, 1987-2008

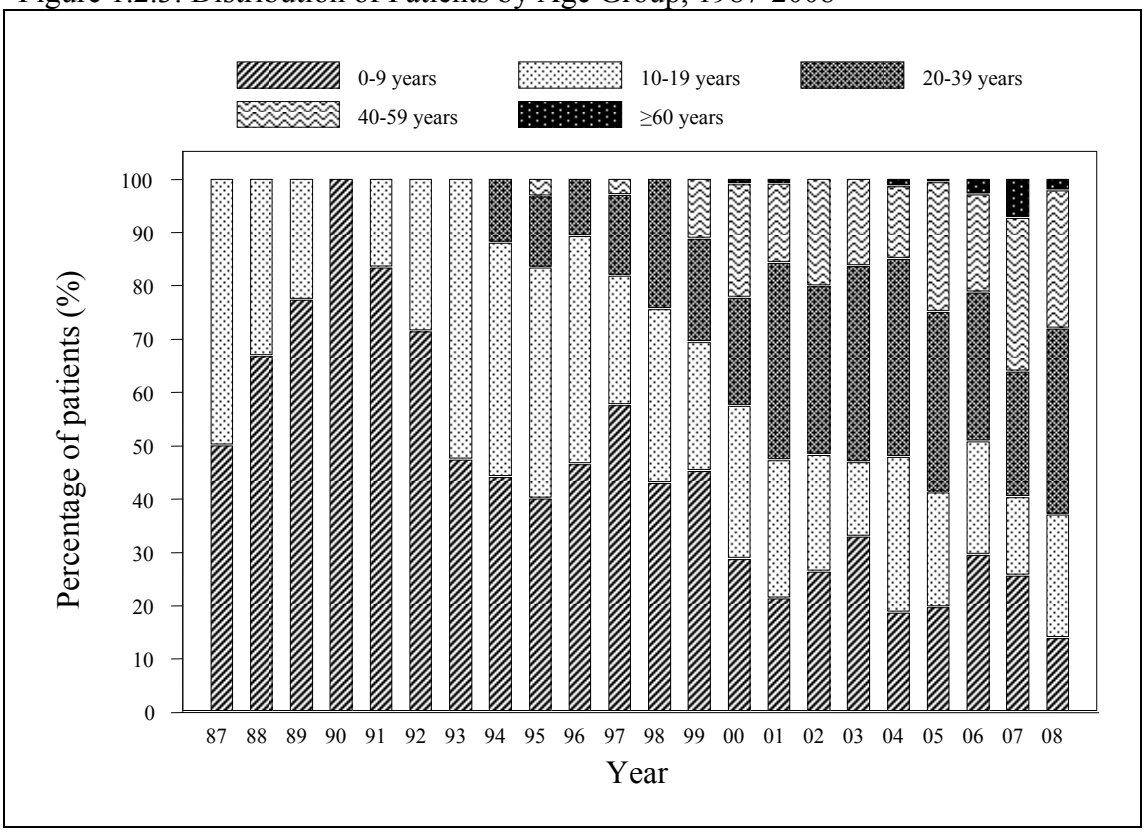


Table 1.2.4: Distribution of Patients by Primary Diagnosis, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Diagnosis	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Acute leukaemia	5	63	4	67	8	36	2	40	1	8	4	19	6	32	8	32
Chronic leukaemia	0	0	0	0	1	5	1	20	1	8	4	19	2	11	4	16
Hypoplastic anaemia	2	25	0	0	4	18	0	0	4	33	5	24	4	21	5	20
Erythrocytic disorders	0	0	0	0	1	5	1	20	1	8	1	5	0	0	0	0
Lymphoma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solid tumors	0	0	0	0	0	0	0	0	0	0	3	14	1	5	1	4
Myelodysplasia	0	0	0	0	0	0	0	0	0	0	0	0	1	5	2	8
Haemoglobinopathy	1	13	2	33	7	32	1	20	4	33	4	19	2	11	5	20
Multiple myeloma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	1	5	0	0	1	8	0	0	3	16	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Diagnosis	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Acute leukaemia	10	33	13	46	11	33	23	47	28	45	37	39	48	44	48	42
Chronic leukaemia	5	17	5	18	6	18	7	14	7	11	13	14	18	17	19	17
Hypoplastic anaemia	8	27	4	14	5	15	4	8	5	8	11	12	7	6	4	4
Erythrocytic disorders	0	0	1	4	0	0	0	0	0	0	0	0	0	0	1	1
Lymphoma	0	0	0	0	2	6	5	10	6	10	19	20	23	21	20	18
Solid tumors	1	3	0	0	1	3	2	4	5	8	2	2	0	0	3	3
Myelodysplasia	0	0	0	0	0	0	1	2	0	0	1	1	4	4	4	4
Haemoglobinopathy	5	17	5	18	6	18	2	4	4	6	7	7	4	4	8	7
Multiple myeloma	0	0	0	0	0	0	0	0	3	5	1	1	1	1	4	4
Others	1	3	0	0	2	6	5	10	4	6	3	3	3	3	3	3
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Diagnosis	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Acute leukaemia	42	33	46	33	55	37	43	32	54	36	62	34	558	37
Chronic leukaemia	18	14	22	16	13	9	9	7	7	5	5	3	167	11
Hypoplastic anaemia	5	4	12	9	5	3	14	10	13	9	17	9	138	9
Erythrocytic disorders	2	2	0	0	0	0	0	0	0	0	1	1	9	1
Lymphoma	28	22	36	26	34	23	32	24	35	23	43	24	283	19
Solid tumors	2	2	0	0	2	1	5	4	5	3	1	1	34	2
Myelodysplasia	3	2	6	4	4	3	4	3	1	1	5	3	36	2
Haemoglobinopathy	17	13	9	6	16	11	11	8	13	9	11	6	144	9
Multiple myeloma	5	4	3	2	8	5	10	7	16	11	16	9	67	4
Others	6	5	6	4	11	7	8	6	5	3	20	11	82	5
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**

	Diagnosis	**Categorisation**
1	Acute leukaemia, unclassified	Acute leukaemia
2	Acute undifferentiated leukaemia	
3	Acute Lymphocytic Leukaemia (ALL)	
4	Acute Myelogenous Leukaemia (AML) denovo	
5	AML post-chemotherapy	
6	AML post-MDS	
7	Chronic lymphocytic leukaemia	Chronic leukaemia
8	Chronic myeloid leukaemia	
9	Aplastic anaemia	Hypoplastic anaemia
10	Fanconi's anaemia	
11	Diamond-Blackfan anaemia	Erythrocytic Disorders
12	Congenital Dyserythropoeitic Anaemia (CDA)	
13	Hodgkin's lymphoma	Lymphoma
14	Non-Hodgkin's lymphoma, Aggressive	
15	Non-Hodgkin's lymphoma, Indolent	
16	Carcinoma, breast	Solid tumors
17	Carcinoma, ovary	
18	Germ Cell Tumour (GCT)-testicular	
19	GCT-primary non-testis	
20	Ewing's sarcoma	
21	Glioma	
22	Hepatoblastoma	
23	Neuroblastoma	
24	Rhabdomyosarcoma	
25	Soft tissue sarcoma (non-RMS)	
26	Wilms tumour	
27	Primitive Neuroectodermal Tumour (NET)	
28	Juvenile Myelomonocytic leukaemia	Myelodysplasia
29	Myelodyplastic syndrome (MDS)	
30	Myelofibrosis	
31	Thalassaemia major	Haemoglobinopathy
32	Sickle Cell Anaemia	
33	Multiple myeloma	Multiple myeloma
34	Haemophagocytic Lymphohistiocytosis Syndrome	Others
35	Congenital Immunodeficiencies	
36	Osteopetrosis	
37	Others	

1.3 TRANSPLANT PRACTICES

Second grafts constituted 8% of the 181 transplants performed. The majority of the grafts were allogeneic (64%). The commonest stem cell source was peripheral blood stem cells (PBSC) which formed 84% of HSCT done. Bone marrow and cord blood stem cells contributed 11% and 5% to the total, respectively.

The donors for the 115 allogeneic HSCT were HLA-identical sibling donors in 102 cases. There were 13 unrelated donors who were 1-antigen mismatched in 7 cases and 2-antigen mismatched in 6 cases. The unrelated donor transplantations used cord blood for 8 and PBSC for 5 patients. The recourse to unrelated donors remained low at 11% in Malaysia compared with Japan, Singapore and Hong Kong where 40-60% of HSCT used unrelated donors.

Table 1.3.1: Distribution of Patients by Graft Number, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Graft number	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	8	100	6	100	19	86	4	80	9	75	19	90	18	95	24	96
2	0	0	0	0	2	9	1	20	3	25	2	10	1	5	1	4
3	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Graft number	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	29	97	28	100	31	94	47	96	61	98	91	97	103	95	113	99
2	1	3	0	0	1	3	1	2	1	2	3	3	5	5	1	1
3	0	0	0	0	1	3	1	2	0	0	0	0	0	0	0	0
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Graft number	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	125	98	135	98	125	98	123	97	121	98	156	92	1395	96
2	3	2	3	2	2	2	2	2	2	2	13	8	48	4
3	0	0	0	0	0	0	1	1	0	0	0	0	4	0
TOTAL	**128**	**100**	**138**	**100**	**127**	**100**	**126**	**100**	**123**	**100**	**169**	**100**	**1447**	**100**

Note: Missing in graft number = 71 patients (5%)

Figure 1.3.1: Distribution of Patients by Graft Number, 1987-2008

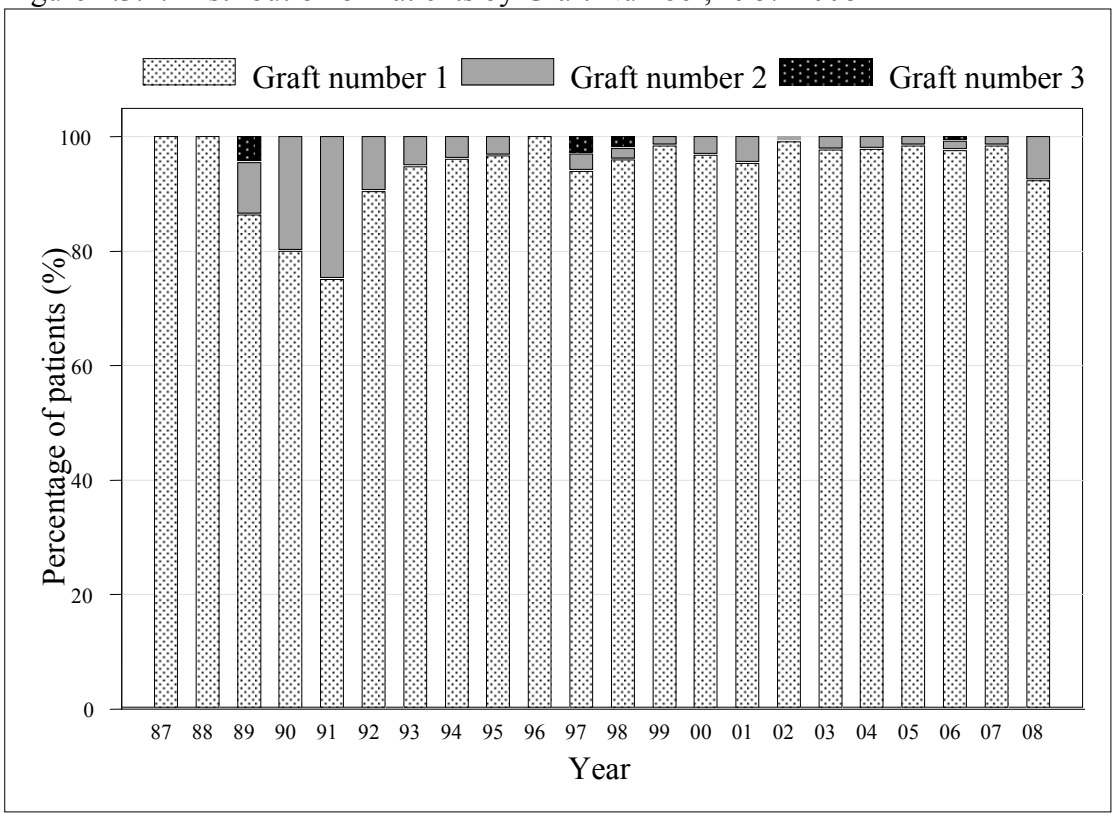


Table 1.3.2: Distribution of Patients by Transplantation Type, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Type of transplant	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Allogeneic + Syngeneic	8	100	6	100	21	95	5	100	12	100	20	95	18	95	24	96
Autologous	0	0	0	0	1	5	0	0	0	0	1	5	1	5	1	4
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Type of transplant	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Allogeneic + Syngeneic	29	97	26	93	27	82	32	65	44	71	56	60	75	69	75	66
Autologous	1	3	2	7	6	18	17	35	18	29	38	40	33	31	39	34
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Type of transplant	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Allogeneic + Syngeneic	83	65	90	64	91	61	87	64	75	50	115	64	1019	67
Autologous	45	35	50	36	57	39	49	36	74	50	66	36	499	33
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**

Figure 1.3.2: Distribution of Patients by Transplantation Type, 1987-2008

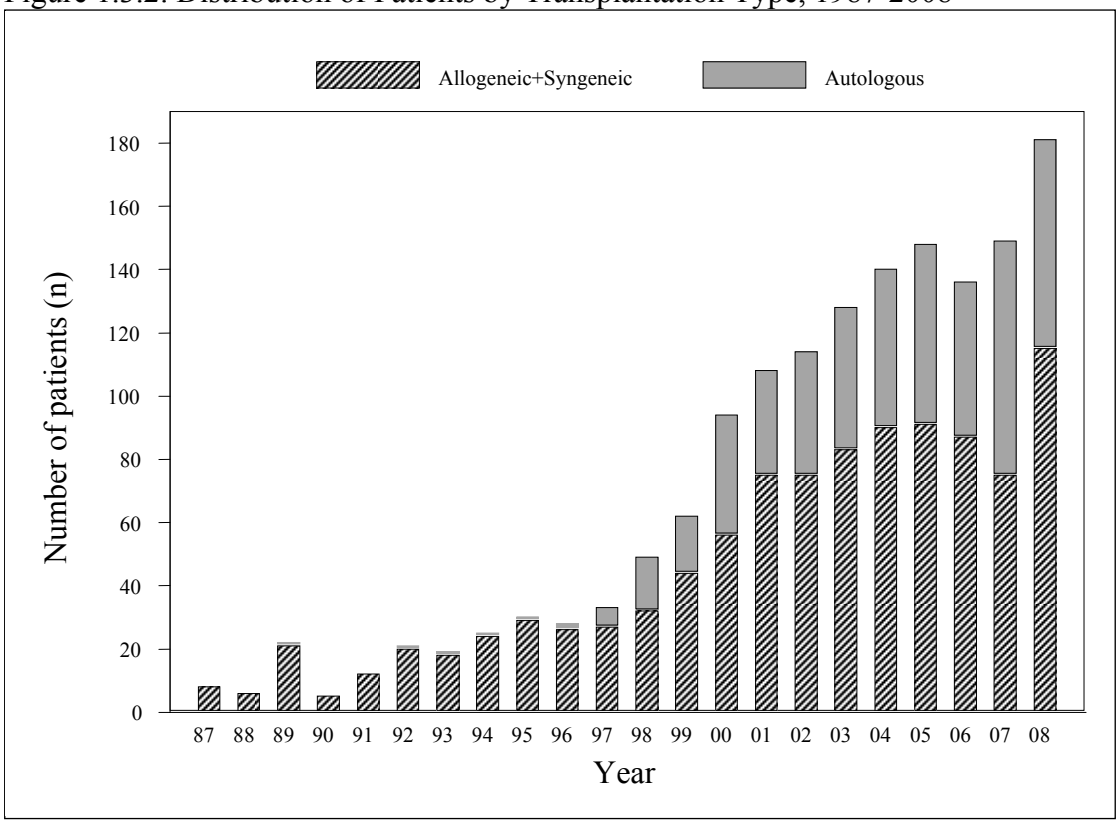


Table 1.3.3: Type of Transplant by Centre, 1987-2008

Type of transplant	Allogeneic + Syngeneic		Autologous		TOTAL	
Centre	**No.**	**%**	**No.**	**%**	**No.**	**%**
KLA	112	11	111	22	223	15
KLP	236	23	29	6	265	17
UKM	69	7	59	12	128	8
SJA	75	7	122	24	197	13
UMA	119	12	54	11	173	11
UMP	307	30	40	8	347	23
GMC	5	0	6	1	11	1
LWE	9	1	1	0	10	1
SJP	38	4	6	1	44	3
HUSM	0	0	6	1	6	0
ASH	1	0	1	0	2	0
HA	47	5	62	12	109	7
HPP	0	0	2	0	2	0
Other	1	0	0	0	1	0
TOTAL	**1019**	**100**	**499**	**100**	**1518**	**100**

Figure 1.3.3: Type of Transplant by Centre, 1987-2008

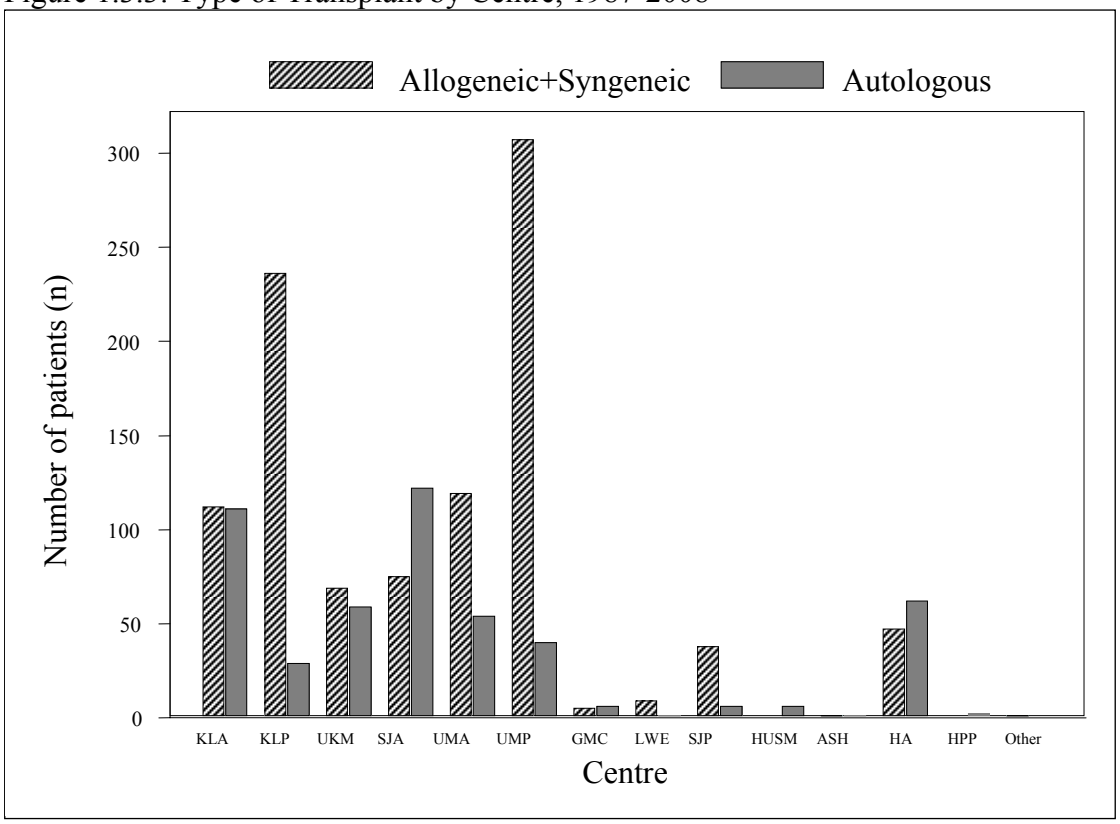


Table 1.3.4: Source of Stem Cells, 1987-2008

Year	1987		1988		1989		1990		1991		1992		1993		1994	
Transplant source	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Marrow	8	100	6	100	22	100	5	100	12	100	21	100	19	100	25	100
PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**22**	**100**	**5**	**100**	**12**	**100**	**21**	**100**	**19**	**100**	**25**	**100**

Year	1995		1996		1997		1998		1999		2000		2001		2002	
Transplant source	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Marrow	30	100	28	100	24	73	25	51	37	60	31	33	30	28	31	27
PBSC / Marrow + PBSC	0	0	0	0	7	21	23	47	23	37	57	61	74	69	79	69
Cord blood / Marrow + cord	0	0	0	0	2	6	1	2	2	3	6	6	4	4	4	4
TOTAL	**30**	**100**	**28**	**100**	**33**	**100**	**49**	**100**	**62**	**100**	**94**	**100**	**108**	**100**	**114**	**100**

Year	2003		2004		2005		2006		2007		2008		Total	
Transplant source	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Marrow	44	34	30	21	25	17	17	13	23	15	20	11	513	34
PBSC / Marrow + PBSC	79	62	101	72	116	78	109	80	119	80	152	84	939	62
Cord blood / Marrow + cord	5	4	9	6	7	5	10	7	7	5	9	5	66	4
TOTAL	**128**	**100**	**140**	**100**	**148**	**100**	**136**	**100**	**149**	**100**	**181**	**100**	**1518**	**100**

Figure 1.3.4: Source of Stem Cells, 1987-2008

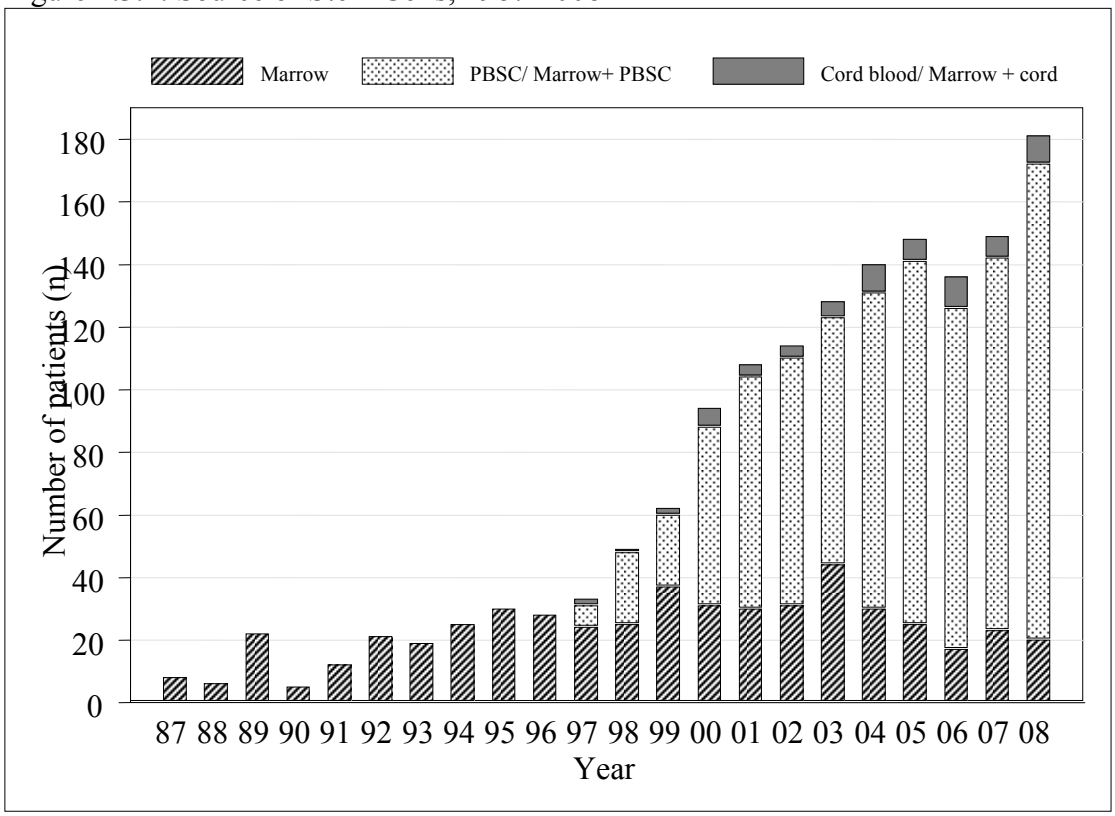


Table 1.3.5: Distribution of Patients by HLA Match, 1987-2008

Year	1987		1988		1989		1990		1991	
HLA Match	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Identical	8	100	6	100	21	100	5	100	12	100
1 AG	0	0	0	0	0	0	0	0	0	0
2 AG	0	0	0	0	0	0	0	0	0	0
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
TOTAL	**8**	**100**	**6**	**100**	**21**	**100**	**5**	**100**	**12**	**100**

Year	1992		1993		1994		1995		1996	
HLA Match	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Identical	20	100	18	100	23	96	29	100	26	100
1 AG	0	0	0	0	1	4	0	0	0	0
2 AG	0	0	0	0	0	0	0	0	0	0
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
TOTAL	**20**	**100**	**18**	**100**	**24**	**100**	**29**	**100**	**26**	**100**

Year	1997		1998		1999		2000		2001	
HLA Match	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Identical	25	93	31	97	40	91	52	93	69	92
1 AG	2	7	0	0	3	7	0	0	4	5
2 AG	0	0	1	3	1	2	4	7	1	1
≥3 AG Disparate	0	0	0	0	0	0	0	0	1	1
TOTAL	**27**	**100**	**32**	**100**	**44**	**100**	**56**	**100**	**75**	**100**

Year	2002		2003		2004		2005		2006	
HLA Match	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Identical	70	93	78	94	83	92	86	95	81	93
1 AG	3	4	3	4	3	3	4	4	4	5
2 AG	2	3	2	2	4	4	1	1	2	2
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0
TOTAL	**75**	**100**	**83**	**100**	**90**	**100**	**91**	**100**	**87**	**100**

Year	2007		2008		Total	
HLA Match	**No.**	**%**	**No.**	**%**	**No.**	**%**
Identical	68	91	102	89	953	94
1 AG	4	5	7	6	38	4
2 AG	2	3	6	5	26	3
≥3 AG Disparate	1	1	0	0	2	0
TOTAL	**75**	**100**	**115**	**100**	**1019**	**100**

Table 1.3.6: Distribution of Patients by Allogeneic Donor Relationship, 1987-2008

Year	1987		1988		1989		1990		1991	
Allogeneic Donor Relationship	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sibling	8	100	6	100	21	100	5	100	11	92
Unrelated	0	0	0	0	0	0	0	0	0	0
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	1	8
TOTAL	**8**	**100**	**6**	**100**	**21**	**100**	**5**	**100**	**12**	**100**

Year	1992		1993		1994		1995		1996	
Allogeneic Donor Relationship	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sibling	20	100	18	100	22	92	29	100	26	100
Unrelated	0	0	0	0	0	0	0	0	0	0
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	2	8	0	0	0	0
TOTAL	**20**	**100**	**18**	**100**	**24**	**100**	**29**	**100**	**26**	**100**

Year	1997		1998		1999		2000		2001	
Allogeneic Donor Relationship	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sibling	26	96	32	100	44	100	55	98	72	96
Unrelated	1	4	0	0	0	0	1	2	3	4
▪ Marrow	0	0	0	0	0	0	0	0	0	0
▪ PBSC / Marrow + PBSC	0	0	0	0	0	0	0	0	0	0
▪ Cord blood / Marrow + cord	1	100	0	0	0	0	1	100	3	100
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	**27**	**100**	**32**	**100**	**44**	**100**	**56**	**100**	**75**	**100**

Year	2002		2003		2004		2005		2006	
Allogeneic Donor Relationship	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sibling	71	95	80	96	81	90	83	91	76	87
Unrelated	4	5	3	4	9	10	8	9	11	13
▪ Marrow	0	0	0	0	1	11	2	25	2	18
▪ PBSC / Marrow + PBSC	0	0	0	0	2	22	1	13	1	9
▪ Cord blood / Marrow + cord	4	100	3	100	6	67	5	63	8	73
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	**75**	**100**	**83**	**100**	**90**	**100**	**91**	**100**	**87**	**100**

Year	2007		2008		Total	
Allogeneic Donor Relationship	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sibling	65	87	102	89	953	94
Unrelated	10	13	13	11	63	6
▪ Marrow	1	10	0	0	6	10
▪ PBSC / Marrow + PBSC	2	20	5	38	11	17
▪ Cord blood / Marrow + cord	7	70	8	62	46	73
Others	0	0	0	0	3	0
TOTAL	**75**	**100**	**115**	**100**	**1019**	**100**

*excluding autologous, including syngeneic

1.4 TRANSPLANT OUTCOMES

A total of 71 deaths were reported for the 181 HSCT in 2008 making the mortality rate 39%. Underlying disease contributed to 51% of these deaths followed by sepsis in 20% and graft-versus-host disease in 10%.

Paediatric patients had better survival rates as shown in Figure 1.4.3. The survival curve for the most recent transplants (1999-2008) compared with the previous decade is inferior most probably because older patients (hence higher risk) had access to HSCT and more complicated unrelated donor HSCT had been undertaken.

Table 1.4.1: Distribution of Patients by Cause of Death, 1987-2008

Year	**1987**		**1988**		**1989**		**1990**		**1991**	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sepsis	1	100	0	0	0	0	0	0	1	100
GVHD	0	0	0	0	0	0	1	17	0	0
Underlying disease	0	0	0	0	6	100	5	83	0	0
Haemorrhage	0	0	1	100	0	0	0	0	0	0
VOD	0	0	0	0	0	0	0	0	0	0
Organ Failure	0	0	0	0	0	0	0	0	0	0
Interstitial pneumonitis	0	0	0	0	0	0	0	0	0	0
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
TOTAL	**1**	**100**	**1**	**100**	**6**	**100**	**6**	**100**	**1**	**100**

Year	**1992**		**1993**		**1994**		**1995**		**1996**	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sepsis	1	50	2	22	1	20	4	24	6	55
GVHD	0	0	0	0	0	0	4	24	0	0
Underlying disease	0	0	6	67	3	60	3	18	3	27
Haemorrhage	0	0	1	11	0	0	2	12	1	9
VOD	0	0	0	0	0	0	1	6	1	9
Organ Failure	1	50	0	0	1	20	2	12	0	0
Interstitial pneumonitis	0	0	0	0	0	0	0	0	0	0
Secondary malignancy	0	0	0	0	0	0	1	6	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
TOTAL	**2**	**100**	**9**	**100**	**5**	**100**	**17**	**100**	**11**	**100**

Year	1997		1998		1999		2000		2001	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sepsis	5	33	1	6	6	38	2	6	4	9
GVHD	0	0	2	12	1	6	2	6	4	9
Underlying disease	9	60	11	65	7	44	22	71	33	70
Haemorrhage	0	0	1	6	0	0	3	10	2	4
VOD	0	0	0	0	0	0	1	3	2	4
Organ Failure	1	7	0	0	1	6	0	0	0	0
Interstitial pneumonitis	0	0	1	6	0	0	1	3	2	4
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	1	6	0	0	0	0
Unknown	0	0	1	6	0	0	0	0	0	0
TOTAL	**15**	**100**	**17**	**100**	**16**	**100**	**31**	**100**	**47**	**100**

Year	2002		2003		2004		2005		2006	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sepsis	6	18	15	27	11	21	13	21	8	19
GVHD	3	9	5	9	9	17	7	11	2	5
Underlying disease	21	62	31	55	27	52	30	49	28	67
Haemorrhage	0	0	0	0	2	4	2	3	1	2
VOD	0	0	0	0	0	0	0	0	3	7
Organ Failure	3	9	2	4	0	0	1	2	0	0
Interstitial pneumonitis	0	0	1	2	0	0	2	3	0	0
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	3	5	0	0
Unknown	1	3	2	4	3	6	3	5	0	0
TOTAL	**34**	**100**	**56**	**100**	**52**	**100**	**61**	**100**	**42**	**100**

Year	2007		2008		Total	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**
Sepsis	6	12	14	20	107	19
GVHD	1	2	7	10	48	9
Underlying disease	27	54	36	51	308	56
Haemorrhage	1	2	3	4	20	4
VOD	0	0	3	4	11	2
Organ Failure	0	0	0	0	12	2
Interstitial pneumonitis	0	0	1	1	8	1
Secondary malignancy	0	0	0	0	1	0
Others	11	22	5	7	20	4
Unknown	4	8	2	3	16	3
TOTAL	**50**	**100**	**71**	**100**	**551**	**100**

Figure 1.4.1: Patient Survival by Year of Transplant, 1987-2008

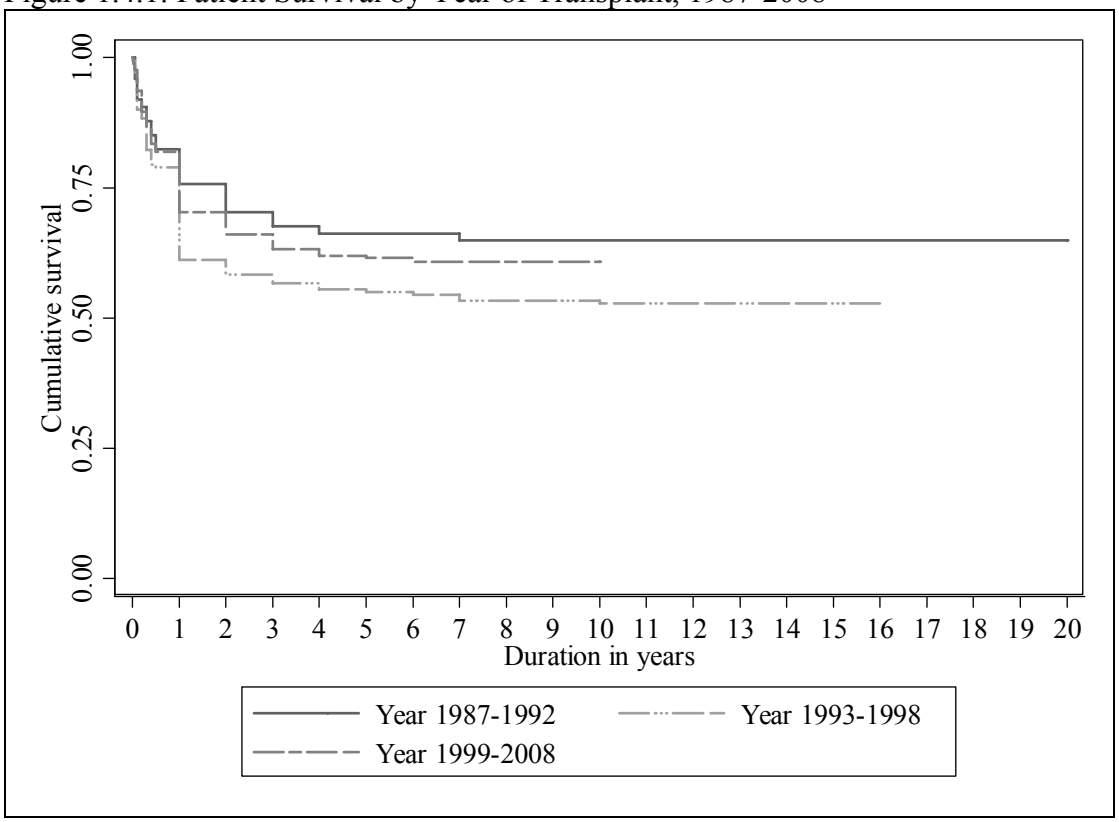


Figure 1.4.2: Patient Survival by Gender, 1987-2008

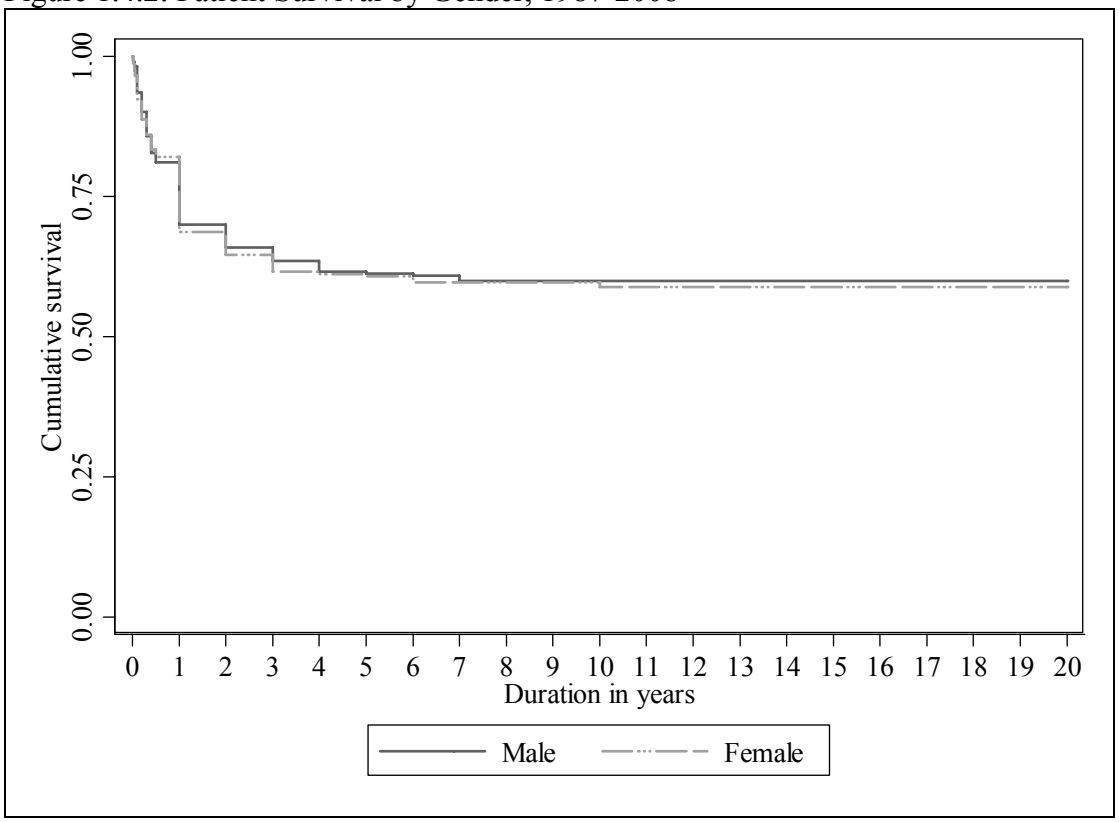


Figure 1.4.3: Patient Survival by Age Group, 1987-2008

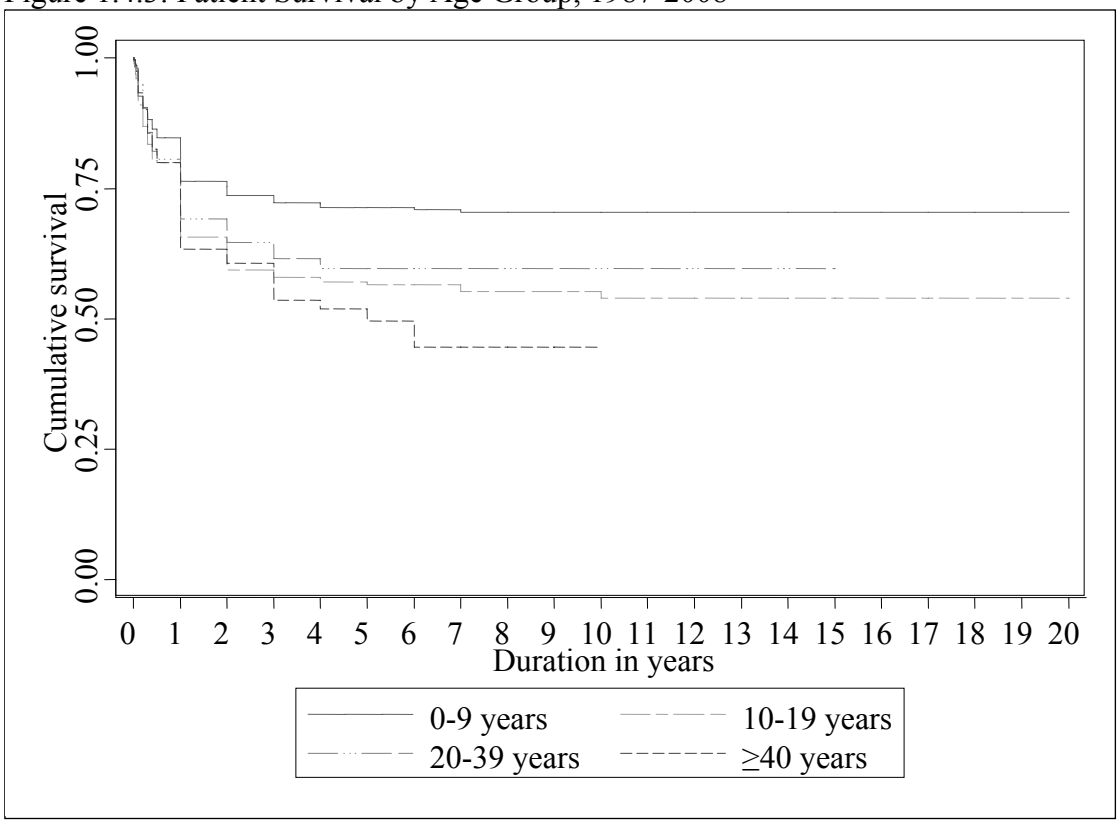
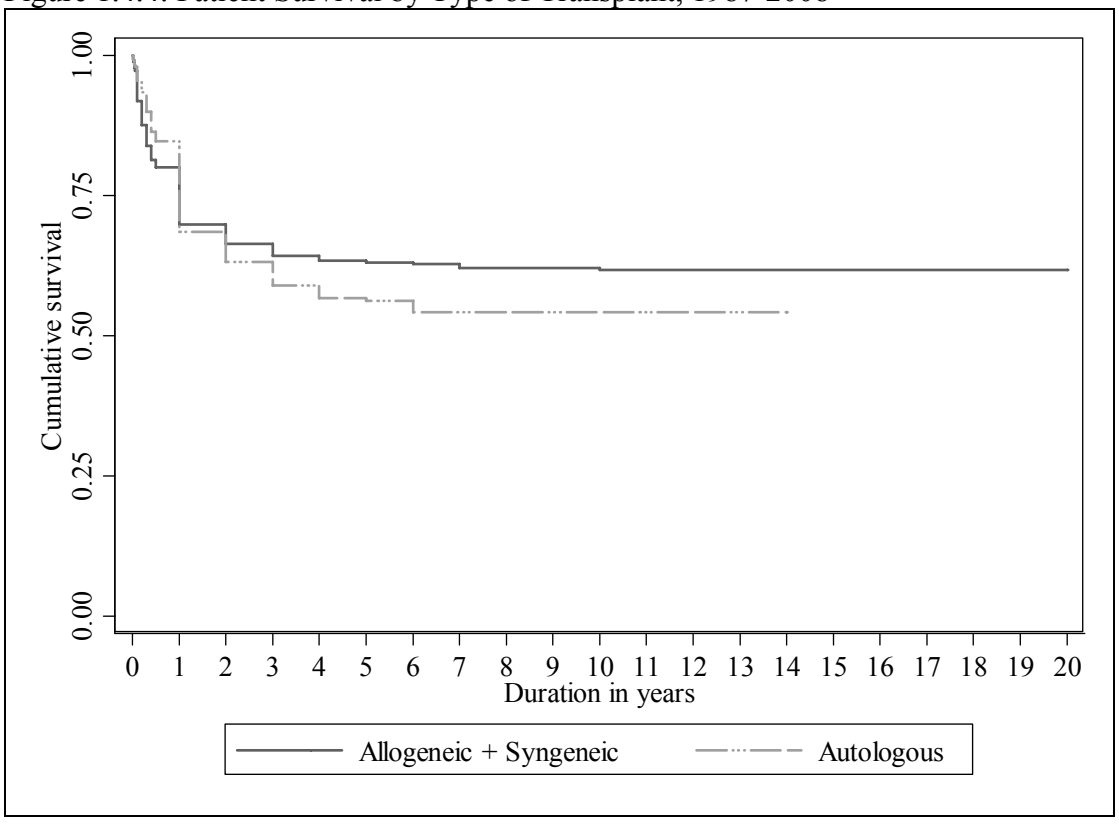


Figure 1.4.4: Patient Survival by Type of Transplant, 1987-2008



1.5 DISEASE-FREE SURVIVAL

Figures 1.5.1 to 1.5.7 show the disease free survival for individual diseases while Figures 1.5.8 to 1.5.13 show the breakdown between paediatric and adult patients. Superior survival was seen in adults for acute lymphoblastic leukaemia and aplastic anaemia.

Figure 1.5.1: Disease-free Survival for Acute Myeloid Leukaemia, 1987-2008 (Allogeneic vs. Autologous)

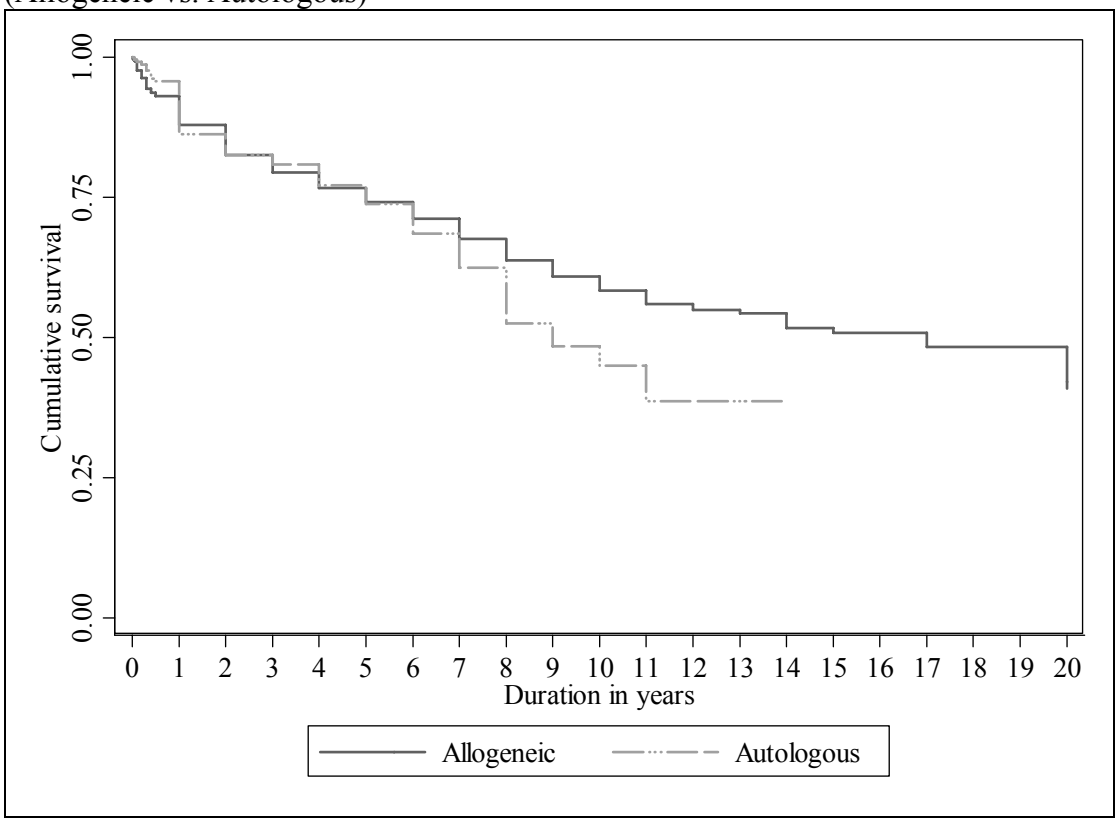


Figure 1.5.2: Disease-free Survival for Acute Lymphoblastic Leukaemia, 1987-2008 (Allogeneic)

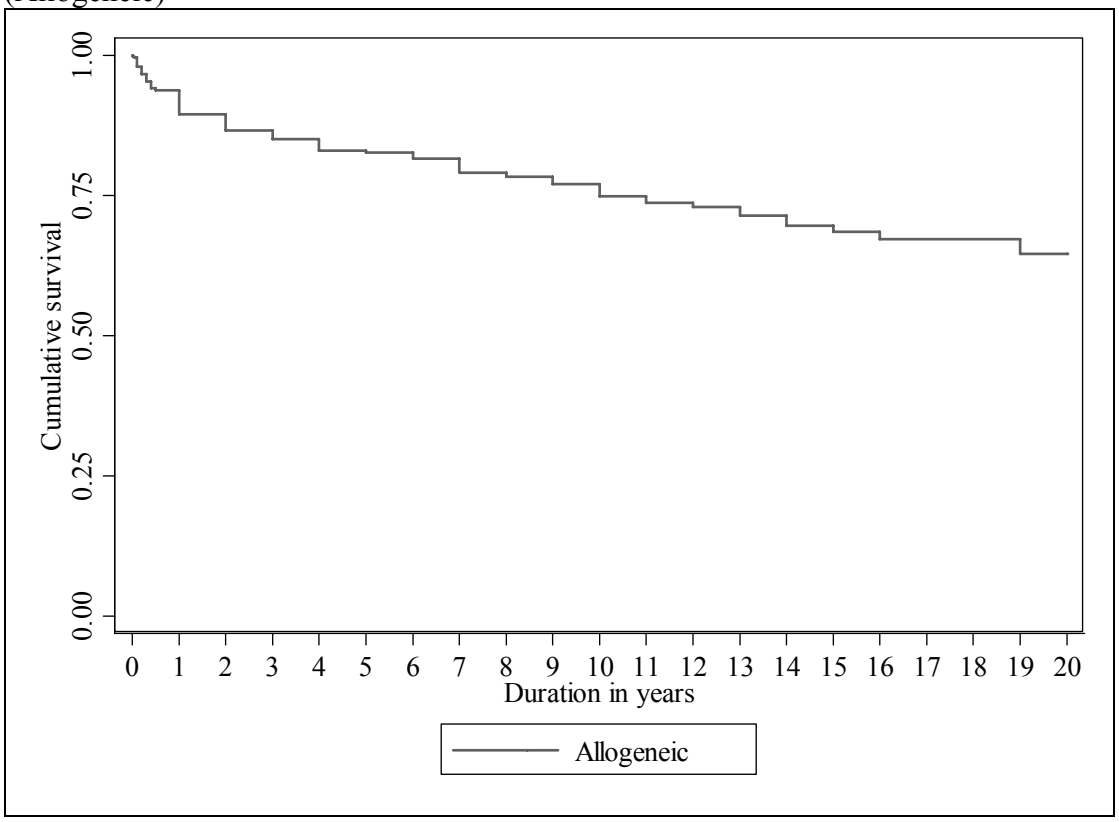


Figure 1.5.3: Disease-free Survival for Thalassaemia, 1987-2008 (Allogeneic)

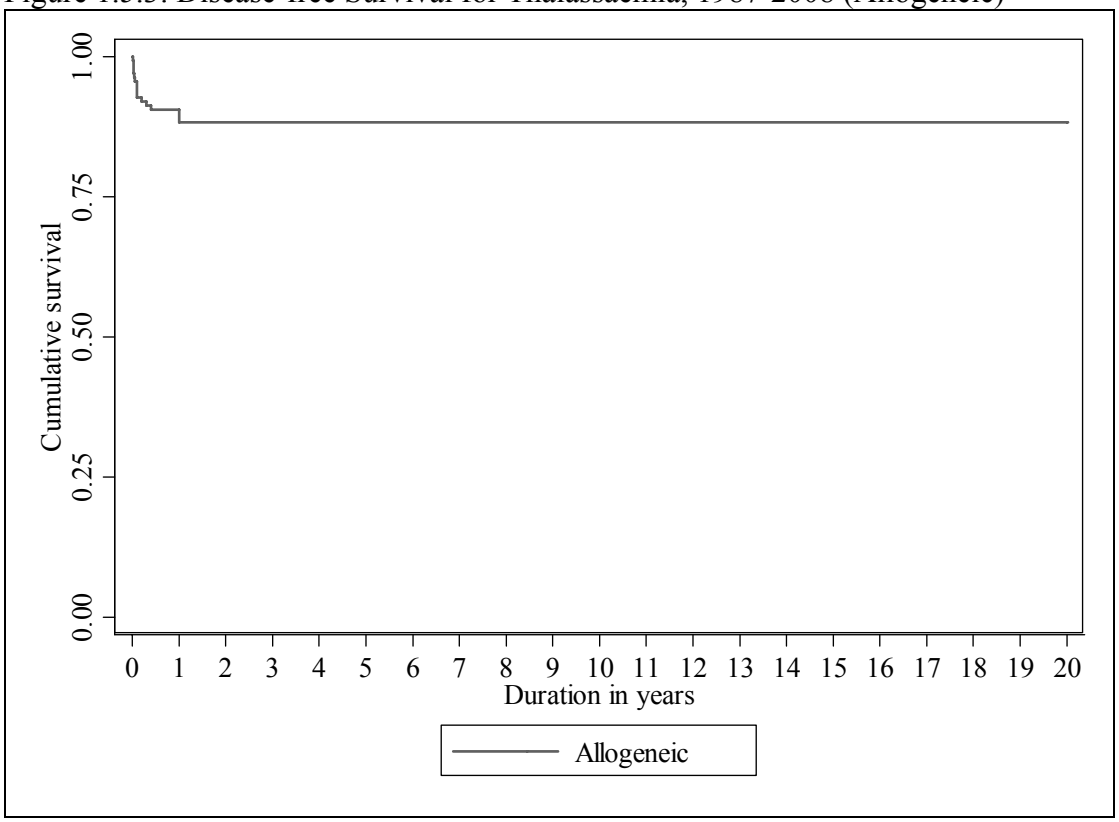


Figure 1.5.4: Disease-free Survival for Non-Hodgkin's Lymphoma, 1987-2008 (Allogeneic vs. Autologous)

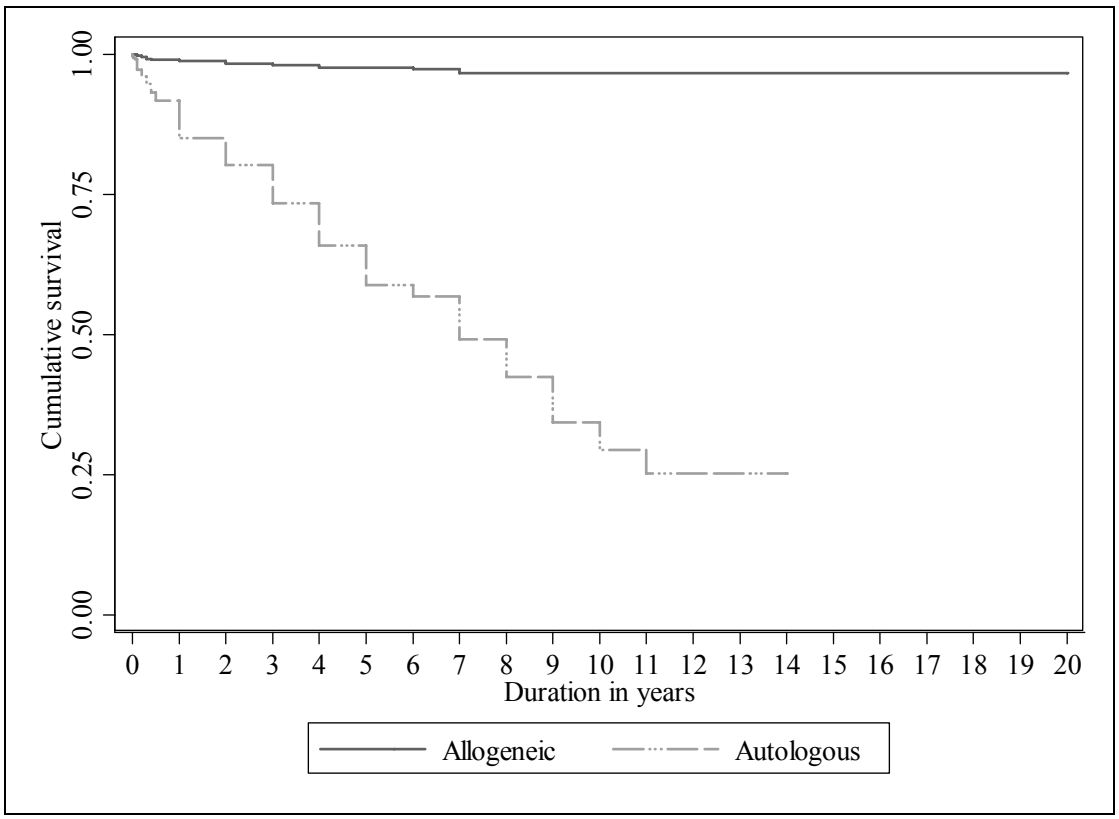


Figure 1.5.5 Disease-free Survival for Hodgkin's Disease, 1987-2008 (Autologous)

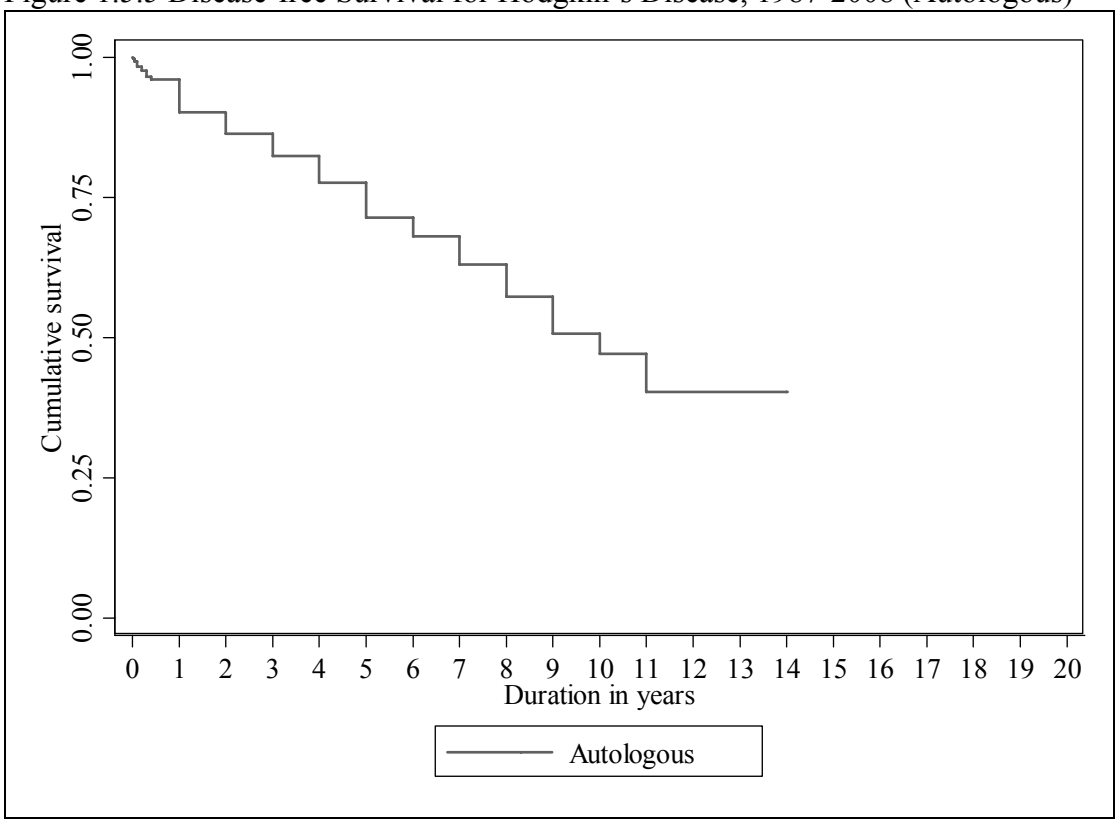


Figure 1.5.6: Disease-free Survival for Chronic Myeloid Leukaemia, 1987-2008 (Allogeneic)

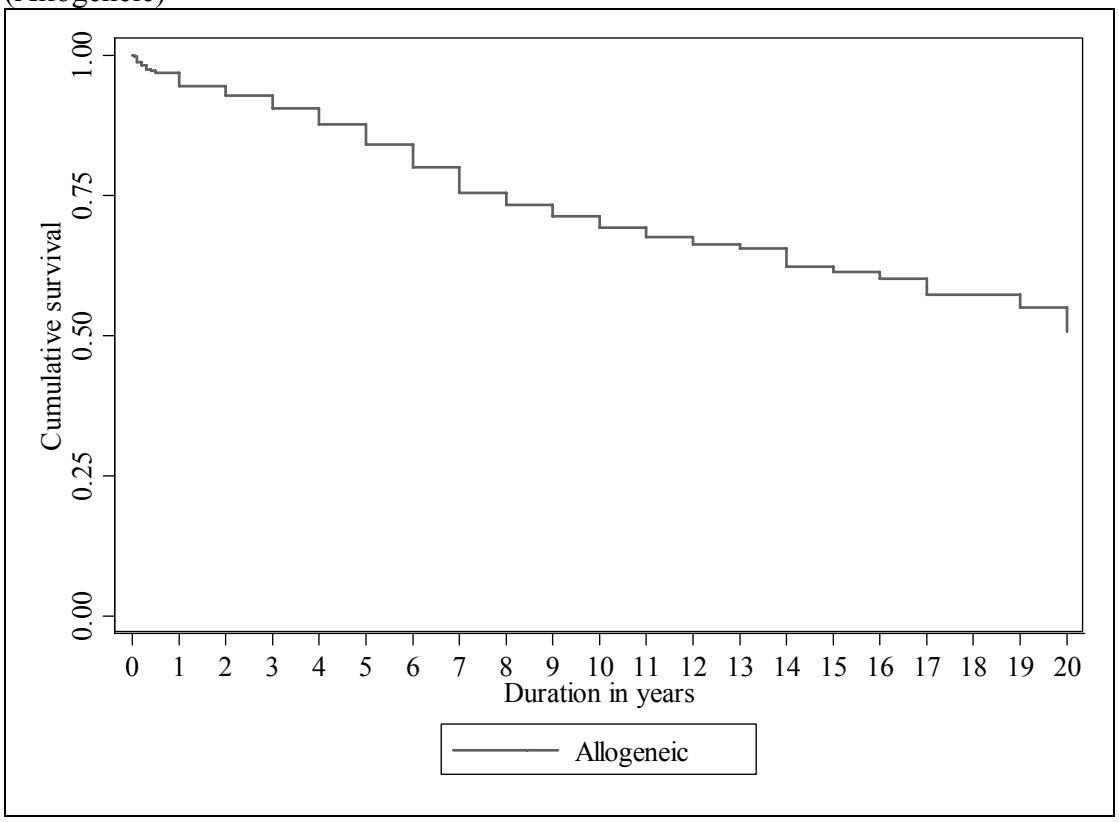


Figure 1.5.7: Disease-free Survival for Aplastic Anaemia, 1987-2008 (Allogeneic)

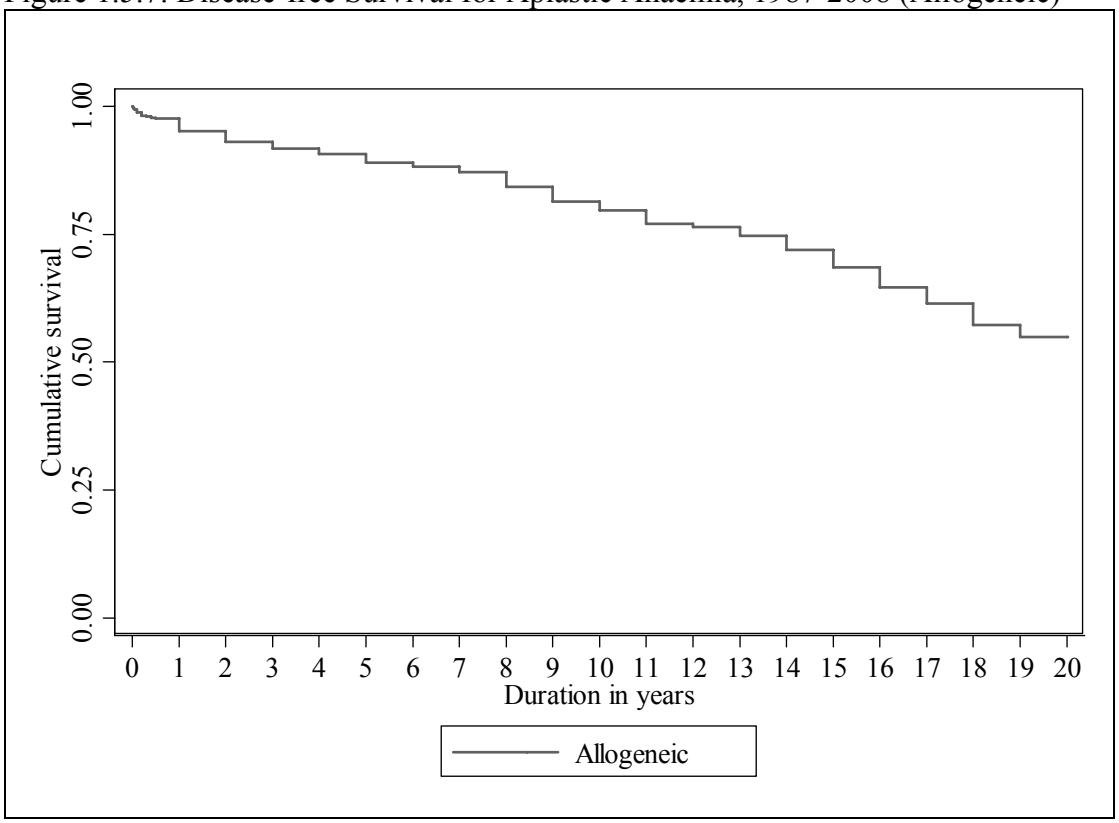
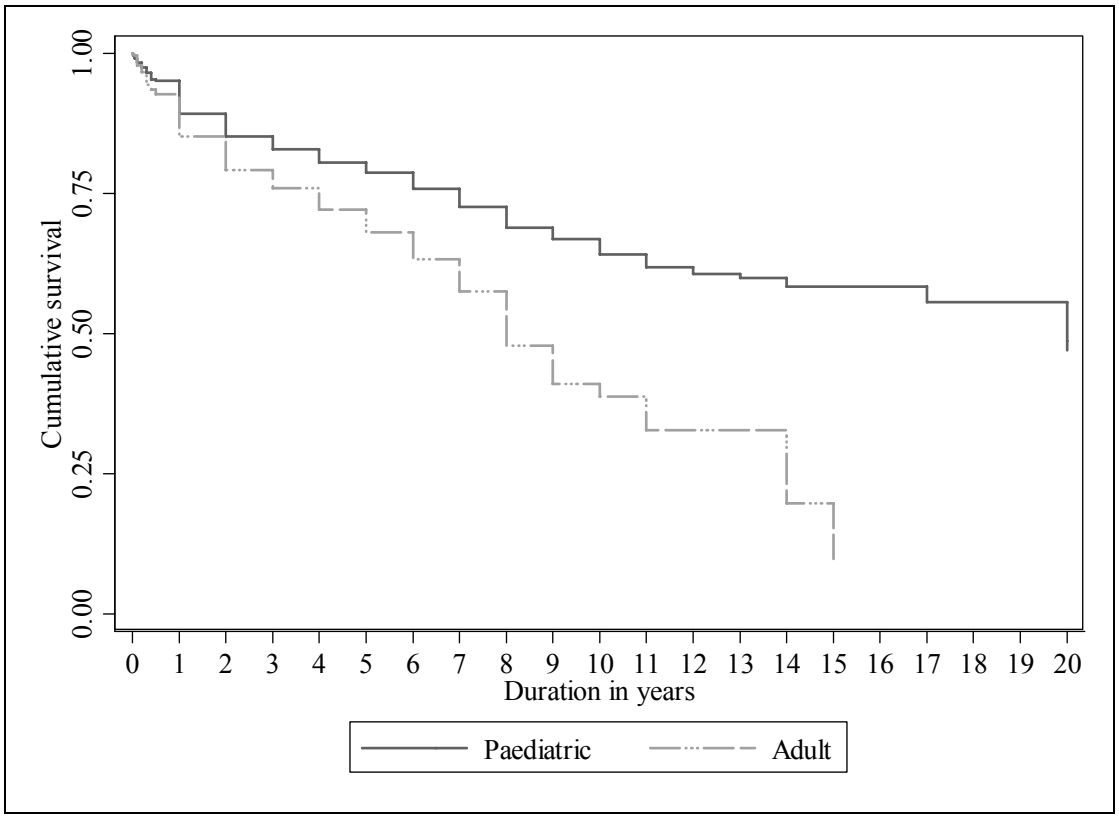
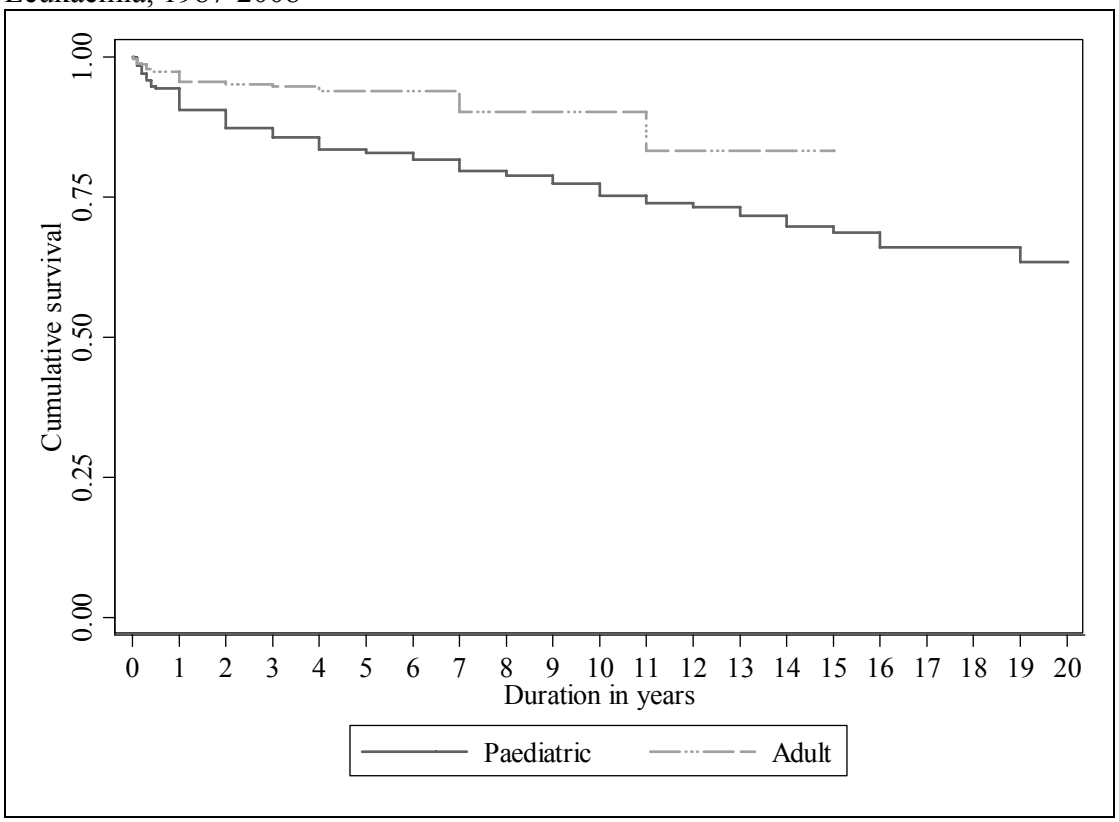


Figure 1.5.8: Disease-free Survival by Age Group for Acute Myeloid Leukaemia, 1987-2008



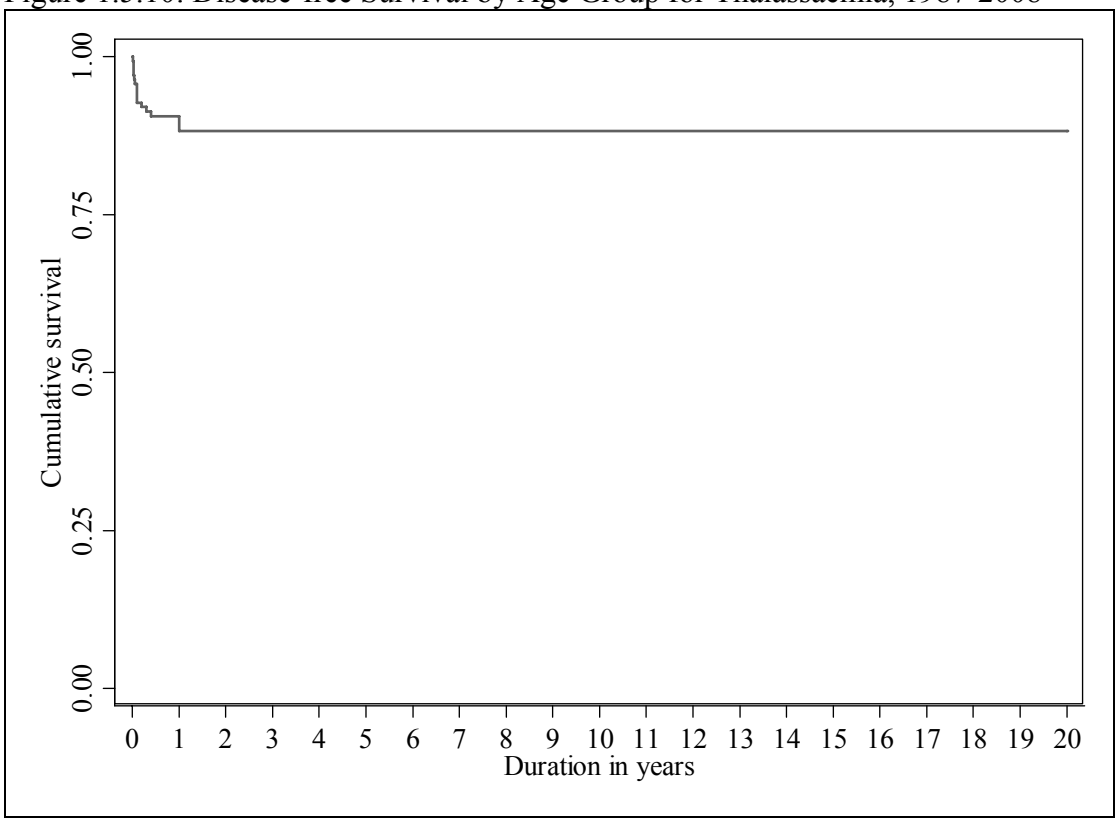
Paediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.9: Disease-free Survival by Age Group for Acute Lymphoblastic Leukaemia, 1987-2008



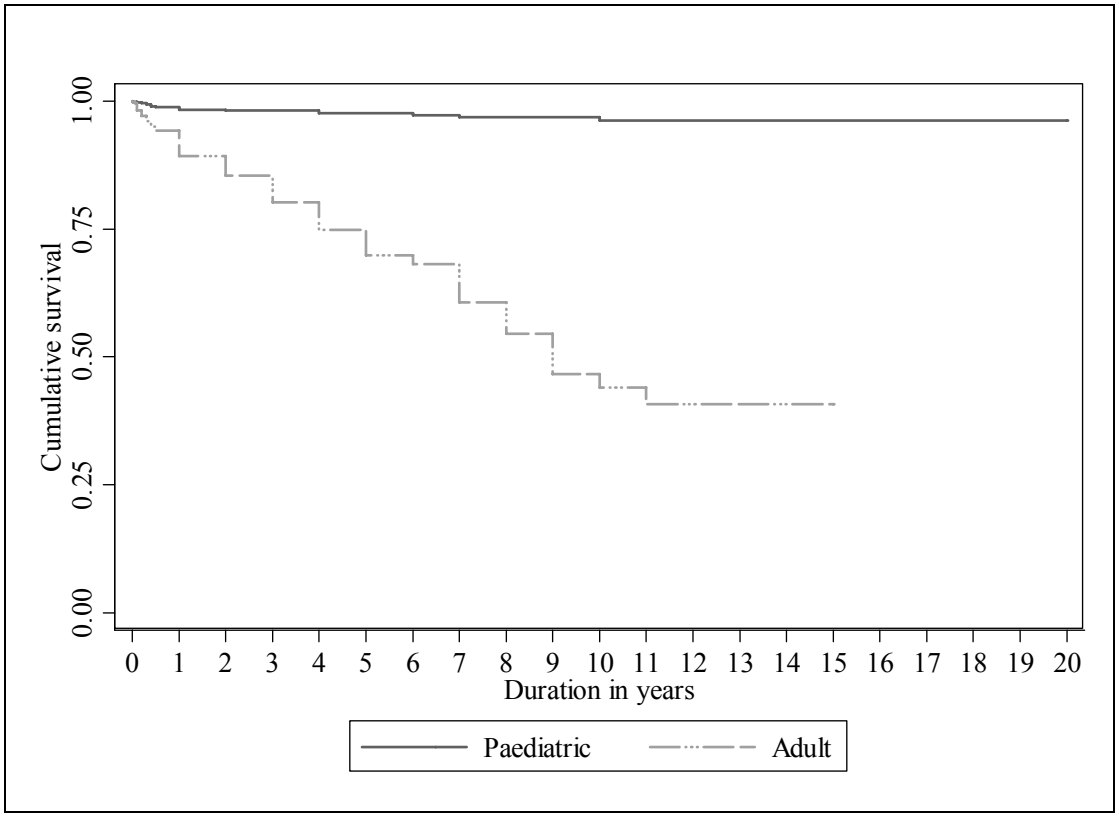
Pediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.10: Disease-free Survival by Age Group for Thalassaemia, 1987-2008



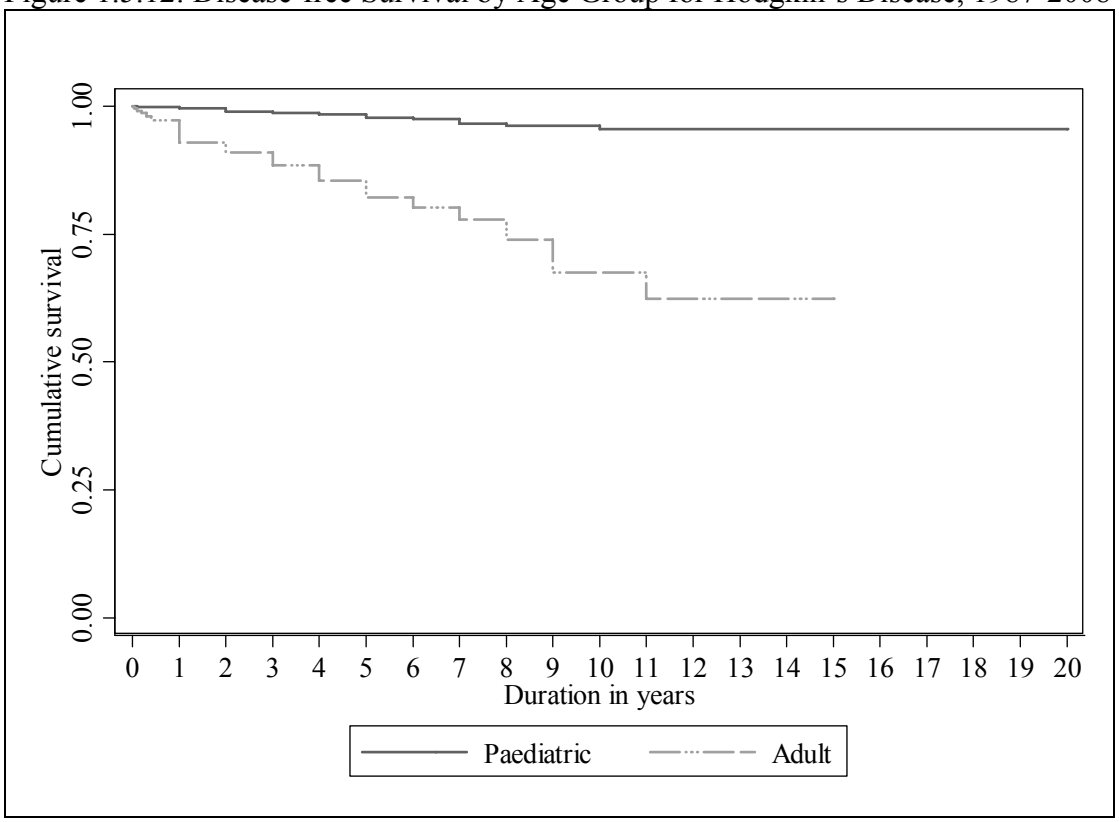
Pediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.11: Disease-free Survival by Age Group for Non-Hodgkin's Lymphoma, 1987-2008



Pediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.12: Disease-free Survival by Age Group for Hodgkin's Disease, 1987-2008



Paediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.13: Disease-free Survival by Age Group for Chronic Myeloid Leukaemia, 1987-2008

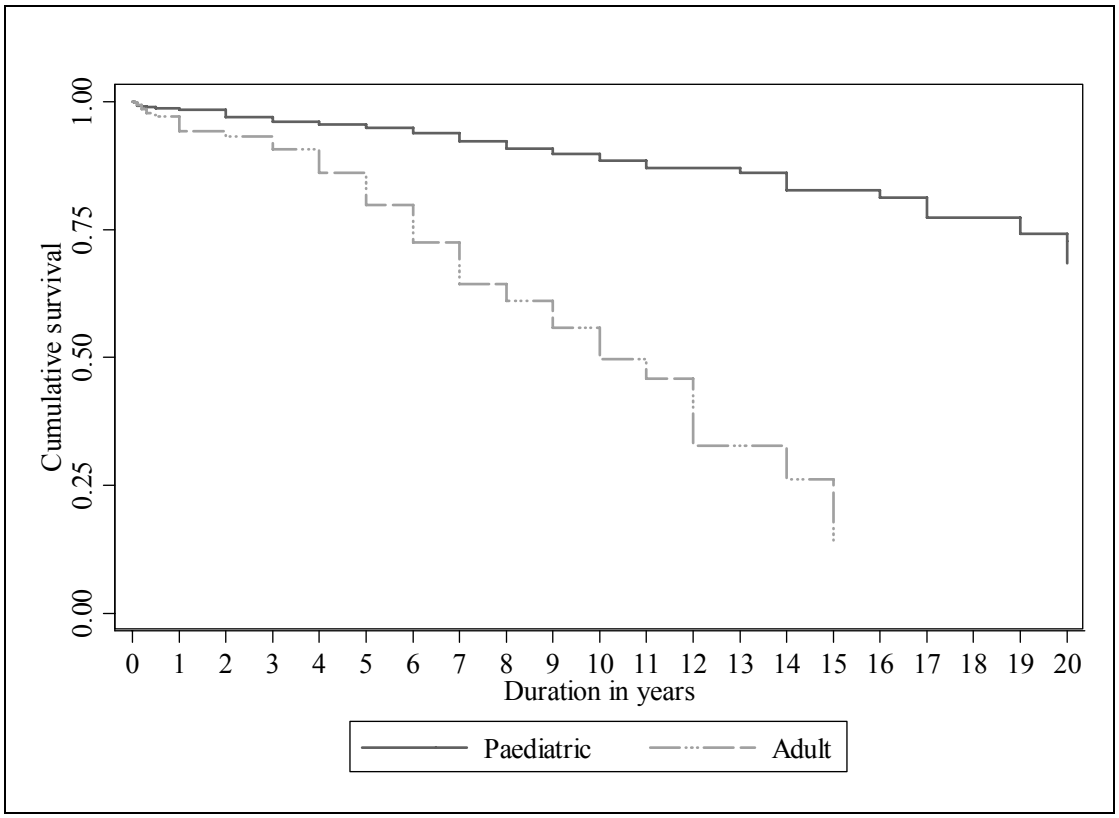
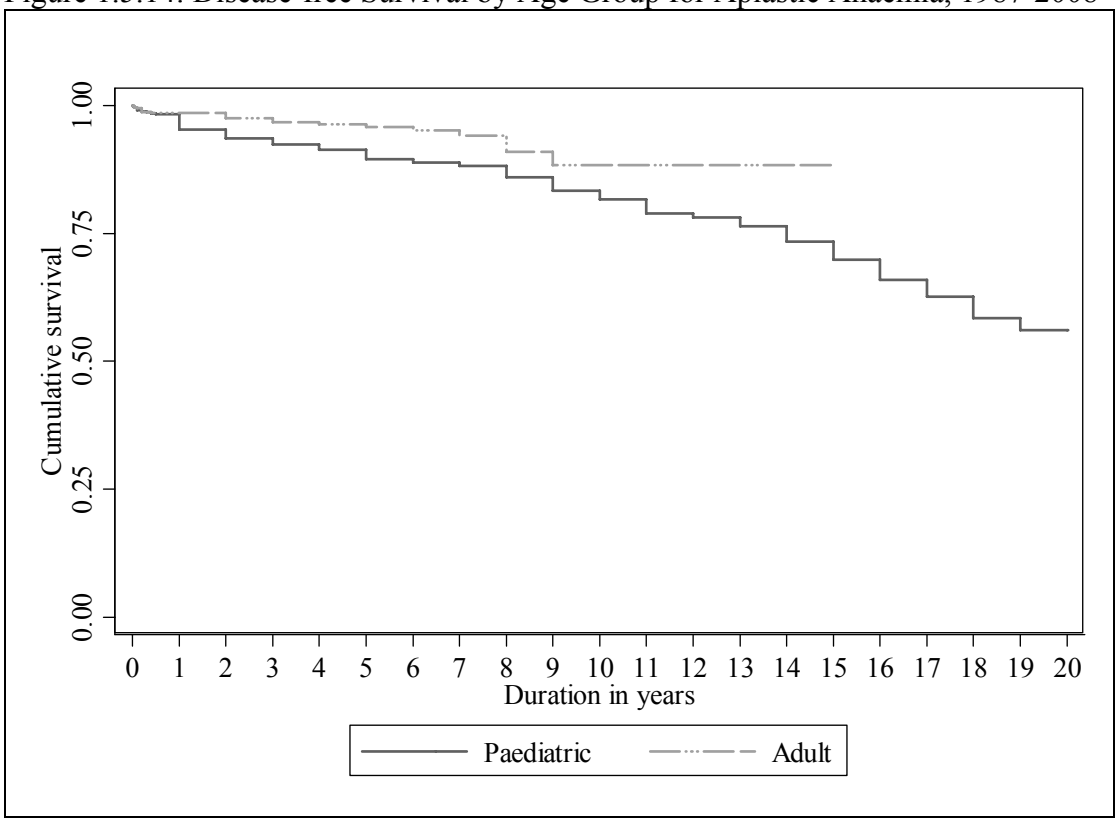


Figure 1.5.14: Disease-free Survival by Age Group for Aplastic Anaemia, 1987-2008



Pediatric is defined as age ≤18 years and adult age >18 years

CHAPTER 2

CORNEAL TRANSPLANTATION

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2.0 INTRODUCTION

Corneal transplantation surgery allows restoration of vision in patients with corneal blindness. Corneal transplantation in Malaysia dates back to the 1970's. Today it is performed by ophthalmologists both in the government and private sectors with each centre contributing data towards the National Transplant Registry.

The National Transplant Registry (NTR) was established in December 2003. The corneal transplant section of the NTR is a systematic centralised data collection of all corneal transplantations performed in the country.

A total of 46 centres registered and agreed to provide information on retrospective and prospective corneal transplant activities. A total of 75 contributing surgeons participated in the NTR – Corneal Transplant section. Participation was on a voluntary basis.

Retrospective data (from 1998 to 2003) on corneal transplant activities were collected to identify the trend of corneal transplant surgery in the recent past. ***Prospective data*** (from the year 2004) on corneal transplant activities involved gathering information on all cornea transplants performed in Malaysia on two forms. The first form is the i) **Corneal Transplant Notification Form (Form N-cds)** which is completed at the time of surgery and gathers information on the recipient, operative procedure and the donor. The second form is the ii) **Corneal Transplant Outcome Form (Form O-cds)** which is completed at the end of 12 months and annually thereafter. Follow-up only ceases upon failure of graft, death or loss to follow-up of the patient.

The Corneal section of the NTR will be discussed under 5 sections.

Section 2.1 and Section 2.2 covers notification data on corneal transplantation over 9 years from 1998 to 2007. Effort was made to ensure that all cases of corneal transplantation were reported. To the best of our knowledge, this report provides information on all corneal transplants performed in the country.

Section 2.3 covers prospective notification data on corneal transplantation performed (from 2004 onwards)

Section 2.4 covers prospective outcome data on corneal transplantation performed (from 2004 onwards).

Section 2.5 covers prospective outcome data on corneal transplantation complications (from 2004 onwards).

2.1 CORNEAL TRANSPLANT ACTIVITIES AND TRENDS (1998 – 2008)

The number of cornea transplants performed between 1998 and 2008 showed an increasing trend from 119 in 1998 to 230 in 2008. The highest number of corneal transplantation performed was in the year 2008 (Table 2.1.1).

Penetrating keratoplasty was the most frequent type of cornea transplant surgery and was performed in 91% of cases (Table 2.1.2).

Table 2.1.1: Number of Corneal Transplantation and Transplant Rate per million population (pmp), 1998-2008

Year	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
No. of new transplants	119	122	126	221	203	165	184	192	177	196	230
New transplant rate, pmp	5	5	5	9	8	7	7	7	7	7	8

Table 2.1.2: Types of Comeal Transplant, 1998-2008

Surgery type	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	114	96	116	95	120	95	207	94	196	97	156	95	165	90	173	90	153	86	175	89	188	82	1763	91
Lamellar Keratoplasty	1	1	5	4	4	3	14	6	5	2	8	5	10	5	13	7	16	9	7	4	21	9	104	5
Patch Graft for Comea	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	2	5	3	10	5	12	5	32	2
Patch Graft for Sclera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	5	0
Comea Scleral Keratopalsty	0	0	1	1	0	0	0	0	0	0	1	1	7	4	2	1	2	1	3	2	4	2	20	1
Endothelialkeratoplasty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	0
No data	4	3	0	0	2	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	8	0

2.2 RECIPIENTS' CHARACTERISTICS

There was a preponderance of male recipients each year and this ranged from 59% to 69% (Table 2.2.1). Ethnic Chinese (38%) were the predominant race undergoing cornea transplant surgery followed by Malays (33%) and Indians (22%) (Table 2.2.2). The mean age was 45 years (SD 21) with a range from as young as 2 months of age to as old as 102 years (Table 2.2.3).

The commonest primary indication for surgery was keratoconus (16%) followed by cornea scar (14%), pseudophakic bullous keratopathy (14%), other non-pseudophakic bullous keratopathy (11%) and microbial keratitis (10%) (Table 2.2.4). There may be one or more indications for corneal transplant surgery. The most frequent indication was ***optical***, followed by ***tectonic*** and/or ***therapeutic*** indications (Table 2.2.5).

Table 2.2.1: Gender Distribution, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
Gender	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	78	66	80	66	81	64	142	64	122	60	114	69	112	61	115	60	118	67	129	66	143	62	1234	64
Female	41	34	42	34	45	36	79	36	81	40	51	31	72	39	77	40	59	33	67	34	87	38	701	36
No data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.2: Ethnic Distribution, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
Ethnic group	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Malay	28	24	34	28	41	33	70	32	74	36	52	32	66	36	62	32	60	34	64	33	79	34	630	33
Chinese	47	39	46	38	50	40	92	42	83	41	67	41	58	32	73	38	59	33	70	36	83	36	728	38
Indian	36	30	35	29	28	22	49	22	35	17	34	21	43	23	41	21	40	23	38	19	41	18	420	22
Bumiputra Sabah	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	2	2	1	2	1	9	0
Bumiputra Sarawak	0	0	0	0	0	0	1	0	0	0	0	0	4	2	5	3	4	2	4	2	7	3	25	1
Others	8	7	7	6	7	6	9	4	11	5	12	7	12	7	10	5	11	6	18	9	18	8	123	6

Table 2.2.3: Age Distribution of Corneal Transplant Recipient Patients, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
Age group (years)	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	4	3	5	4	6	5	8	4	9	4	6	4	6	3	8	4	7	4	4	2	5	2	68	4
10-19	13	11	17	14	9	7	29	13	16	8	21	13	15	8	14	7	23	13	13	7	20	9	190	10
20-39	28	24	34	28	34	27	49	22	53	26	36	21	55	30	59	31	53	30	48	24	68	30	517	27
40-59	38	32	32	26	40	32	61	28	57	28	51	31	52	28	45	23	41	23	66	34	69	30	552	28
≥60	36	30	34	28	37	29	74	33	68	34	51	31	56	31	66	35	53	30	65	33	68	30	608	31
Mean	45		43		44		45		46		45		45		46		44		47		46		45	
SD	21		22		20		21		21		21		21		21		22		21		20		21	
Median	45		43		45		50		46		46		44		49		43		49		48		46	
Minimum	4 months		5		2 months		5 months		1		5 months		2 months		2 months		2 months		3		1		2 months	
Maximum	82		92		86		85		86		84		86		84		96		102		87		102	

Table 2.2.4: Primary Diagnosis, 1998-2008

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)		2003 (N=165)		2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=1935)	
Primary Diagnosis	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Keratoconus	24	20	24	20	15	12	38	17	32	16	18	11	34	18	34	18	33	19	28	14	37	16	317	16
Corneal scar	33	28	25	20	21	17	34	15	28	14	21	13	26	14	20	10	18	10	25	13	29	13	280	14
Microbial keratitis	11	9	11	9	19	15	30	14	31	15	21	13	18	10	13	7	11	6	14	7	18	8	197	10
Microbial keratitis+Corneal perforation	1	1	6	5	1	1	6	3	4	2	4	2	17	9	20	10	7	4	10	5	12	5	88	5
Corneal perforation (non microbial)	6	5	7	6	8	6	12	5	12	6	27	16	13	7	18	9	20	11	21	11	18	8	162	8
Pseudophakic Bullous keratopathy	10	8	16	13	17	13	23	10	15	7	19	12	19	10	35	18	30	17	36	18	45	20	265	14
Other (non pseudophakic) bullous keratopathy	14	12	4	3	19	15	37	17	47	23	25	15	16	9	14	7	11	6	8	4	14	6	209	11
Failed previous graft	14	12	12	10	13	10	17	8	15	7	14	8	12	7	14	7	10	6	23	12	16	7	160	8
Corneal dystrophy	5	4	6	5	5	4	12	5	9	4	7	4	8	4	6	3	10	6	12	6	10	4	90	5
Congenital opacity	1	1	1	1	1	1	1	0	0	0	1	1	8	4	4	2	1	1	1	1	5	2	24	1
Others	3	3	8	7	7	6	15	7	14	7	10	6	34	18	34	18	36	20	39	20	48	21	248	13
No data	0	0	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	8	0

Table 2.2.5: Indications of Corneal Transplant, 2004-2008

Indication of transplant	2004 (N=184)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=979)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Optical	120	65	135	70	124	70	139	71	154	67	672	69
Tectonic	26	14	23	12	20	11	17	9	25	11	111	11
Therapeutic	27	15	19	10	17	10	24	12	24	10	111	11
Tectonic+Therapeutic	9	5	9	5	4	2	8	4	6	3	36	4
Optical+Tectonic	1	1	1	1	1	1	0	0	1	0	4	0
Optical+Tectonic+Therapeutic	0	0	1	1	0	0	1	1	1	0	3	0
Optical+Therapeutic	0	0	0	0	5	3	6	3	7	3	18	2
Optical+Others	0	0	0	0	1	1	0	0	1	0	2	0
Therapeutic+Others	0	0	0	0	0	0	0	0	1	0	1	0
Others	1	1	4	2	4	2	1	1	9	4	19	2
No data	0	0	0	0	1	1	0	0	1	0	2	0

2.3 TRANSPLANT DATA, 2004-2008

2.3.1 Recipient Data

Regrafts were performed in 13% of cases (Table 2.3.1.1). Ocular co-morbidity was noted in 52% of the patients and corneal vascularisation was the most frequently encountered (Table 2.3.1.2).

From the data available 59% of the cases were legally blind (vision worse than 3/60) prior to corneal transplantation (Table 2.3.1.3).

Table 2.3.1.1: No of Previous Grafts in Grafted Eye, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Graft Number	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0	123	89	171	89	160	90	161	82	201	87	816	87
1	11	8	15	8	15	8	30	15	21	10	92	10
2	3	2	2	1	1	1	4	2	5	2	15	2
3	0	0	1	1	1	1	0	0	0	0	2	0
4	1	1	0	0	0	0	1	1	0	0	2	0
Not available	0	0	0	0	0	0	0	0	1	0	1	0
Missing	0	0	3	2	0	0	0	0	2	1	5	1

Table 2.3.1.2: Ocular Co-morbidity, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Ocular co-morbidity	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Any ocular co-morbidity (a to d below)	88	64	103	54	82	46	89	45	126	55	488	52
a) Superficial corneal vascularisation	44	50	48	47	44	54	53	60	70	56	259	53
b) Deep corneal vascularisation	42	48	39	38	22	27	28	31	31	25	162	33
c) History of glaucoma	29	33	36	35	36	44	39	44	68	54	208	43
d) Current ocular inflammation	41	47	50	49	41	50	39	44	66	52	237	49

*Patient might have multiple ocular co-morbidities

Table 2.3.1.3: Pre-operative Vision, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Unaided VA	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6/6	3	2	0	0	1	1	1	1	1	0	6	1
6/9	1	1	1	1	1	1	2	1	6	3	11	1
6/12	0	0	2	1	3	2	0	0	2	1	7	1
6/18	0	0	1	1	0	0	2	1	1	0	4	0
6/24	3	2	5	3	4	2	2	1	3	1	17	2
6/36	4	3	6	3	5	3	3	2	5	2	23	2
6/60	7	5	16	8	17	10	11	6	14	6	65	7
5/60	1	1	0	0	0	0	0	0	0	0	1	0
4/60	3	2	1	1	2	1	2	1	0	0	8	1
3/60	2	1	2	1	1	1	4	2	5	2	14	2
2/60	1	1	2	1	4	2	1	1	2	1	10	1
1/60	4	3	9	5	7	4	2	1	1	0	23	2
CF	47	34	47	24	45	25	43	22	40	17	222	24
HM	47	34	46	24	37	21	48	24	47	20	225	24
PL	13	9	15	8	12	7	17	9	20	9	77	8
NPL	2	1	1	1	0	0	1	1	0	0	4	0
No data	0	0	38	20	38	21	57	29	83	36	216	23

2.3.2 Donor details

Eye Banks in the United States of America (USA) were the most frequent source of the corneal tissues (Table 2.3.2.1). The majority of donors were elderly patients with a median age of 57 years (Table 2.3.2.2). Optisol GS was the commonest corneal tissue storage medium used at 76% (Table 2.3.2.3). The major cause of death of the donors were related to the cardiac or circulatory system (31%) followed by malignancy (15%) (Table 2.3.2.4).

Table 2.3.2.1: Source of Donor Cornea Tissue, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Source of donor	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Local	20	14	19	10	36	20	31	16	41	18	147	16
USA	95	69	133	69	98	56	114	58	150	65	590	64
Sri Lanka	22	16	38	20	41	23	51	26	36	16	188	20
Others	0	0	0	0	2	1	0	0	2	1	4	0
No data	1	1	2	1	0	0	0	0	1	0	4	0
If Local, ethnic group:												
Malay	0	0	4	21	1	3	5	16	0	0	10	7
Chinese	14	70	8	42	12	33	16	52	22	54	72	49
Indian	5	25	7	37	23	64	4	13	9	22	48	33
Others	0	0	0	0	0	0	4	13	6	15	10	7
No data	1	5	0	0	0	0	2	6	4	10	7	5

* In the year 2004 there were a total of 184 corneal transplants performed but complete data set was only received for 138 patients

Figure 2.3.2.1: Source of Donor Corneal Tissue, 2004-2008

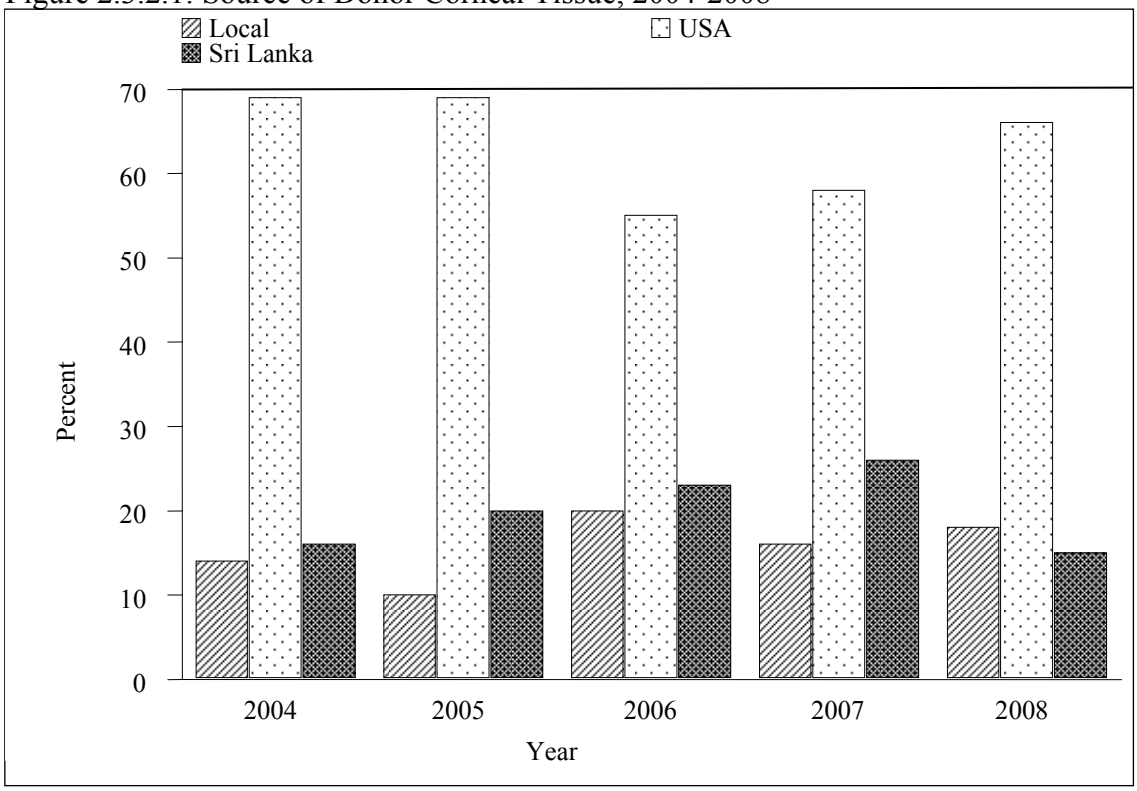


Table 2.3.2.2: Donor Age Distribution, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
Age group (years)	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-9	2	1	3	2	2	1	2	1	7	3	16	2
10-19	6	4	4	2	9	5	5	3	7	3	31	3
20-39	11	8	7	4	11	6	13	7	19	8	61	7
40-59	52	38	89	46	81	46	83	42	79	34	384	41
≥60	67	49	89	46	74	42	93	47	118	51	441	47
Mean	56		58		56		57		56		57	
SD	15		14		16		14		17		15	
Median	59		58		56		59		60		59	
Minimum	8		3		6		4		1		1	
Maximum	78		79		78		78		76		79	

Table 2.3.2.3: Preservation Media, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Preservation media	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Optisol GS	110	80	147	76	129	72	134	68	189	82	709	76
MK Medium	22	16	37	19	40	23	51	26	34	15	184	19
Moist Chamber	4	3	3	2	7	4	8	4	4	2	26	3
Others	0	0	1	1	0	0	3	2	1	0	5	1
No data	2	1	4	2	1	1	0	0	2	1	9	1

*Others (specify) Eusol-C

Figure 2.3.2.3: Preservation Media, 2004-2008

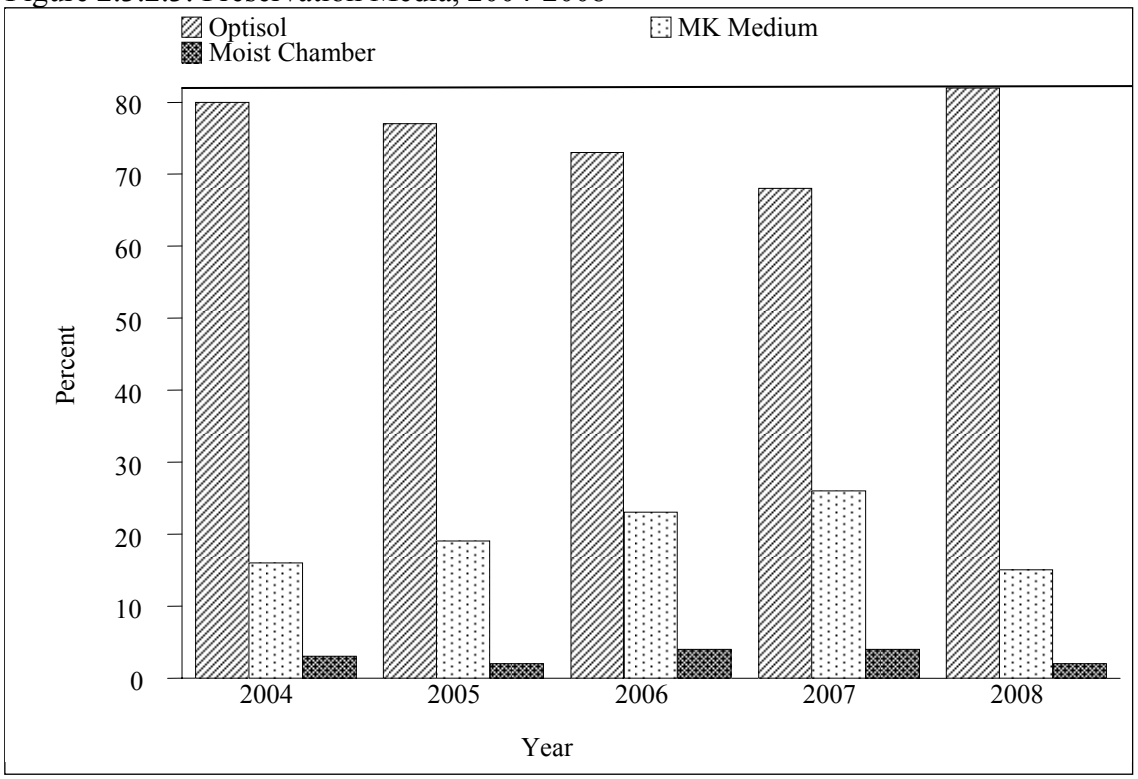


Table 2.3.2.4: Cause of Death in Corneal Donors, 2004-2008

Year	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
Cause of death	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Cardiac / Circulatory System	47	34	49	26	59	33	75	38	61	27	291	31
Cerebrovascular System	17	12	25	13	11	6	23	12	35	15	111	12
Malignancy	19	14	31	16	25	14	26	13	41	18	142	15
Trauma / Accident	20	15	13	7	19	11	24	12	21	9	97	10
Respiratory System	15	11	8	4	8	5	13	7	10	4	54	6
Others	17	12	21	11	27	15	32	16	58	25	155	17
No data	3	2	45	23	28	16	3	2	4	2	83	9

2.3.3 Transplant Practices

Penetrating Keratoplasty (PK) was the commonest type of surgery performed (86%) (Table 2.3.3.1). Corneal transplantation was performed in combination with other surgical procedures in 19% of cases. Cataract extraction, with or without intraocular lens implantation (IOL), was the commonest combined procedure (Table 2.3.3.2).

The recipient graft size ranged from 2mm to 10mm, with the median recipient cornea graft size being 7.5mm.(Table 2.3.3.3). The majority of cases had the donor tissue over-sized by 0.5mm (Table 2.3.3.4). The commonest suturing technique was interrupted sutures (Table 2.3.3.5).

Table 2.3.3.1: Types of Surgeries, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Type of surgery	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Penetrating Keratoplasty	120	87	173	90	153	86	175	89	188	82	809	87
Lamellar Keratoplasty	10	7	13	7	16	9	7	4	21	9	67	7
Patch Graft for Corneal	2	1	3	2	5	3	10	5	12	5	32	3
Patch Graft for Scleral	0	0	1	1	1	1	1	1	2	1	5	1
Cornea Scleral Keratoplasty	6	4	2	1	2	1	3	2	4	2	17	2
Endothelial keratoplasty	0	0	0	0	0	0	0	0	3	1	3	0

* In the year 2004 there were a total of 184 corneal transplants performed but complete data set was only received for 138 patients

Table 2.3.3.2: Types of Combined Surgeries, 2004-2008

	2004 (N=138)		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Combined surgeries	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
No. of patients with corneal transplant surgery combined with another surgical procedure	31	22	27	14	41	23	35	18	46	20	180	19
(a) Glaucoma surgery	2	6	3	11	1	2	0	0	3	7	9	5
(b) Cataract Extraction	16	52	13	48	21	51	13	37	17	37	80	44
(c) IOL	14	45	10	37	24	59	19	54	23	50	90	50
(d) Cataract extraction and IOL	10	32	8	30	15	37	10	29	16	35	59	33
(e) Retinal Surgery ± Internal Tamponade	1	3	1	4	2	5	4	11	10	22	18	10
(f) Anterior vitrectomy	9	29	3	11	4	10	10	29	6	13	32	18
(g) Others	5	16	8	30	8	20	16	46	14	30	51	28

*Patients may have more than one combined surgery

Table 2.3.3.3: Recipient Cornea Trephine Size, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Graft size, mm	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
2	1	1	1	1	2	1	1	1	0	0	5	1
3	0	0	1	1	2	1	1	1	1	0	5	1
4	1	1	2	1	1	1	5	3	2	1	11	1
5	0	0	0	0	0	0	1	1	1	0	2	0
5.5	1	1	0	0	0	0	0	0	0	0	1	0
6	3	2	0	0	5	3	4	2	4	2	16	2
6.25	0	0	1	1	0	0	0	0	0	0	1	0
6.5	2	1	5	3	4	2	8	4	7	3	26	3
6.7	0	0	0	0	0	0	0	0	0	0	0	0
6.75	1	1	3	2	2	1	1	1	1	0	8	1
7	25	18	36	19	25	14	29	15	37	16	152	16
7.2	0	0	0	0	0	0	0	0	0	0	0	0
7.25	10	7	10	5	14	8	5	3	5	2	44	5
7.5	36	26	18	9	26	15	37	19	50	22	167	18
7.75	10	7	11	6	6	3	12	6	14	6	53	6
8	19	14	7	4	13	7	19	10	26	11	84	9
8.15	0	0	0	0	0	0	0	0	0	0	0	0
8.25	4	3	4	2	5	3	4	2	4	2	21	2
8.5	6	4	6	3	2	1	11	6	10	4	35	4
8.75	0	0	1	1	0	0	0	0	0	0	1	0
8.8	0	0	0	0	0	0	0	0	0	0	0	0
9	8	6	3	2	1	1	4	2	3	1	19	2
9.5	0	0	2	1	0	0	0	0	1	0	3	0
10	1	1	0	0	0	0	0	0	2	1	3	0
11	0	0	0	0	0	0	0	0	1	0	1	0
12	0	0	0	0	0	0	0	0	1	0	1	0
No data	10	7	81	42	69	39	54	28	57	25	271	29
Mean	7.5		7.3		7.2		7.3		7.5		7.4	
SD	0.9		1		1.1		1.1		0.9		1	
Median	7.5		7.3		7.3		7.5		7.5		7.5	
Minimum	2		2		2		2		3		2	
Maximum	10		9.5		9		9		12		12	

Table 2.3.3.4: Difference in Trephined Sizes of Recipient and Donor Corneas, 2004-2008

	2004 (N=138)		2005 (N=192)		2006 (N=177)		2007 (N=196)		2008 (N=230)		TOTAL (N=933)	
Difference in Graft size, mm	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Same Size	9	7	8	4	8	5	12	6	19	8	56	6
0.2	0	0	0	0	0	0	0	0	2	1	2	0
0.25	29	21	19	10	30	17	27	14	27	12	132	14
0.5	87	63	84	44	67	38	95	48	116	50	449	48
0.55	0	0	0	0	0	0	0	0	1	0	1	0
0.6	0	0	0	0	0	0	0	0	1	0	1	0
0.75	1	1	0	0	1	1	1	1	2	1	5	1
1	1	1	0	0	1	1	4	2	2	1	8	1
1.5	0	0	0	0	0	0	0	0	1	0	1	0
2	1	1	0	0	0	0	0	0	0	0	1	0
Not Available	10	7	81	42	70	40	57	29	59	26	277	30

Table 2.3.3.5: Suture Technique, 2004-2008

Year	**2004 (N=138)**		**2005 (N=192)**		**2006 (N=177)**		**2007 (N=196)**		**2008 (N=230)**		**TOTAL (N=933)**	
Suture Technique	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Interrupted only	132	96	139	72	124	70	138	70	170	74	703	75
Continuous only	0	0	0	0	5	3	1	1	6	3	12	1
Combined	6	4	18	10	18	10	12	6	10	4	64	7
No data	0	0	35	18	30	17	45	23	44	19	154	17

2.4 CORNEAL TRANSPLANT OUTCOME 2004-2008

Table 2.4.1: Stock and Flow - Graft Status (Whole Database)

		Optical		Non optical		Total	
		No.	**%**	**No.**	**%**	**No.**	**%**
Number registered		699	71	280	29	979	100
Number followed	**Total**	**312**		**159**		**471**	
	1 year	197	63	126	79	323	69
	2 year	67	22	23	14	90	19
	3 year	41	13	6	4	47	10
	4 year	7	2	4	3	11	2
Graft status	**Total**	**312**		**159**		**471**	
-Surviving graft		249	80	87	55	336	71
-Failed graft		63	20	72	45	135	29
Recipient status	**Total**	**699**		**280**		**979**	
-Recipient with complete follow up		143	20.46	103	36.78	246	25.13
-Recipient deaths		3	0.43	1	0.36	4	0.41
-Recipient loss - followed		156	22.32	54	19.29	210	21.45
-Recipient loss - not followed		234	33.47	58	20.71	292	29.82
-Graft not yet followed (Transplant duration less than 1 year)		163	23.32	64	22.86	227	23.19

2.4.2 Outcome – Graft Survival 2004-2008

Graft survival for both optical and non-optical indications at 12 months was 77.3% but this declined to 63.2% at 36 months (Table 2.4.2.1). The cases were grouped into two groups based on the indication for surgery – i) Optical and ii) Non-Optical. Graft survival was 87% at 12 months in the optical group and 58% in the non-optical group. This declined to 71% at 36 months in the optical group and 48% in the non-optical group (Table 2.4.2.2). Gender did not influence graft survival (Table 2.4.2.3). Poorer graft survival was observed in children less than 10 years of age (Table 2.4.2.4). Primary graft failure was the commonest cause of graft failure. Graft failure as a result of infection was present in 26 patients (19%), the indication for surgery was non optical in 20 patients with 12 of these patients having infective keratitis with or without perforation as the diagnosis at the time of notification (Table 2.4.2.5).

Table 2.4.2.1: Graft Survival, 2004-2008

Interval (months)	No.	% success	SE
0	471	100	-
12	366	77.3	2
24	148	69.9	2
36	58	63.2	3
48	11	50.7	7

Figure 2.4.2.1: Graft Survival, 2004-2008

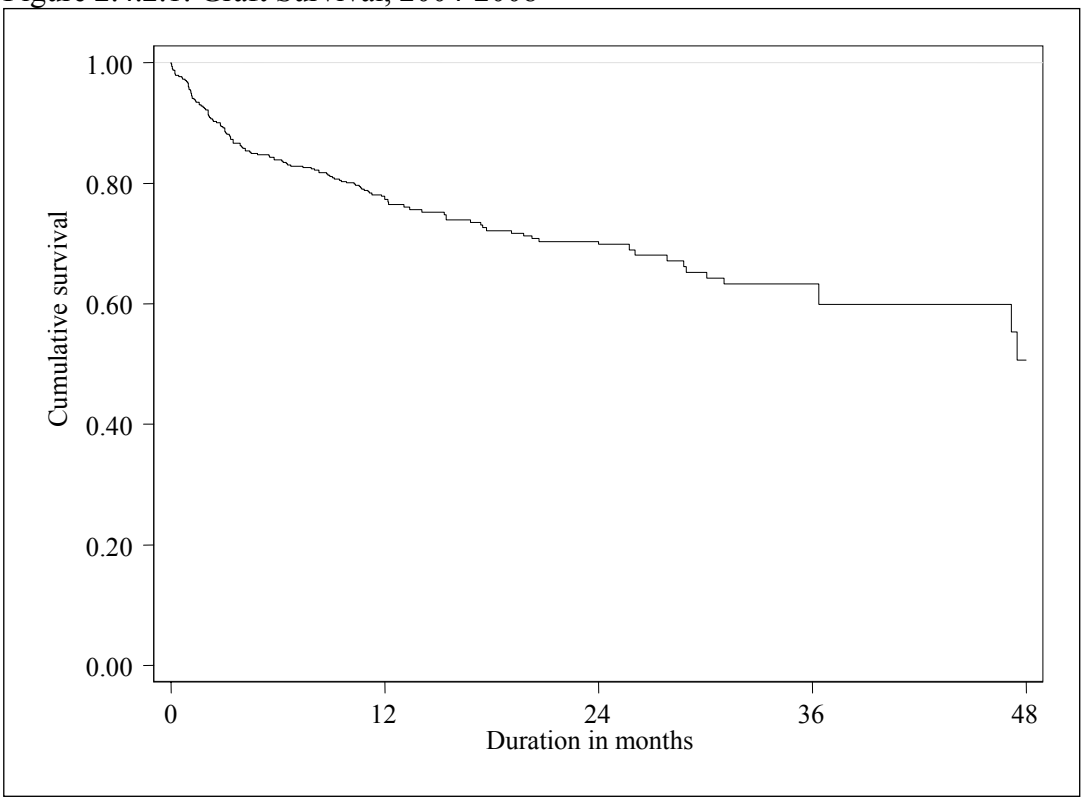


Table 2.4.2.2: Graft Survival by Optical and Non-optical Indication, 2004-2008

	Optical			Non-Optical		
Interval (months)	**No.**	**% success**	**SE**	**No.**	**% success**	**SE**
0	312	100	-	159	100	-
12	271	86.8	2	95	58.5	4
24	115	79.1	3	33	51.9	4
36	48	71.2	4	10	47.8	6
48	7	51.4	10	4	47.8	6

Figure 2.4.2.2: Graft Survival by Optical and Non-optical Indication, 2004-2008

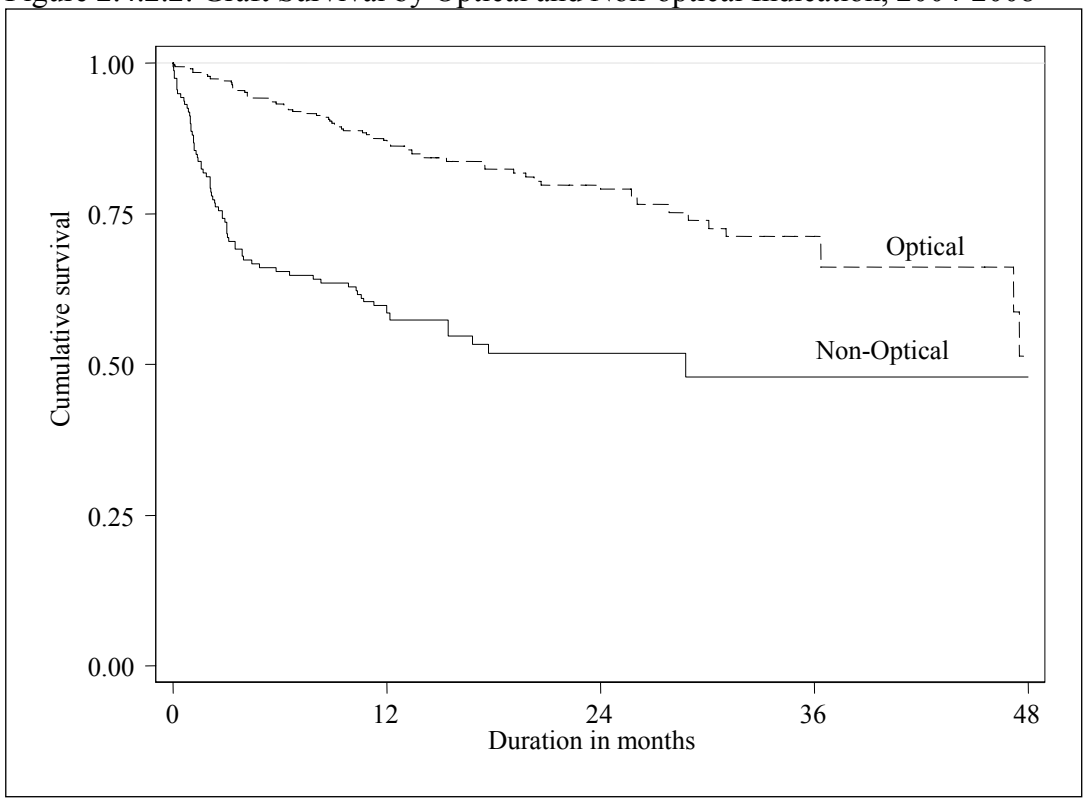


Table 2.4.2.3: Graft Survival by Gender, 2004-2008

	Male			Female		
Interval (months)	**No.**	**% success**	**SE**	**No.**	**% success**	**SE**
0	298	100	-	173	100	-
12	228	76.2	2	138	79.1	3
24	85	69.0	3	63	71.4	4
36	36	61.5	4	22	66.3	5
48	9	56.8	6	2	33.2	17

Figure 2.4.2.3: Graft Survival by Gender, 2004-2008

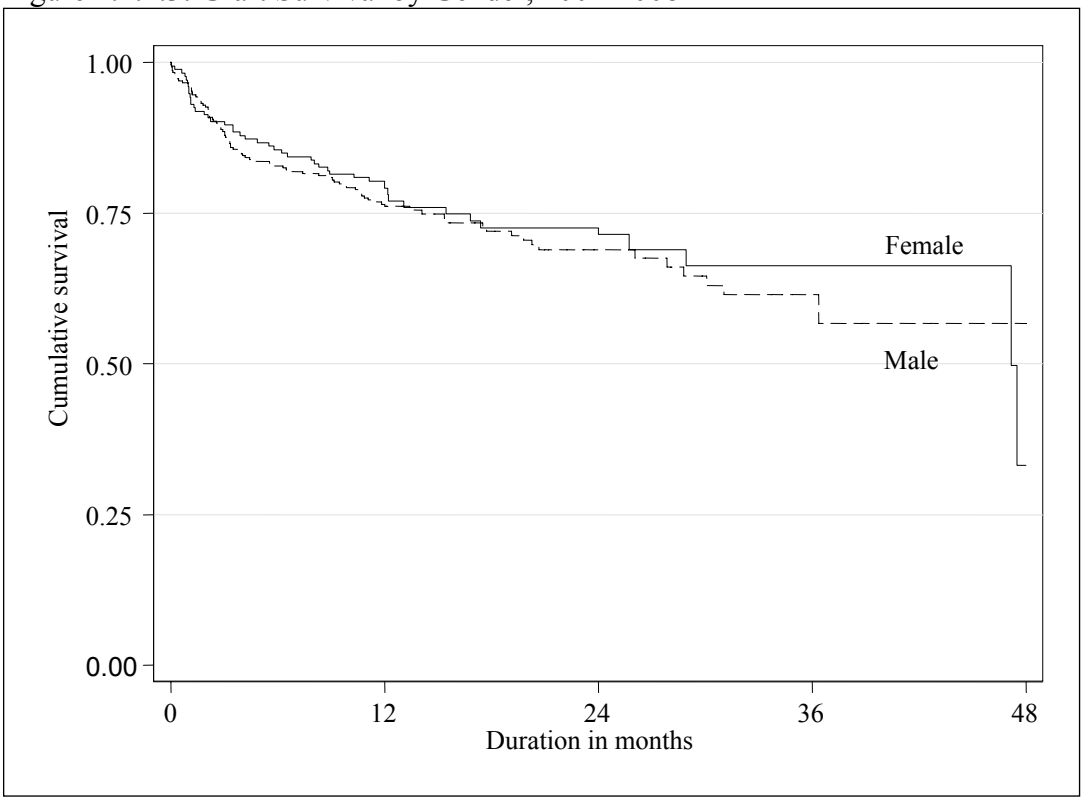


Table 2.4.2.4: Graft Survival by Age, 2004-2008

	0-9			10-19		
Interval (months)	**No.**	**% success**	**SE**	**No.**	**% success**	**SE**
0	9	100	-	21	100	-
12	8	88.9	10	18	85.7	8
24	3	44.4	23	14	85.7	8
36	3	44.4	23	10	85.7	8
48	1	44.4	23	1	.	.
	20-39			**≥40**		
Interval (months)	**No.**	**% success**	**SE**	**No.**	**% success**	**SE**
0	28	100	-	413	100	-
12	22	78.6	8	318	76.5	2
24	5	78.6	8	126	69.0	3
36	3	78.6	8	44	60.9	4
48	2	78.6	8	9	46.5	8

Figure 2.4.2.4: Graft Survival by Age, 2004-2008

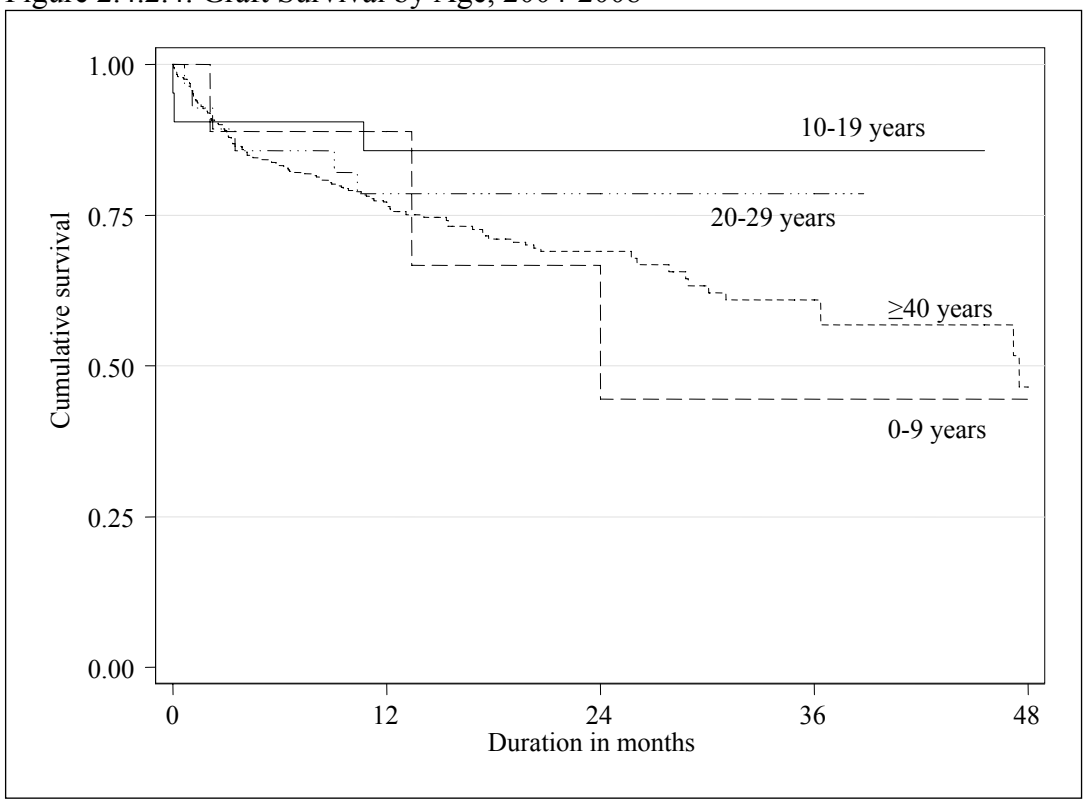


Table 2.4.2.5: Causes of Graft Failure

		Total (N=135)	
		No.	**%**
Graft Failure		135	29
Cause of Failure	Primary graft failure or Primary Endothelial decompensation	34	25
	Recurrence of primary disease	12	9
	Late Endothelial decompensation	23	17
	Glaucoma	28	21
	Infection	26	19
	Graft rejection	28	21
	Others	31	23
	No data	7	5

*Each patient may have more than one cause of graft failure
77 patients had 1 cause
34 patients had 2 causes
3 patients had 3 causes
1 patient had 4 causes

2.4.3 Visual Outcome

Visual outcome of corneal transplants was analysed in cases where post corneal transplant unaided vision was available. Data on post corneal transplant best corrected vision was only available in a limited number of the cases (Table 2.4.3.1). Forty nine percent of optical and 44% of non-optical cases had improved unaided vision after surgery (Table 2.4.3.2). Majority of surviving optical grafts had an unaided vision of 6/24-6/60, whereas the majority in the non optical group had an unaided vision of less than 6/60 (Table2.4.3.3) (Figure 2.4.3.3).

Table 2.4.3.1: Availability of Data on Post Corneal Transplant Unaided Vision

	Unaided Vision (N =979)	
	No.	**%**
Data available	414	42
Lost to follow up	524	54
No data	41	4

Table 2.4.3.2: Unaided Visual Outcome After Cornea Transplant Surgery

Reason for graft	Optical (n=283)		Non-optical (n=131)	
	No.	%	No.	%
Vision better	140	49	57	44
Vision same	52	18	37	28
Vision worse	36	13	26	20
Not known*	55	20	11	8

*Either pre op vision and/or post op vision is not available

Figure 2.4.3.2: Unaided Visual Outcome After Corneal Transplant Surgery

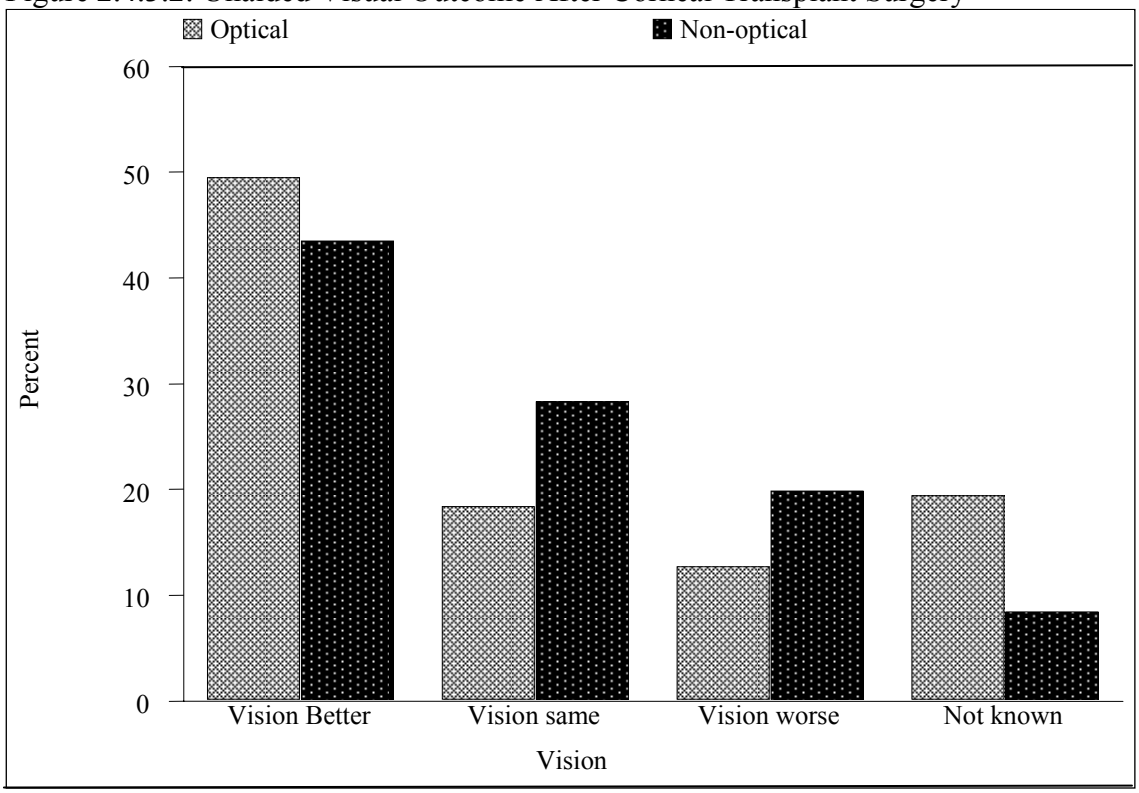
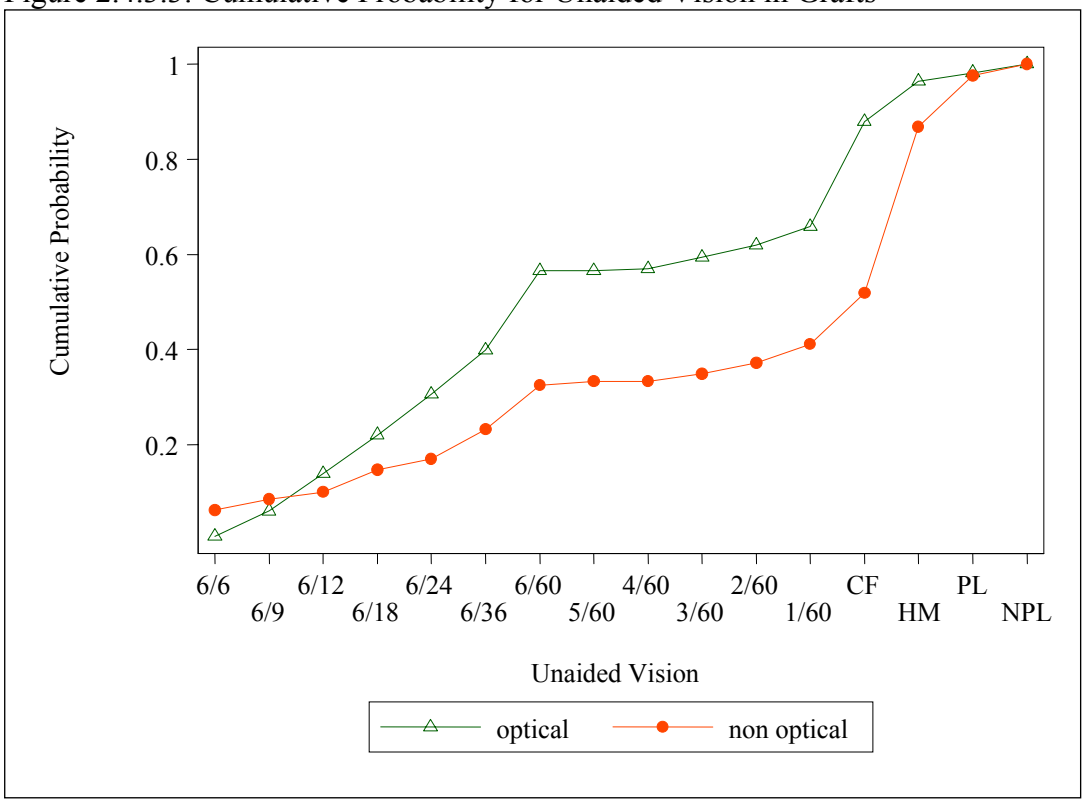


Table 2.4.3.3: Unaided Vision for Optical and Non Optical Cases

Vision	Optical				Non Optical			
	Graft Survival (227)		Graft Failure (56)		Graft Survival (70)		Graft Failure (61)	
	No.	%	No.	%	No.	%	No.	%
6/18 or better	62	27	0	0	17	24	2	3
6/24 – 6/60	94	41	3	5	20	29	3	5
Less than 6/60	69	30	53	95	31	44	56	92
Data not available	2	1	0	0	2	3	0	0

Figure 2.4.3.3: Cumulative Probability for Unaided Vision in Grafts



2.5 POST CORNEAL TRANSPLANT COMPLICATIONS

The common complications observed at one year were post-keratoplasty glaucoma, graft vascularisation, epithelial problems and graft rejection. Rejection was seen in 11% who were on follow-up (Table 2.5.1). Endothelial rejection is the commonest graft rejection (Table 2.5.2).

Table 2.5.1: Post Transplant Complications

		One year outcome (N=225)		**2nd year outcome (N=82)**		**3rd year outcome (N=46)**		**4th year outcome (N=13)**		**Total (N=366)**	
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Any complications		**147**	**70**	**40**	**19**	**20**	**9**	**4**	**2**	**211**	**62**
Complication	Epithelial Problem	37	17	7	9	3	7	2	18	49	14
	Wound Dehiscence	2	1	0	0	0	0	0	0	2	1
	Suture infiltration / abscess	22	10	4	5	2	5	0	0	28	8
	Endophthalmitis	1	0	1	1	0	0	0	0	2	1
	Microbial keratitis	25	12	5	7	2	5	0	0	32	9
	Vascularisation	44	21	8	11	5	12	2	18	59	17
	Post-keratoplasty glaucoma	59	28	21	28	13	30	2	18	95	28
	Graft Rejection	33	15	6	8	0	0	0	0	39	11
	No data	67	31	34	46	23	53	7	64	131	38

* Each patient may have more than one complication

Table 2.5.2: Post Transplant Graft Rejection Types

		One year outcome (N=225)		**2nd year outcome (N=82)**		**3rd year outcome (N=46)**		**4th year outcome (N=13)**		**Total (N = 366)**	
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Graft Rejection		**33**		**6**		**0**		**0**		**39**	
Types	Epithelial	11	33	2	33	0	0	0	0	13	33
	Stromal	11	33	0	0	0	0	0	0	11	28
	Endothelial	12	36	3	50	0	0	0	0	15	38
	No data	5	15	1	17	0	0	0	0	6	15

* Each patient may have more than one type of rejection

CHAPTER 3

HEART AND LUNG TRANSPLANTATION

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3.0 INTRODUCTION

Following the introduction of heart transplant in 1997 and lung transplant in 2005, the number of thoracic organ transplants has been few and far between. The main limitation to the performance of heart and lung transplants has been the lack of success in obtaining viable donor thoracic organs. Because of the infrequent performance of thoracic organ transplants results would not be expected to improve.

In 2008, no thoracic organ transplants were conducted. For end stage heart failure patients, a new approach to keep the patients alive while awaiting transplant has been explored with the use of ventricular assist devices as a bridge to transplant.

2 patients reached their 10^{th} anniversary following their transplants in 1998.

The rest of the report that follows will review the results of heart and lung transplantation in Malaysia till end of 2008.

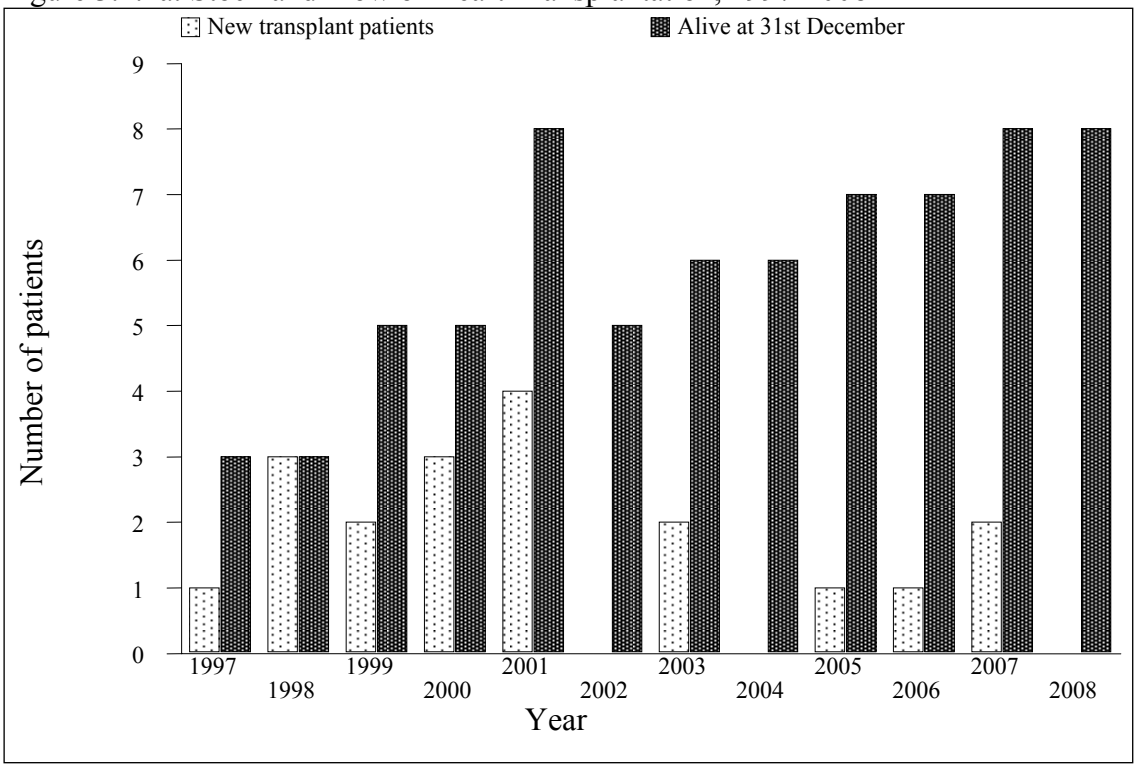
3.1 STOCK AND FLOW

Table 3.1.1a: Stock and Flow of Heart Transplantation, 1997-2008

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New transplant patients	1	3	2	3	4	0	2	0	1	1	1	0
Deaths	0	1	0	3	1	3	1	0	0	1	0	0
Retransplanted	0	0	0	0	0	0	0	0	0	0	1	0
Lost to follow up	0	0	0	0	0	0	0	0	0	0	0	0
Alive at 31st December	1	3	5	5	8	5	6	6	7	7	8	8

Note: The same patient was re-transplanted in the year 2007, thus only counted as one.

Figure 3.1.1a: Stock and Flow of Heart Transplantation, 1997-2008



3.2 RECIPIENTS' CHARACTERISTICS

Table 3.2.1a: Distribution of Patients by Gender, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Gender	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Male	1	3	0	2	2	0	2	0	1	1	0	0	12
Female	0	0	2	1	2	0	0	0	0	0	1	0	6
TOTAL	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**1**	**0**	**18**

Note: The same patient was re-transplanted in the year 2007, thus only counted as one.

Table 3.2.2a: Distribution of Patients by Ethnic Group, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Ethnic group	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Malay	0	0	1	1	2	0	0	0	1	0	0	0	5
Chinese	0	0	0	1	0	0	1	0	0	0	1	0	3
Indian	1	3	1	1	2	0	1	0	0	1	0	0	10
TOTAL	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**1**	**0**	**18**

Note: The same patient was re-transplanted in the year 2007, thus only counted as one.

Table 3.2.3a: Distribution of Patients by Age, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Age, years	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
0-19	0	0	2	1	1	0	0	0	1	0	1	0	6
20-39	0	2	0	0	0	0	0	0	0	0	0	0	2
40-59	1	1	0	2	3	0	2	0	0	1	0	0	10
≥60	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**1**	**0**	**18**
Mean	51	40	16	37	38	-	46	-	15	44	15	-	35
SD	-	9	1	22	17	-	8	-	-	-	-	-	16
Median	51	37	16	44	43	-	46	-	15	44	15	-	40
Minimum	51	33	15	13	14	-	40	-	15	44	15	-	13
Maximum	51	50	16	55	54	-	52	-	15	44	15	-	55

Age=date of transplant-date of birth

Note: The same patient was re-transplanted in the year 2007, thus only counted as one.

Age for 2007 patient was same for 1st and 2nd transplant

Table 3.2.4a: Distribution of Patients by Primary Diagnosis, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Primary diagnosis	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Ischaemic Cardiomyopathy	1	3	0	1	1	0	2	0	0	1	0	0	9
Idiopathic Dilated Cardiomyopathy	0	0	2	1	2	0	0	0	1	0	0	0	6
Restrictive Cardiomyopathy	0	0	0	0	0	0	0	0	0	0	0	0	0
End Stage Valvular Heart Disease	0	0	0	0	1	0	0	0	0	0	0	0	1
Hypertrophic Cardiomyopathy	0	0	0	1	0	0	0	0	0	0	0	0	1
Others	0	0	0	0	0	0	0	0	0	0	1	0	1
TOTAL	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**1**	**0**	**18**

Note: The same patient was re-transplanted in the year 2007, thus only counted as one.

3.3 TRANSPLANT PRACTICES

Table 3.3.1a: Distribution of Patients by Heart Procedure, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Heart Procedure	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Orthotopic Bicaval	1	1	0	0	0	0	0	0	0	0	0	0	2
Orthotopic Traditional	0	2	2	3	4	0	2	0	1	1	2	0	17
Heterotopic	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**2**	**0**	**19**

Table 3.3.2a: Distribution of Patients by Immunosuppressive Used, 1997-2008

Year	97	98	99	00	01	02	03	04	05	06	07	08	Total
Type of immunosuppressive	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Steroids													
Prednisolone	1	3	2	3	4	0	1	0	1	0	1	0	16
Methylprednisolone	1	3	2	3	4	0	2	0	1	1	2	0	19
Calcineurin Inhibitors													
Cyclosporin A	0	0	0	0	0	0	1	0	0	1	0	0	2
Neoral®	1	3	2	3	4	0	0	0	1	0	0	0	14
Tacrolimus (FK506)	0	0	0	0	0	0	0	0	0	0	1	0	1
Antimetabolites													
Azathioprine (AZA)	1	3	2	3	4	0	2	0	0	1	0	0	16
Mycophenolate Mofetil (MMF)	0	0	0	0	1	0	0	0	1	0	1	0	3
Anti-lymphocyte Receptor Antibodies													
Anti-thymocyte globulin (ATG)	0	0	0	0	0	0	0	0	0	0	2	0	2
TOTAL patients at notification	**1**	**3**	**2**	**3**	**4**	**0**	**2**	**0**	**1**	**1**	**2**	**0**	**19**

Table 3.3.3a: Immunosuppressive Used at Time of Last Follow-up up to 2008

Year of follow up*	2004	2005	2006	2007	2008
Type of immunosuppressive	**No.**	**No.**	**No.**	**No.**	**No.**
Steroids					
Prednisolone	1	3	2	2	2
Methylprednisolone	0	0	0	0	0
Calcineurin Inhibitors					
Cyclosporin A					
Neoral®	1	6	7	5	7
Tacrolimus (FK506)					1
Antimetabolites					
Azathioprine (AZA)	1	3	2	1	1
Mycophenolate Mofetil (MMF)	3	3	5	4	6
TOTAL patients at follow-up	**6**	**6**	**7**	**7**	**8**

*Data according to year of follow up of transplanted patients

Table 3.3.4a: Duration of Waiting Time on Waiting List, 1997-2008

Year	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Duration (months)*	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
<5	0	2	1	0	1	0	1	0	0	0	0	0	5
5≤10	1	0	1	0	1	0	0	0	1	0	0	0	4
10≤15	0	0	0	1	0	0	0	0	0	1	2	0	4
15≤20	0	0	0	1	0	0	0	0	0	0	0	0	1
20≤25	0	0	0	0	0	0	0	0	0	0	0	0	0
25≤30	0	0	0	0	0	0	0	0	0	0	0	0	0
30≤35	0	0	0	0	0	0	0	0	0	0	0	0	0
35≤40	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	**1**	**2**	**2**	**2**	**2**	**0**	**2**	**0**	**1**	**1**	**2**	**0**	**15**
Mean	6	2	4	15	5	-	20	-	9	10	13	-	9
SD	-	0	1	6	5	-	25	-	-	-	0	-	9
Median	6	2	4	15	5	-	20	-	9	10	13	-	8
Minimum	6	2	3	10	1	-	2	-	9	10	13	-	1
Maximum	6	2	5	19	8	-	37	-	9	10	13	-	37

*Duration=date of transplant-date added to wait list

3.4 TRANSPLANT OUTCOMES

Table 3.4.1a: Post Transplant Events at Last Follow-up up to 2008

Year of transplant*	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Type of post transplant events	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Drug Treated Hypertension	1	2	2	1	3	0	1	0	0	0	0	0	10
Bone Disease (Symptomatic)	1	0	0	0	1	0	0	0	0	0	0	0	2
Chronic Liver Disease	0	0	0	0	0	0	0	0	0	0	0	0	0
Cataracts	0	0	0	0	0	0	0	0	0	0	0	0	0
Diabetes	1	2	0	0	0	0	1	0	0	0	0	0	4
Renal Dysfunction	1	1	0	0	1	0	0	0	0	0	0	0	3
Stroke	0	0	0	0	0	0	0	0	0	0	0	0	0
Drug-Treated Hyperlipidaemia	1	2	2	1	3	0	1	0	1	0	0	0	11
TOTAL patients at follow-up	**1**	**2**	**2**	**1**	**3**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**12**

*Data according to year of transplant of patient

Table 3.4.2a: Post Transplant Malignancies at Follow-up up to 2008

Year of transplant*	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Type of post transplant malignancies	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Recurrence of pre-transplant tumour	0	0	0	0	0	0	0	0	0	0	0	0	0
De Novo solid tumour	1	0	0	0	0	0	0	0	0	0	0	0	1
De Novo lymphoproliferative disorder	0	0	0	0	0	0	0	0	0	0	0	0	0
Skin	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL patients at follow-up	**1**	**2**	**2**	**1**	**3**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**12**

*Data according to year of transplant of patient

Table 3.4.3a: Non-compliance at Follow-up up to 2008

Year of transplant*	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Non-compliance during follow-up	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
• Yes	0	0	2	0	0	0	1	0	0	0	0	0	3
• No	1	2	0	1	3	0	0	0	1	0	1	0	9
TOTAL patients at follow-up	**1**	**2**	**2**	**1**	**3**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**12**
Areas of non-compliance:													
• Immunosuppression medication	0	0	1	0	0	0	1	0	0	0	0	0	2
• Patient unable to afford immunosuppression medications	0	0	0	0	0	0	0	0	0	0	0	0	0
• Other medication	0	0	0	0	0	0	0	0	0	0	0	0	0
• Other therapeutic regimen	0	0	1	0	0	0	0	0	0	0	0	0	1
TOTAL patients with noncompliance	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**

*Data according to year of transplant of patient

Table 3.4.4a: Patient Treated for Rejection at Follow-up up to 2008

Year of transplant*	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Patient treated for rejection	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
• Yes	0	1	1	0	1	0	0	0	1	0	0	0	4
• No	1	1	1	1	2	0	1	0	0	0	1	0	8
TOTAL patients at follow-up	**1**	**2**	**2**	**1**	**3**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**12**
Number of rejection events													
• 1	0	1	0	0	1	0	0	0	1	0	0	0	3
• 2	0	0	0	0	0	0	0	0	0	0	0	0	0
• 3	0	0	1	0	0	0	0	0	0	0	0	0	1
TOTAL patients with rejection	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**4**

*Data according to year of transplant of patient

Table 3.4.5a: Distribution of Patients by Time of Deaths, 1997-2008

Year of discharge	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**TOTAL**
Time of deaths*	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
<3 months (at discharge)	0	1	0	2	0	1	1	0	0	1	0	6
3-<6 months	0	0	0	0	0	0	0	0	0	0	0	0
6 months-1 year	0	0	0	0	0	1	0	0	0	0	0	1
>1 year	0	0	0	1	1	1	0	0	0	0	0	3
TOTAL patients who died	**0**	**1**	**0**	**3**	**1**	**3**	**1**	**0**	**0**	**1**	**0**	**10**

*Time=Date of death–date of transplant

Table 3.4.6a: Patient Survival, 1997-2008

Year of Transplant	1997-2008	
Interval	**% Survival**	**SE**
6 months	68	11
1 year	63	11
2 year	50	12
3 year	44	12
4 year	44	12
5 year	44	12
6 year	44	12
7 year	44	12
8 year	44	12
9 year	44	12
10 year	44	12

SE=standard error
Duration = date follow up-date transplant, if alive at discharge
= date of discharge-date of transplant, if alive but lost to follow up
= date of discharge-date of transplant, if dead at discharge

Figure 3.4.6a: Patient Survival, 1997-2008

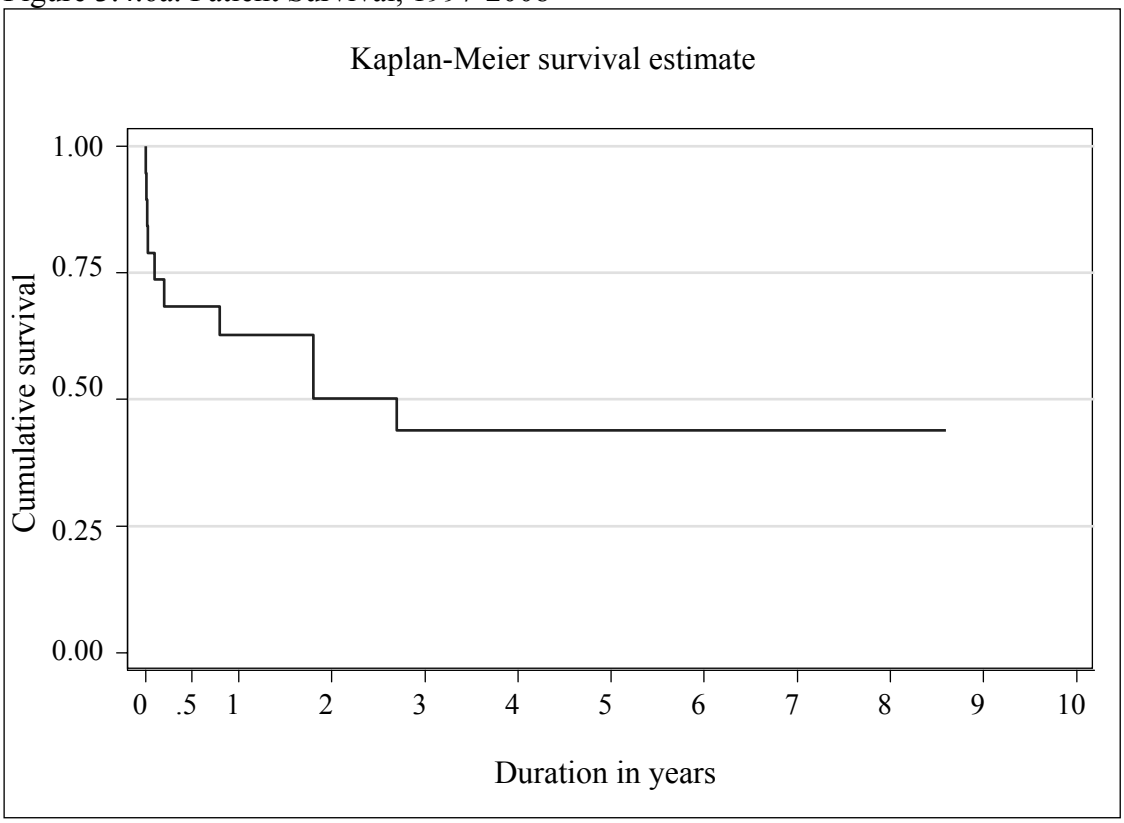


Table 3.4.7a: Cause of Death at Discharge, 1997-2008

Year	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Cause of death	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Hyperacute rejection	0	0	0	0	0	0	1	0	0	0	0	0	1
Multi organ failure	0	0	0	1	0	0	0	0	0	0	0	0	1
Respiratory failure secondary to septicaemia	0	0	0	0	0	1	0	0	0	0	0	0	1
Respiratory failure, renal function and liver failure, ARDS, septicaemia	0	0	0	1	0	0	0	0	0	0	0	0	1
Septicaemia, multiorgan failure	0	1	0	0	0	0	0	0	0	0	0	0	1
Graft failure	0	0	0	0	0	0	0	0	0	1	0	0	1
TOTAL patients who died at discharge	**0**	**1**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**6**

Table 3.4.8a: Cause of Death at Follow-up, 1997-2008

Year	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Cause of death	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Severe bleeding	0	0	0	0	0	1	0	0	0	0	0	0	1
Lung cancer, small cell type, septicaemia, bronchopneumonia	0	0	0	1	0	0	0	0	0	0	0	0	1
Rejection due to non-compliance	0	0	0	0	1	0	0	0	0	0	0	0	1
Unknown	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL patients who died at follow-up	**0**	**0**	**0**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**

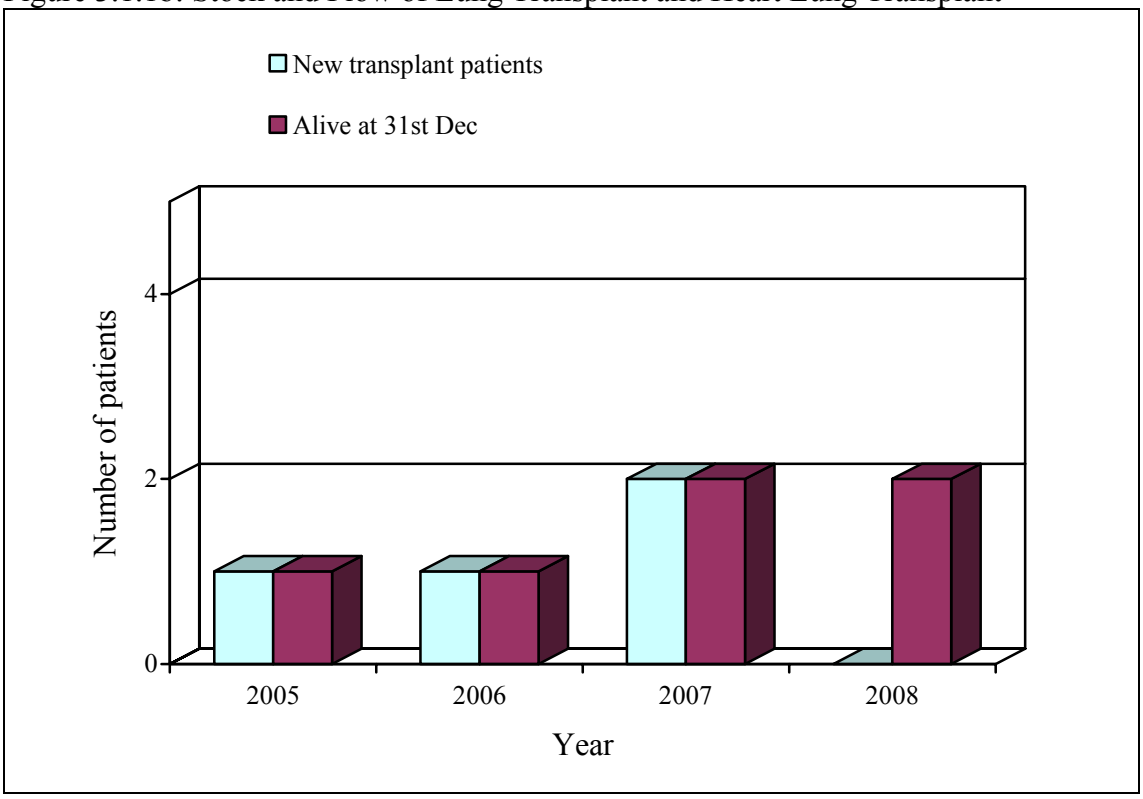
LUNG TRANSPLANTATION & HEART-LUNG TRANSPLANTATION

3.1 STOCK AND FLOW

Table 3.1.1b: Stock and Flow of Lung Transplantation, 2005-2008

Year	2005	2006	2007	2008
New transplant patients	1	1	2	0
Deaths	0	1	1	0
Retransplanted	0	0	0	0
Lost to follow up	0	0	0	0
Alive at 31st December	1	1	2	2

Figure 3.1.1b: Stock and Flow of Lung Transplant and Heart Lung Transplant



3.2 RECIPIENT'S CHARACTERISTICS

Table 3.2.1b: Distribution of Patients by Gender, 2005-2008

Year	2005	2006	2007	2008
Gender	**No.**	**No.**	**No.**	**No.**
Male	1	1	1	0
Female	0	0	1	0
TOTAL	**1**	**1**	**2**	**0**

Table 3.2.2b: Distribution of Patients by Ethnic Group, 2005-2008

Year	2005	2006	2007	2008
Race	**No.**	**No.**	**No.**	**No.**
Malay	0	0	1	0
Chinese	0	0	0	0
Indian	1	1	0	0
Iban	0	0	1	0
TOTAL	**1**	**1**	**2**	**0**

Table 3.2.3b: Distribution of Patients by Age, 2005-2008

Year	2005	2006	2007	2008
Age(years)	**No.**	**No.**	**No.**	**No.**
0-19	0	0	1	0
20-39	0	1	1	0
40-59	1	0	0	0
≥ 60	0	0	0	0
TOTAL	**1**	**1**	**2**	**0**

Table 3.2.4b: Distribution of Patients by Primary Diagnosis, 2005 -2008

Year	2005	2006	2007	2008
Diagnosis	**No.**	**No.**	**No.**	**No.**
Idiopathic pulmonary fibrosis	1	1	1	0
Idiopathic pulmonary arterial hypertension	0	0	1	0
Chronic obstructive pulmonary disease	0	0	0	0
Bronchiectasis	0	0	0	0
TOTAL	**1**	**1**	**2**	**0**

3.3 TRANSPLANT'S PRACTISES

Table 3.3.1b: Distribution of Patients by Lung Procedure, 2005-2008

Year	**2005**	**2006**	**2008**	**2008**
Procedure	**No.**	**No.**	**No.**	**No.**
Single Lung Transplant	1	0	0	0
Double Lung Transplant	0	1	1	0
Heart – Lung Transplant	0	0	1	0
TOTAL	**1**	**1**	**2**	**0**

Table 3.3.3b: Immunosuppressive Used at Time Follow-up to 2008

Year	**2005**	**2006**	**2007**	**2008**
Immunosuppresive drugs	**No.**	**No.**	**No.**	**No.**
Steroids:				
Prednisolone	1	2	2	1
Methylprednisolone	1	1	2	0
Antimetabolites:				
Azathioprine(AZA)	0	0	0	0
Mycophenolate (MMF)	1	2	3	2
Neoral	1	2	3	0
Tacrolimus	0	0	0	2
TOTAL patients at follow -up	**1**	**2**	**3**	**2**

3.4 TRANSPLANT'S OUTCOMES

Table 3.4.5b: Distribution of patients by time of deaths, 2005-2008

Year	**2005**	**2006**	**2007**	**2008**
Death	**No.**	**No.**	**No.**	**No.**
< 3 months	0	1	1	0
3 - < 6 months	0	0	0	0
6 – 12 months	0	0	0	0
> 12 months	0	0	0	0
TOTAL	**0**	**1**	**1**	**0**

CHAPTER 4

LIVER TRANSPLANTATION

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4.1 STOCK AND FLOW

The number of liver transplants performed from 1993 to 2008 is one hundred. Eighty six (86%) were performed locally and fourteen (14%) were performed at overseas centres. Five new liver transplants were done in 2008 and they were all done locally at Selayang Hospital.

Table 4.1.1 Stock and Flow of Liver Transplantation, 1993-2008

Year	**93**	**94**	**95**	**96**	**97***	**98**	**99**	**00**	**01**	**02**	**03****	**04**	**05**	**06**	**07**	**08**
New transplant patients	1	1	8	13	3	2	8	3	5	10	5	16	5	8	7	5
Deaths	0	0	3	4	1	1	4	1	2	5	1	5	6	3	2	2
Re-Transplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lost to follow up	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0
Functioning graft at 31st December	1	2	7	16	18	19	23	24	27	31	35	46	44	49	54	57

*1 patient who was alive until 05/12/1997 is recorded dead with missing date of death
** 1 patient transplanted in 2003 is recorded as dead with missing date of death

Figure 4.1.1 Stock and Flow of Liver Transplantation, 1993-2008

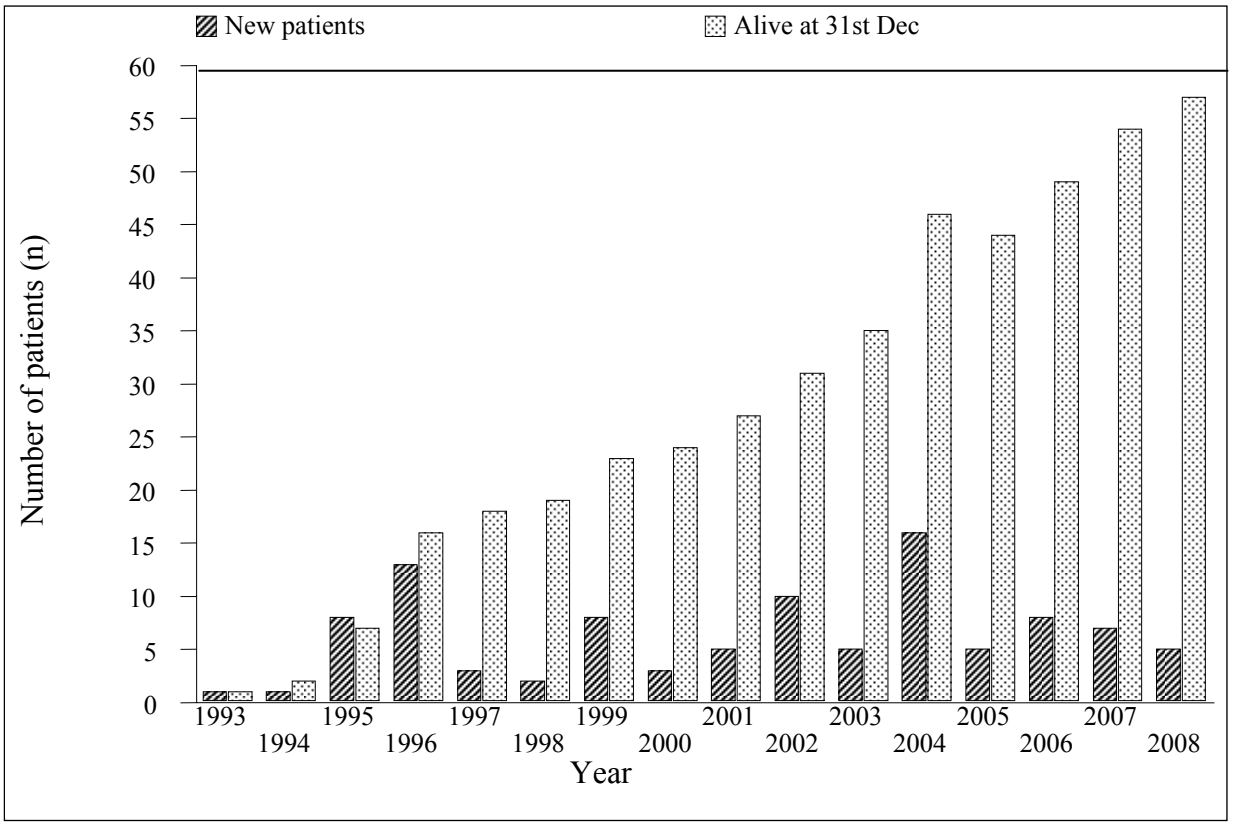

Table 4.1.2 Distribution of Patients by Place of Transplant, 1993-2008

Place of Transplant	Year (No.)																
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Local	0	0	8	10	1	1	8	3	5	9	2	14	5	8	7	5	86
Overseas	1	1	0	3	2	1	0	0	0	1	3	2	0	0	0	0	14
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

Table 4.1.3 Distribution of Patients by Centres for Liver Transplantation, 1993-2008

Transplant Centre	Year (No.)																
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Sime Darby Medical Centre, Subang Jaya	0	0	8	10	1	1	8	3	5	6	2	7	0	0	0	0	51
Hospital Selayang	0	0	0	0	0	0	0	0	0	3	0	7	5	8	7	5	35
University of Malaya Medical Centre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Children's Hospital, Brisbane	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
National University Hospital, Singapore	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
Queensland Liver Transplant Service, Australia	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Kings College Hospital, UK	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Tianjin, China	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Asian Centre for Liver Disease & Transplantation, Singapore	0	0	0	0	0	0	0	0	0	1	2	1	-	-	-	-	4
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

4.2 RECIPIENTS' CHARACTERISTICS

Fifty four (54%) were males and 46 (46%) were females. The ethnic distribution of the liver transplant recipients are as follows: Chinese 51 (51%), Malays 39 (39%), Indians 8 (8%), Others 2 (2%).

Eighty (80%) of the transplant recipients were between 1 and 9 years of age at the time of transplantation. Biliary atresia was the primary liver disease in 72 (72%) of the recipients. The commonest indication for liver transplantation was failure to thrive with growth retardation and poor liver function. The commonest blood group amongst the liver transplant recipients was group O (38%).

Table 4.2.1 Distribution of Patients by Gender, 1993-2008

Gender	**Year (No.)**																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Male	0	0	6	5	2	1	3	1	2	7	5	10	2	6	3	1	54
Female	1	1	2	8	1	1	5	2	3	3	0	6	3	2	4	4	46
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

Figure 4.2.1 Distribution of Patients by Gender, 1993-2008

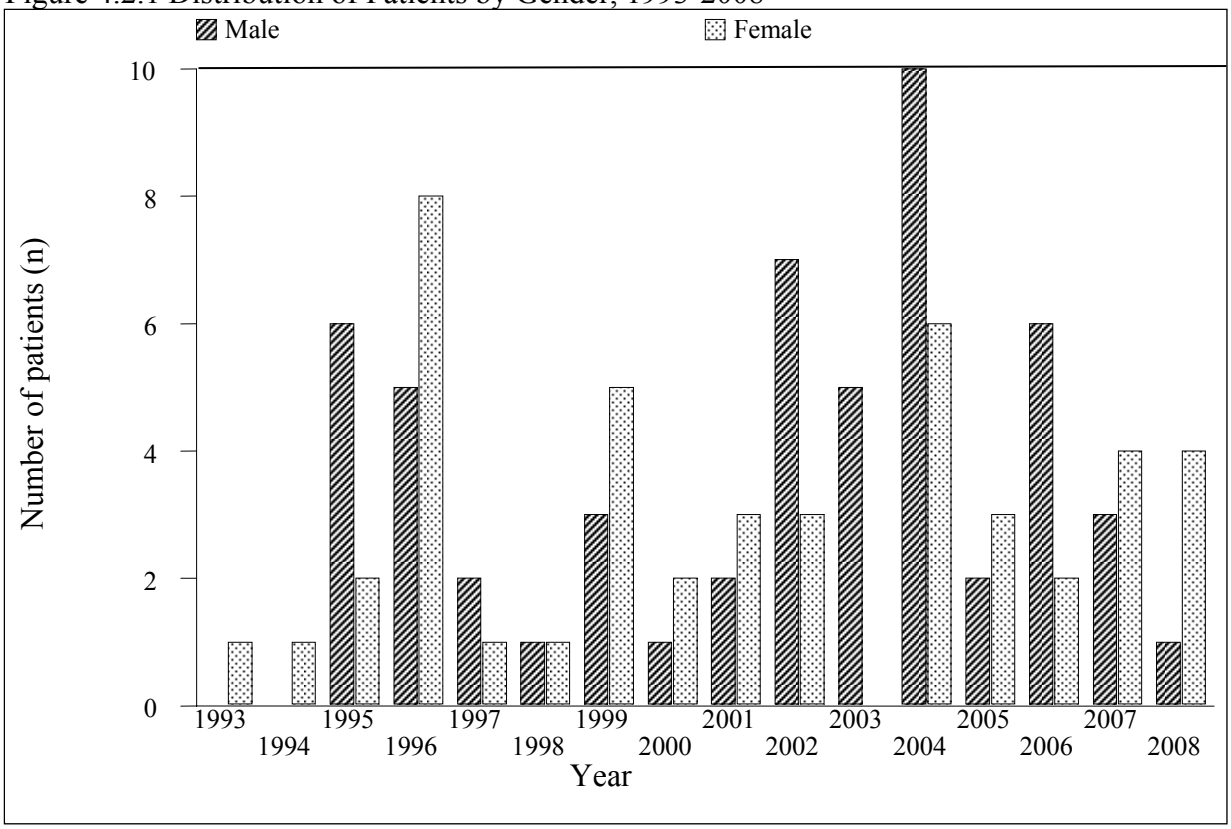

Table 4.2.2 Distribution of Patients by Ethnic Group, 1993-2008

Ethnic group	Year (No.)																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Malay	0	1	2	3	1	0	4	1	2	3	1	11	3	3	2	2	39
Chinese	1	0	6	8	2	1	2	2	3	6	4	5	1	3	4	3	51
Indian	0	0	0	2	0	1	1	0	0	0	0	0	1	2	1	0	8
Others	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

Figure 4.2.2 Distribution of Patients by Ethnic Group, 1993-2008

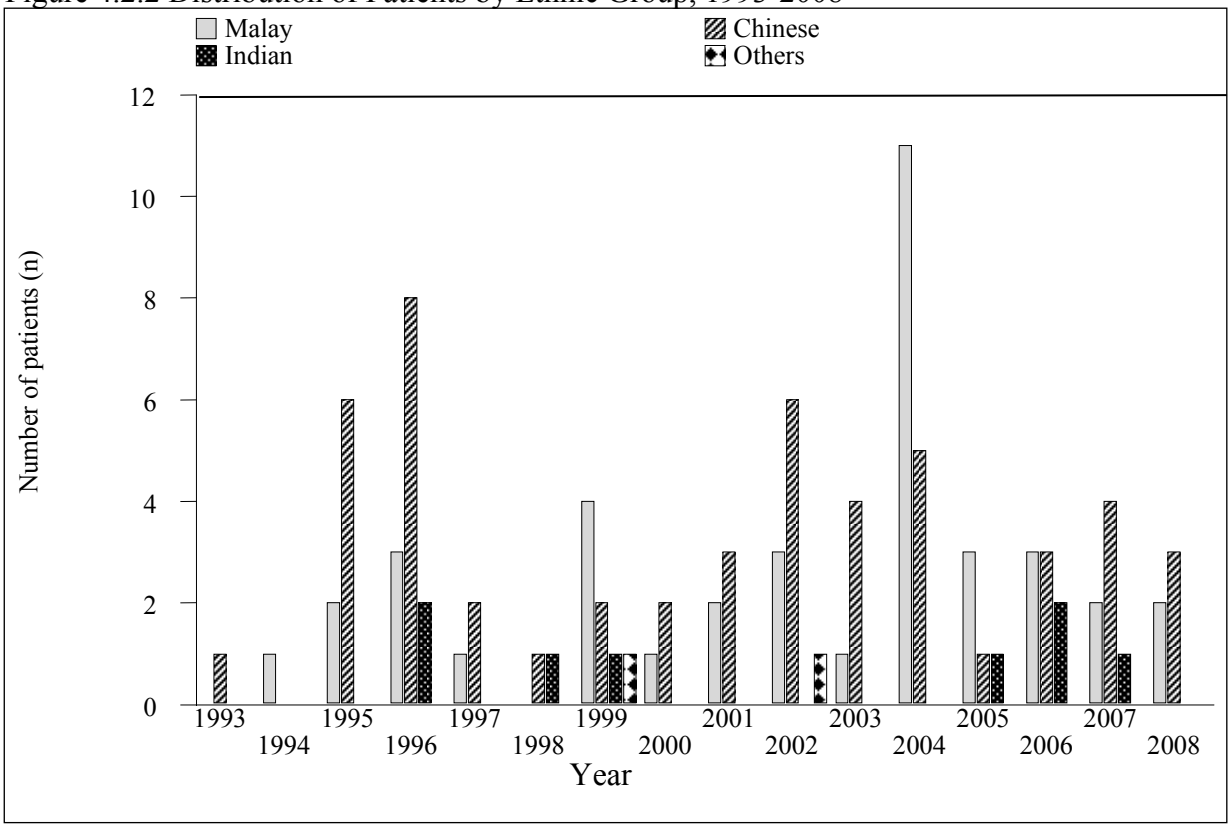

Table 4.2.3 Distribution of Patients by Age, 1993-2008

Age Group*	**Year (No.)**																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
<1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
1-4	1	1	3	11	3	1	5	3	4	5	2	9	2	4	3	1	58
5-9	0	0	3	1	0	0	2	0	1	3	1	3	3	1	2	1	21
10-14	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	0	5
15-19	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2
20-39	0	0	1	0	0	0	0	0	0	1	0	0	0	2	1	3	8
40-59	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	3
≥60	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**
Mean	2	4	9	4	2	1	4	1	2	10	27	12	4	12	10	17	9
SD	-	-	9	4	1	1	5	0	2	14	33	22	3	15	13	10	14
Median	2	4	5	2	2	1	2	1	2	4	9	3	5	4	5	23	3
Minimum	2	4	2	2	1	3 months	1	1	1	4 months	1	1	1	2	2	2	3 months
Maximum	2	4	30	14	2	1	15	2	5	46	73	74	8	39	37	26	74

* Age=date if transplant – date of birth

Table 4.2.4 Primary Diagnosis, 1993-2008 (N=100)

Primary diagnosis	Year (No.)																
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Biliary atresia	1	1	7	12	3	1	7	2	5	6	2	10	4	2	6	3	72
Metabolic liver disease	0	0	1	1	0	0	0	0	0	2	0	2	0	0	0	0	6
Cholestatic liver disease	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	3
Primary biliary cirrhosis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary sclerosing cholangitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autoimmune hepatitis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Chronic hepatitis B	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	5
Chronic hepatitis C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alcoholic liver disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malignancies	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	4
Acute liver failure	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	4
Idiopathic/ Cryptogenic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	2	0	1	1	4	1	3	12
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**11**	**7**	**17**	**6**	**9**	**7**	**6**	**107**

** 7 patients have more than one primary disease

Table 4.2.5 Indication for Transplantation, 1993-2008 (N=100)

Indication for transplantation	Year (No.)																
	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	TOTAL
Recurrent encephalopathy	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	3
Uncontrolled bleeding varices	0	0	0	7	1	0	4	1	1	0	0	2	0	0	0	0	16
Intractable ascites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spontaneous bacterial peritonitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poor liver function	1	1	7	11	3	1	8	3	5	9	3	11	4	1	4	0	72
Malignancy	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Unacceptable quality of life	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
Failure to thrive and growth retardation in paediatric patients	0	0	6	10	3	2	6	3	5	7	2	10	3	1	0	0	58
Others	0	0	0	0	0	0	0	0	0	0	0	1	2	8	3	5	19
No data	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	4
TOTAL	**1**	**1**	**14**	**28**	**7**	**3**	**19**	**7**	**11**	**19**	**7**	**26**	**10**	**10**	**7**	**5**	**175**

** 33 patients had 1 indication for transplant, 63 had more than 1 indication for transplantation

Table 4.2.6 Recipients' Blood Group, 1993-2008

Blood group	**Year (No.)**																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
A	0	1	2	0	0	0	3	0	1	3	1	4	1	4	2	1	23
B	0	0	1	2	0	1	2	0	1	1	0	1	1	3	3	1	17
AB	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	4
O	0	0	2	5	1	0	3	3	3	5	1	8	2	1	2	2	38
No Data	1	0	3	5	2	0	0	0	0	1	3	2	0	0	0	1	18
TOTAL	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

4.3 TRANSPLANT PRACTICES

Seventy five (75%) of liver transplants were living donors while twenty five (25%) were from cadaveric donors. 62% of living donors were first degree relatives with mother to child being the most common. The immunosuppressive medications most commonly used are tacrolimus and steroids**.**

Table 4.3.1 Distribution of Patients by Type of Donors, 1993-2008

Type of donor	Year (No.)																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Cadaveric	1	0	0	3	1	0	0	0	0	1	1	4	2	4	4	4	25
Living Related - Mother	0	1	5	2	1	2	5	2	2	2	2	7	1	1	0	0	33
Living Related - Father	0	0	2	7	1	0	2	0	2	3	0	1	1	3	3	1	26
Living Related - Daughter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Living Related - Son	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Living Related - Brother	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Living Related - Sister	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Living Related - Monozygotic twin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Living Related - Dizygotic twin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Living Related - Others	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Living Related - Emotionally	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Living Unrelated	0	0	1	1	0	0	1	1	1	3	0	3	0	0	0	0	11
TOTAL patients	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

Table 4.3.2 Immunosuppresive Drug Treatment at Transplantation, 1993-2008 (N=100)

Immunosuppressive drugs	Year (No.)																
	93	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**TOTAL**
Steroids	0	0	2	5	0	2	5	2	5	5	1	12	5	8	6	5	63
Azathioprine	0	0	0	0	0	0	0	0	0	0	0	4	5	8	4	2	23
Cyclosporin A	1	1	1	2	0	0	0	1	0	0	0	0	0	0	0	0	6
Tacrolimus (FK506)	0	0	3	7	2	2	8	2	5	9	5	12	5	8	5	4	77
Mycophenolate Mofetil (MMF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rapamycin	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
Monoclonal/Polyclonal Antiodies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anti IL26 Antibodies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No Data	0	0	4	3	1	0	0	0	0	1	0	4	0	0	1	0	14
TOTAL patients	**1**	**1**	**8**	**13**	**3**	**2**	**8**	**3**	**5**	**10**	**5**	**16**	**5**	**8**	**7**	**5**	**100**

Note: 22 patients had 1 type if drug, 41 patients had 2 types, 23 patients had 3 types

4.4 TRANSPLANT OUTCOMES

The 1 year survival rate for the period 1993 - 1998 and 1999 - 2007 was 71% and 69% respectively. The most common cause of death was sepsis.

Table 4.4.1 Patient Survival by Year of Transplant, 1993-2008 (N=100)

Interval (months)	Year of transplant			
	1993-1998		1999-2008	
	% Survival	SE	% Survival	SE
1	82	7	82	5
6	71	9	70	5
12	71	9	69	6

Figure 4.4.1 Patient Survival by Year of Transplant, 1993-2008

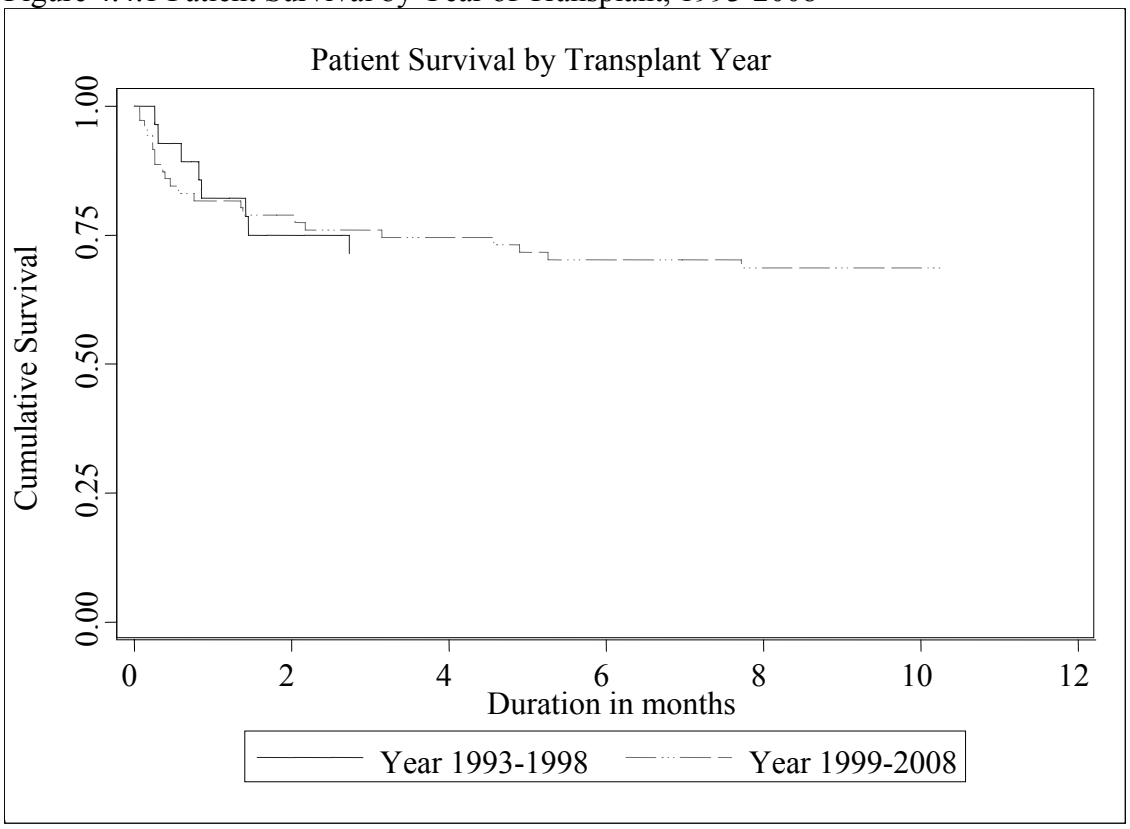

Table 4.4.2 Patient Survival by Gender, 1993-2008 (N=100)

Interval (months)	Gender			
	Male		Female	
	% Survival	SE	% Survival	SE
1	83	5	80	6
6	72	6	69	7
12	70	6	69	7

Figure 4.4.2 Patient Survival by Gender, 1993-2008

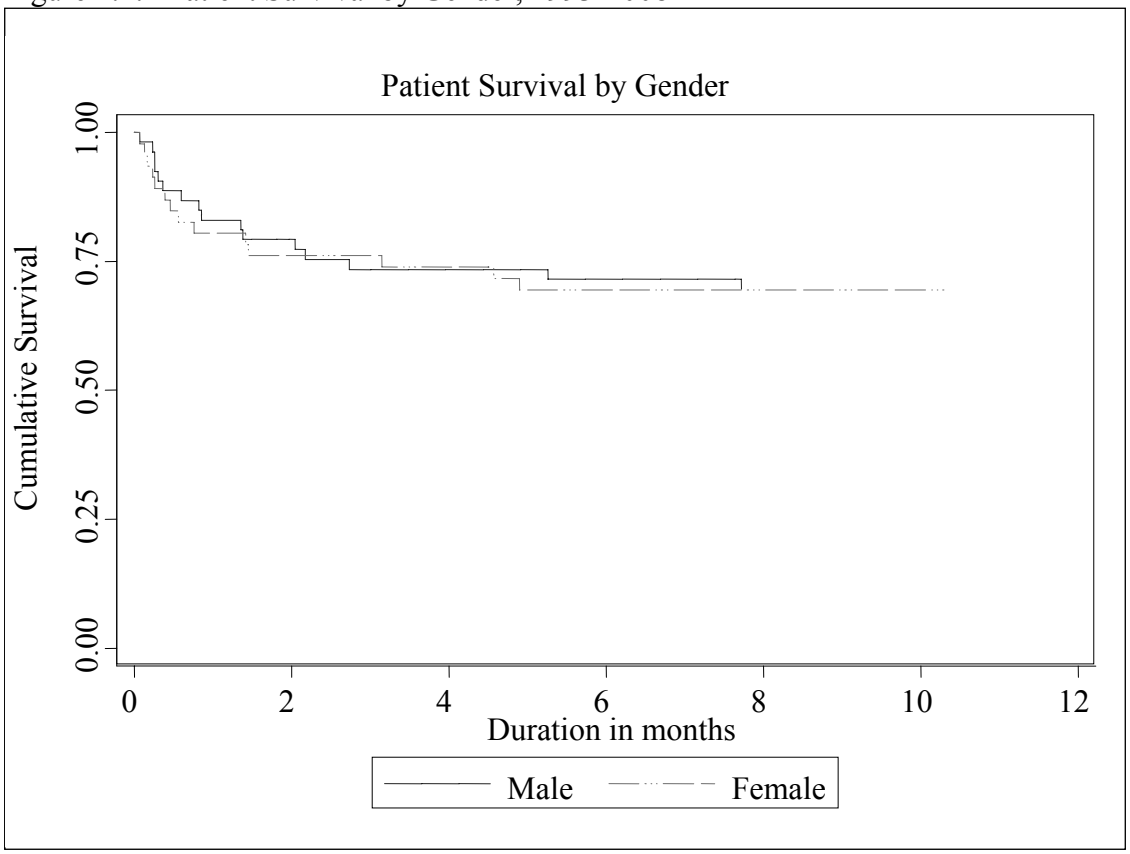

Table 4.4.3 Patient Survival by Age Group, 1993-2008 (N=100)

Interval (months)	Age Group			
	0-9 years		≥10 years	
	% Survival	SE	% Survival	SE
1	81	5	85	8
6	70	5	80	9
12	70	5	74	10

Figure 4.4.3 Patient Survival by Age Group, 1993-2008

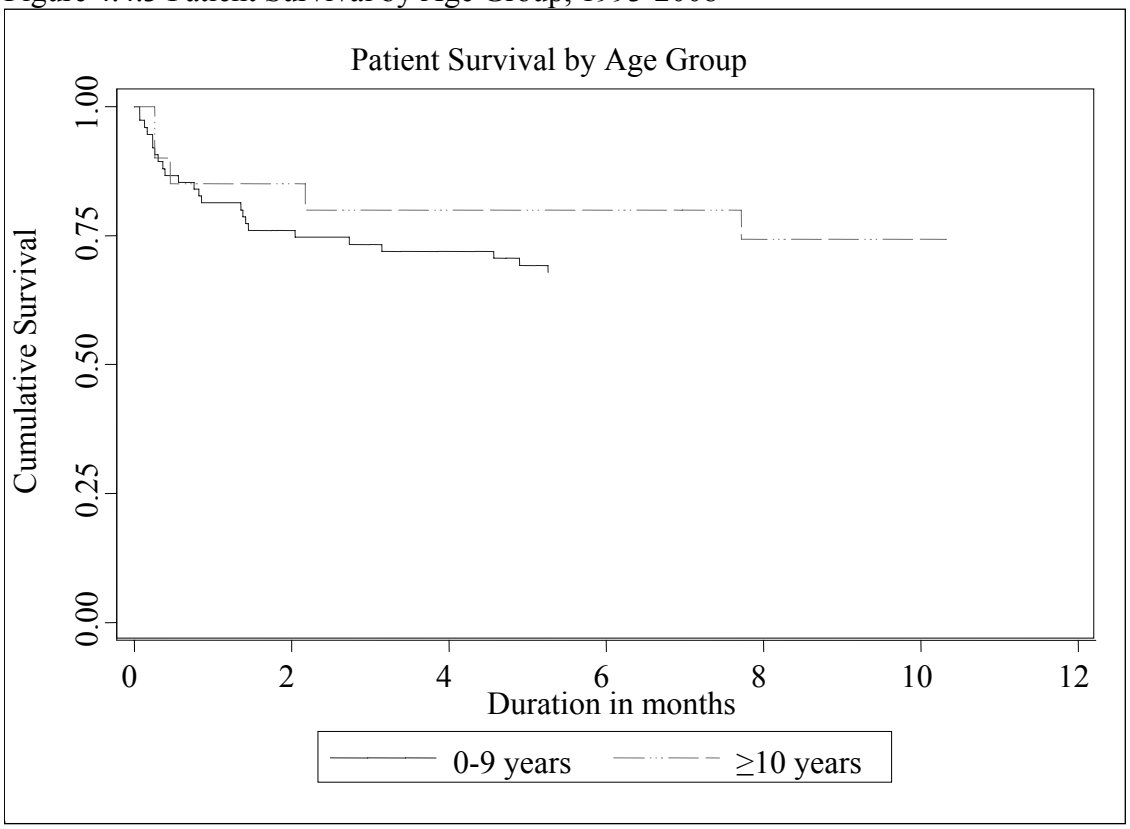

Table 4.4.4 Distribution of Patients by Cause of Death, 1993-2008 (N=100)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Causes of death	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Graft failure	0	0	0	0	0	1	0	0	0	0	2	0	1	0	4
Chronic graft rejection	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Intra-abdominal Bleeding	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Peritonitis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
CMV Pneumonia	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Decompensated liver cirrhosis	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Intracranial hemorrhage	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2
Malignancy	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
Variceal bleed	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3
Pneumonia and respiratory failure	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Post transplant lymphoproliferative disease	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Sepsis	0	2	0	0	0	0	0	2	0	1	2	3	0	0	10
Acute liver failure secondary to portal vein thrombosis post liver transplant														1	1
End stage liver failure recurrent ascending cholangitis				1											1
Acute or Chronic Liver Failure												1	1		2
Viral bronchopneumonia										1					1
Hepatitis B										1					1
Cholethiasis											1				1
Unknown	3	0	0	0	0	0	0	1	0	3	0	0	0	0	7
TOTAL	**3**	**4**	**1**	**1**	**4**	**1**	**2**	**5**	**1**	**6**	**6**	**4**	**2**	**2**	**42**

CHAPTER 5

RENAL TRANSPLANTATION

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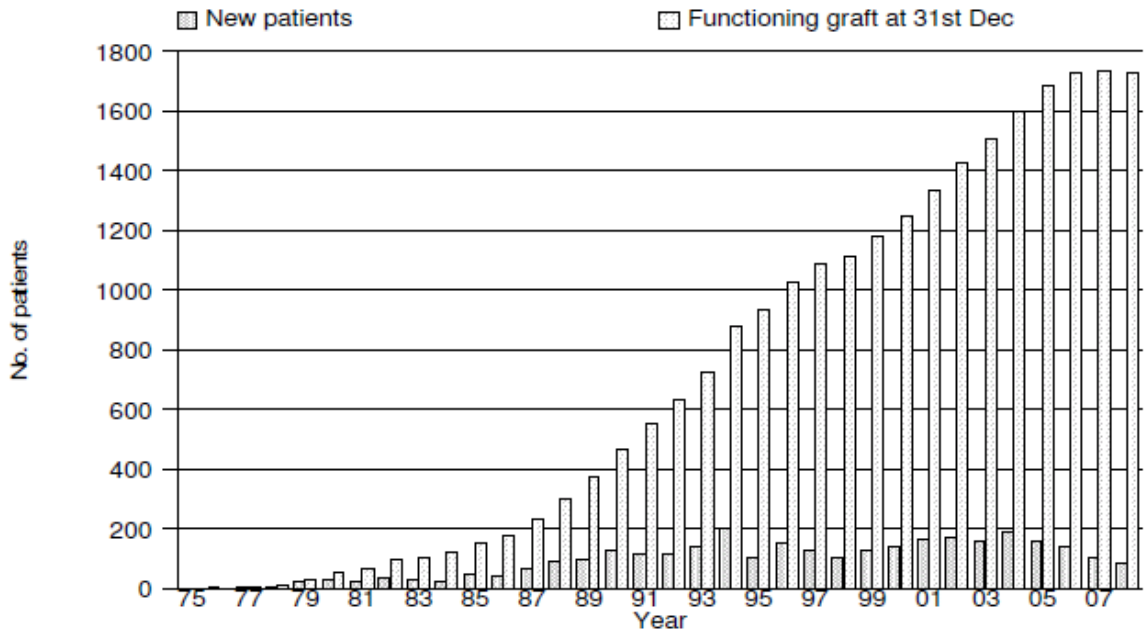
SECTION 5.1: STOCK AND FLOW

The number of new renal transplant patients shows an initial rise from 127 transplants per year in 1998 to a peak of 190 transplants in 2004. This is a rise of nearly 50% but the number declined subsequently to only 100 in 2007 (Table 5.1.1). This is due to reduction in the number of transplantations done in China. As renal transplantation in the country is still dependant on the availability of commercial cadaveric transplantation done abroad this drop was foreseeable. There may be an increase post 2008 Beijing Olympic Games and this is supported by 88 transplants in year 2008. The number of functioning renal transplants reported to the National Transplant Registry (NTR) had increased from 1178 in 1999 to 1730 in 2008 (Table 5.1.1).

Table 5.1.1: Stock and Flow of Renal Transplantation, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New transplant patients	127	143	163	172	160	190	162	141	100	88
Died	25	30	37	33	37	42	43	50	39	48
Graft failure	37	32	40	39	42	44	21	38	37	32
Lost to Follow up	1	9	3	5	4	14	10	10	18	10
Functioning graft at 31st December	1178	1250	1333	1428	1505	1595	1683	1726	1732	1730

Figure 5.1.1: Stock and Flow of Renal Transplantation, 1975-2008



The incidence of renal transplantation stabilised at a modest rate of 5-7 per million population (Table 5.1.2) while transplant prevalence rate has grown slowly from 52 per million in 1999 to 64 per million population in 2007 (Table 5.1.3), an increase of 23% over the 1999 figures. However compared to growth in the prevalence rate of dialysis patients (which has increased by 300% from 205 in 1998 to 615 in 2007) our transplant prevalence rate has not kept up. In fact, the incidence rate and prevalence rate seem to reduce in year 2008 (3 and 62 per million population respectively (Table 5.1.2 and 5.1.3).

Table 5.1.2: New Transplant Rate per million population (pmp), 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New transplant patients	127	143	163	172	160	190	162	141	100	88
New transplant rate, pmp	6	6	7	7	6	7	6	5	4	3

Figure 5.1.2: New Transplant Rate, 1975-2008

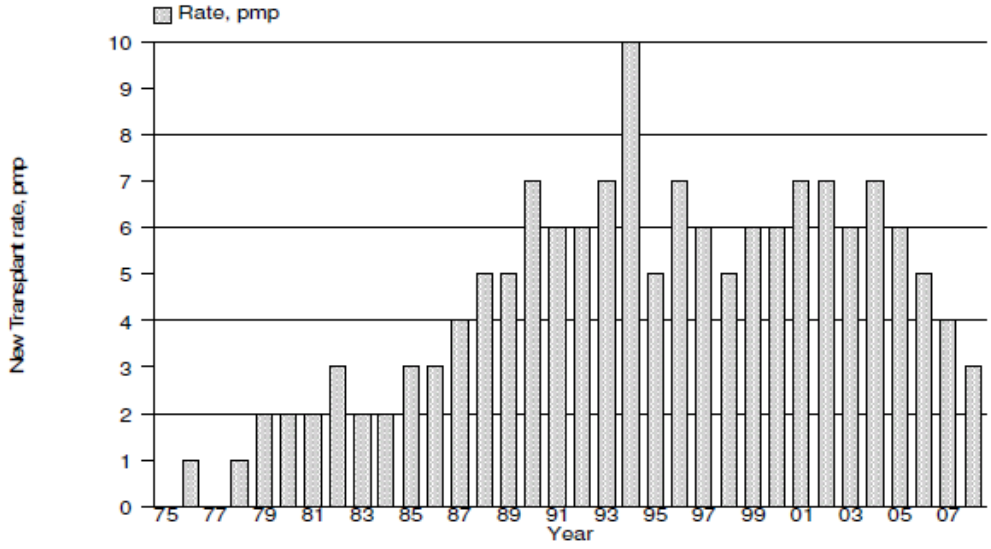


Table 5.1.3: Transplant Prevalence Rate per million population (pmp), 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Functioning graft at 31st Dec	1178	1250	1333	1428	1505	1595	1683	1726	1732	1730
Transplant prevalence rate, pmp	52	53	56	58	60	62	64	65	64	62

Figure 5.1.3: Transplant Prevalence Rate, 1975-2008

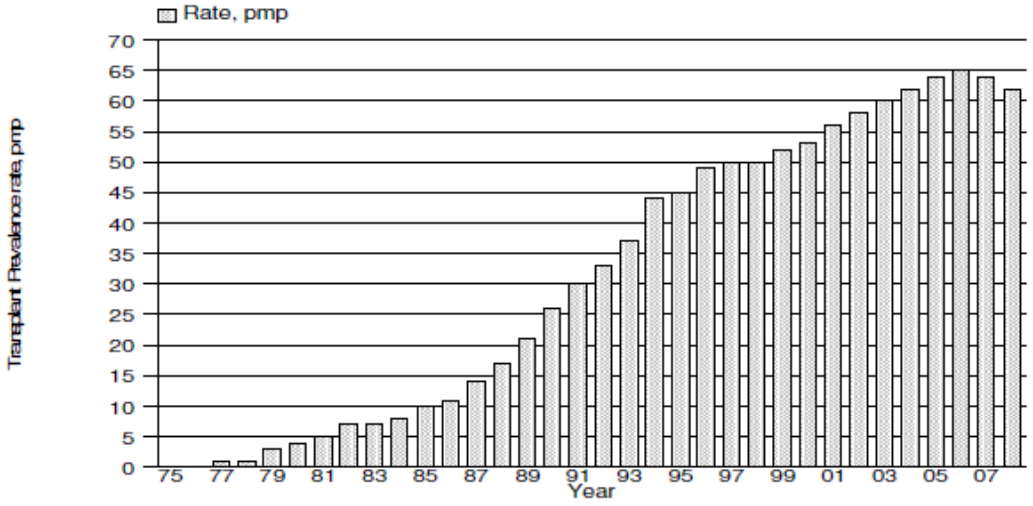


Table 5.1.4: Place of Transplantation, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	36	28	28	20	33	20	30	17	26	16
UMMC	16	13	19	13	23	14	15	9	6	4
Selayang Hospital	0	0	4	3	11	7	11	6	11	7
Other local	1	1	3	2	4	2	1	1	1	1
China	63	50	80	56	83	51	103	60	111	69
India	5	4	9	6	8	5	12	7	4	3
Other overseas	2	2	0	0	1	1	0	0	1	1
Unknown	4	3	0	0	0	0	0	0	0	0
TOTAL	127	100	143	100	163	100	172	100	160	100

Year	2004		2005		2006		2007		2008		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	20	11	31	19	35	25	36	36	32	36	307	21
UMMC	7	4	7	4	5	4	0	0	0	0	98	7
Selayang Hospital	11	6	5	3	9	6	14	14	7	8	83	6
Other local	2	1	5	3	2	1	3	3	7	8	29	2
China	137	72	108	67	81	57	41	41	41	47	848	59
India	11	6	5	3	7	5	1	1	1	1	63	4
Other overseas	2	1	1	1	2	1	5	5	0	0	14	1
Unknown	0	0	0	0	0	0	0	0	0	0	4	0
TOTAL	190	100	162	100	141	100	100	100	88	100	1446	100

In terms of place of transplantation, transplantation within local centres has remained the quite same from 1999 to 2007, with 52 to 53 cases (51% of all renal transplants), but has decreased to 46 in 2008. This is disturbing data as it underscores our failure to improve transplantation rates within the country which is mainly due to the lack of both living as well as cadaver donors. Transplantation in China in 2008 comprised 47% of all of renal transplant recipients with 41 patients.

SECTION 5.2: RECIPIENTS' CHARACTERISTICS

In terms of renal transplant recipients' characteristics, age at transplant has been stable at 34 to 42 years. Between 58% and 70% of recipients were males over the last 10 years. There has been an increase in the proportion of diabetic patients undergoing transplantation from 11% in 1998 to 21% in 2006 (Table 5.2.1). However, there is a drastic drop in number of diabetic patients who underwent transplantation in 2007 and 2008 (14% and 15% respectively). This coincided with the drop in China transplants where the majority of the diabetic patients underwent their transplantation. Patients with hepatitis B and hepatitis C remained static at around 4-8%. In terms of cause of end stage renal failure (Table 5.2.2), the primary cause was still glomerulonephritis, followed by hypertension and diabetes as the third cause. Up to 40% of transplant recipients had end stage renal disease due to unknown causes, belying the fact that majority of these patients presented late.

Table 5.2.1: Renal Transplant Recipients' Characteristics, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
New Transplant Patients	127	143	163	172	160	190	162	141	100	88
Age at transplant (years), Mean	37	39	41	41	42	41	38	37	36	34
Age at transplant (years), SD	13	14	13	13	13	13	14	15	16	15
% Male	62	64	63	58	66	62	70	67	63	58
% Diabetic (co-morbid/ primary renal disease)	11	15	18	15	22	22	20	21	14	15
% HBsAg positive	4	5	5	7	8	5	4	7	5	4
% Anti-HCV positive	11	8	15	8	10	8	2	8	10	4

Table 5.2.2: Primary Causes of End Stage Renal Failure, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	127	100	143	100	163	100	172	100	160	100
Glomerulonephritis	41	32	50	35	44	27	54	31	54	34
Diabetes Mellitus	10	8	16	11	23	14	16	9	26	16
Hypertension	7	6	20	14	17	10	24	14	25	16
Obstructive uropathy	4	3	3	2	3	2	2	1	2	1
ADPKD	1	1	3	2	1	1	3	2	5	3
Drugs/ toxic nephropathy	0	0	0	0	0	0	0	0	2	1
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0
Unknown	62	49	54	38	61	37	70	41	58	36
Others	6	5	12	8	23	14	16	9	12	8

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	190	100	162	100	141	100	100	100	88	100
Glomerulonephritis	62	33	44	27	52	37	29	29	21	24
Diabetes Mellitus	32	17	29	18	22	16	9	9	10	11
Hypertension	51	27	39	24	31	22	24	24	15	17
Obstructive uropathy	4	2	3	2	4	3	1	1	0	0
ADPKD	5	3	3	2	1	1	1	1	0	0
Drugs/ toxic nephropathy	2	1	0	0	1	1	0	0	2	2
Hereditary nephritis	1	1	0	0	0	0	0	0	0	0
Unknown	83	44	50	31	44	31	37	37	40	45
Others	27	14	17	10	16	11	14	14	12	14

SECTION 5.3: TRANSPLANT PRACTICES

In 2006, 62% of the renal transplant recipients received their grafts from commercial sources. Fifty-eight percent of these were from commercial cadavers. Live donor transplantation made up 20% of transplants (28 recipients) in the same year which was down from 45 cases (37%) in 1999 and 40 cases (24%) in 2005. Since 2006, the number of life donor has remained low - 31 in 2007 and 25 in 2008. Local cadaveric donation made up 18% of transplants (24 recipients) in 2006 although it had shown an initial promising rise to 37 recipients in 2001. 2007 marked the first time in 10 years where there were more local transplantations (57%) compared to commercial transplantations in oversea (41%).

Table 5.3.1: Type of Renal Transplantation, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial cadaver	64	52	80	56	83	51	103	60	112	70
Commercial live donor	4	3	9	6	7	4	11	6	3	2
Live donor (genetically related)	40	33	21	15	32	20	33	19	25	16
Live donor (emotionally related)	5	4	6	4	4	2	3	2	5	3
Cadaver	10	8	27	19	37	23	22	13	15	9
Total	123	100	143	100	163	100	172	100	160	100

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial cadaver	143	76	105	65	82	58	41	41	40	45
Commercial live donor	6	3	8	5	5	4	2	2	1	1
Live donor (genetically related)	21	11	37	23	24	17	20	20	22	25
Live donor (emotionally related)	2	1	3	1	4	3	11	12	3	4
Cadaver	17	9	9	6	26	18	25	25	22	25
Total	189	100	162	100	141	100	99	100	88	100

*Commercial Cadaver (China, India, other oversea) *Commercial live donor (living unrelated) *Cadaver (local)

Table 5.3.2: Biochemical Data, 2006-2008

Biochemical parameters	Summary	2006	2007	2008
Creatinine, umol/L	N	1592	1686	1499
	Mean	135.7	131.8	131
	SD	81.3	77.6	80.2
	Median	120	116	113
	Minimum	21.7	36	29
	Maximum	1152	1186	1181
Hb, g/dL	N	1592	1686	1499
	Mean	12.7	12.8	12.9
	SD	1.9	1.9	1.9
	Median	12.8	12.8	12.9
	Minimum	3.3	4.4	6.2
	Maximum	19.8	18.7	18.6
Albumin, g/L	N	1592	1686	1499
	Mean	40	40	40
	SD	0.7	0.8	0.8
	Median	40	40	40
	Minimum	29	29	30
	Maximum	48	48	50
Calcium, mmol/L	N	1592	1686	1499
	Mean	2.3	2.3	2.3
	SD	0.2	0.2	0.2
	Median	2.3	2.3	2.3
	Minimum	1.1	1.4	1
	Maximum	3.1	3.2	3.5

Biochemical parameters	Summary	2006	2007	2008
Phosphate, mmol/L	N	1592	1686	1499
	Mean	1.1	1.1	1.1
	SD	0.2	0.3	0.3
	Median	1.1	1.1	1.1
	Minimum	0.5	0.5	0.5
	Maximum	3.5	3.9	3.2
Alkaline Phosphate (ALP), U/L	N	1592	1686	1499
	Mean	79.1	79.4	78.4
	SD	43.2	39.8	47.9
	Median	71	72	70
	Minimum	24	22	20
	Maximum	700	508	985
ALT, U/L	N	1592	1686	1499
	Mean	29.8	29.8	28.6
	SD	30.4	25.7	31
	Median	22	23	22
	Minimum	4	4	4
	Maximum	433	356	733
Total cholesterol, mmol/L	N	1592	1686	1499
	Mean	5.3	5.2	5.2
	SD	1	1	1
	Median	5.3	5.3	5.3
	Minimum	1.5	1.7	2
	Maximum	11.1	11.4	11.2
LDL cholesterol, mmol/L	N	1592	1686	1499
	Mean	3	3	2.9
	SD	0.8	0.8	0.8
	Median	3	3	3
	Minimum	1	1	0.9
	Maximum	11.1	8.9	7.7
HDL cholesterol, mmol/L	N	1592	1686	1499
	Mean	1.6	1.5	1.6
	SD	0.5	0.4	0.5
	Median	1.6	1.6	1.6
	Minimum	0.4	0.4	0.5
	Maximum	5.8	7.5	7.5
Systolic Blood Pressure, mmHg	N	1592	1686	1499
	Mean	130.7	131.6	129.4
	SD	15.9	15.7	16.1
	Median	130	130	130
	Minimum	66	80	80
	Maximum	210	210	245
Diastolic Blood Pressure, mmHg	N	1592	1686	1499
	Mean	78.9	78.8	77.5
	SD	9.8	9.4	9.7
	Median	80	80	80
	Minimum	30	20	20
	Maximum	120	116	133

Table 5.3.3: Medication Data, 2006-2008

Medication data	Single drug treatment						Combined drug treatment					
	2006		2007		2008		2006		2007		2008	
	N	%	N	%	N	%	N	%	N	%	N	%
All	1482	100	1664	100	1359	100	1482	100	1664	100	1359	100
(i) Immunosuppressive drug(s) treatment												
Prednisolone	8	1	9	1	6	0	1444	97	1610	97	1321	97
Azathioprine	0	0	0	0	0	0	497	34	479	29	374	28
Cyclosporin A	5	0	8	0	2	0	1119	76	1190	72	938	69
Tacrolimus (FK506)	0	0	4	0	3	0	254	17	348	21	327	24
Mycophenolate Mofetil (MMF)	0	0	1	0	2	0	708	48	906	54	721	53
Rapamycin	0	0	0	0	1	0	7	0	33	2	30	2
Others	0	0	0	0	0	0	18	1	4	0	1	0
(ii) Non-Immunosuppressive drug(s) treatment												
Beta blocker	77	5	90	5	87	6	597	40	735	44	609	45
Calcium channel blocker	199	13	184	11	137	10	787	53	904	54	680	50
ACE inhibitor	39	3	38	2	29	2	292	20	384	23	282	21
AIIRB	27	2	18	1	17	1	141	10	210	13	137	10
Anti-lipid	156	11	95	6	87	6	679	46	731	44	616	45
Other anti-hypertensive	11	1	6	0	24	2	159	11	140	8	188	14

In 2008, Cyclosporine based regimes remained the mainstay of immunosuppressive therapy with 69% of patients receiving it. This showed a gradual declining trend from 80% of all immunosuppression used since 2004 which coincided with increasing trend in Tacrolimus usage. Tacrolimus based regimes accounted for 24%. There has been continuous increase in the use of Mycophenolate Mofetil as the second immunosuppressive agent in 53% of patients in 2008 compared to 37% of patients in 2004. During the same period, the use of Azathioprine declined from 43% in 2004 to 28% in 2008. Monotherapy of immunosuppresion is mostly not noted except in a small number of patients. Sirolimus was used in 2% of all transplant recipients in 2008.

In terms of non immunosuppressive medications, in year 2008 only 31% of patients were on ACE inhibitors or Angiotensin II receptor blockers (AIIRB) or both and this trend has been relatively static since 2004. Calcium Channel blockers appeared to be the mainstay of antihypertensive therapy in 50% of patients whilst Beta Blockers use was reported in 45% of patients. Other antihypertensives were reported in 14% of patients. The widespread use of Calcium Channel blockers either as monotherapy or combination may be due to the use of the dihydropyridine group to minimise the dose of cyclosporine, which remains the main immunosuppressive drug.

SECTION 5.4: TRANSPLANT OUTCOMES

5.4.1 Post-transplant Complications

In the year 2008, sixty-two percent of patients were hypertensive prior to transplantation whereas 27% developed hypertension post transplantation. Fourteen percent of patients had diabetes mellitus prior to transplant whereas only 7% of patients developed post transplant diabetes mellitus. These trends have been quite the same since 2006. In terms of cardiovascular and cerebrovascular disease 4% had either or both prior to transplant whereas 5% developed these post transplantation.

Table 5.4.1: Post-transplant Complications, 2006-2008

Post transplant complications	Complication developed before transplant (regardless of complication after transplantation)						Complication developed only after transplantation					
	2006		2007		2008		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
All patients	1592	100	1686	100	1499	100	1592	100	1686	100	1499	100
Diabetes (either as Primary Renal Disease or co-morbid)	216	14	230	14	204	14	125	8	112	7	112	7
Cancer	2	0	3	0	2	0	20	1	21	1	26	2
Cardiovascular disease + cerebrovascular disorder	73	5	72	4	61	4	45	3	54	3	70	5
Hypertension	1035	65	1062	63	927	62	354	22	450	27	400	27

*Hypertension: BP systolic>140 and BP diastolic >90
OR have either Beta blocker/ Calcium channel blocker / ACE inhibitor / AIIRB / Other anti-hypertensive

5.4.2 Deaths and Graft Loss

In 2008, 48 transplant recipients died and 32 lost their grafts. The rates of transplant death and graft loss have remained static for the past 10 years (Table 5.4.2). The main known causes of death have been infection and cardiovascular disease with 26% and 13% respectively. Another 23% of patients died at home, which is usually presumed to be cardiovascular death as well.

Cancer death rates have been significantly high since 2003 contributing to 15% of all deaths in 2003, 17% in 2004 and 19% in 2008. Death due to liver disease has remained relatively static at 5-9% from 2003 to 2006.

In terms of graft loss, 72% were due to rejection with 6% apiece for vascular causes and infections in 2008 and these figures have remained relatively stable for the last 4 years.

Table 5.4.2: Transplant Patients Death Rate and Graft Loss, 1999-2008

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. at risk	1145	1213	1291	1380	1466	1549	1638	1704	1728	1730
Transplant death	25	30	37	33	37	42	43	50	39	48
Transplant death rate %	2	2	3	2	3	3	3	3	2	3
Graft loss	37	32	40	39	42	44	21	38	37	32
Graft loss rate %	3	3	3	3	3	3	1	2	2	2
Acute rejection	0	0	0	0	3	19	14	18	12	0
Acute rejection rate %	0	0	0	0	0	1	1	1	1	0
All losses	62	62	77	72	79	86	64	88	76	80
All losses rate %	5	5	6	5	5	6	4	5	4	5

*Graft loss=graft failure
*All losses=death / graft loss (acute rejection happens concurrently with graft failure / death)

Figure 5.4.2(a): Transplant Recipient Death Rate, 1977-2008

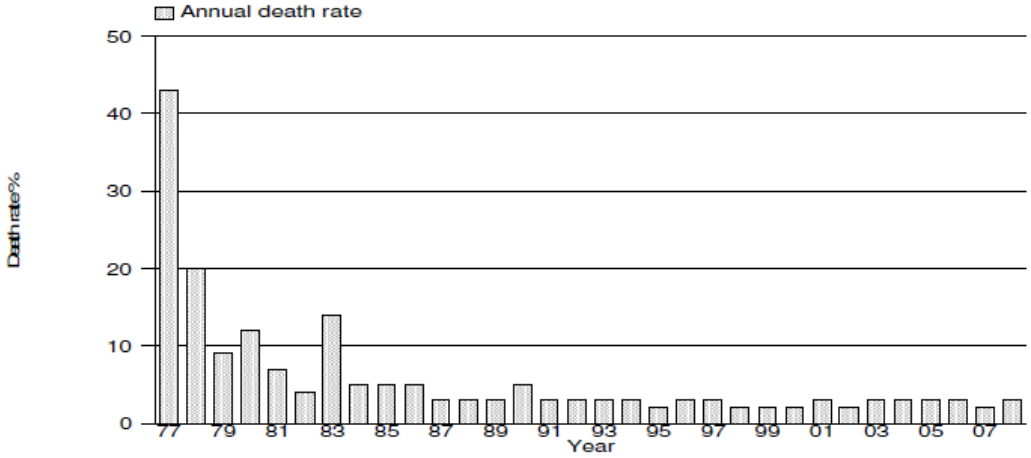


Figure 5.4.2(b): Transplant Recipient Graft Loss Rate, 1977-2008

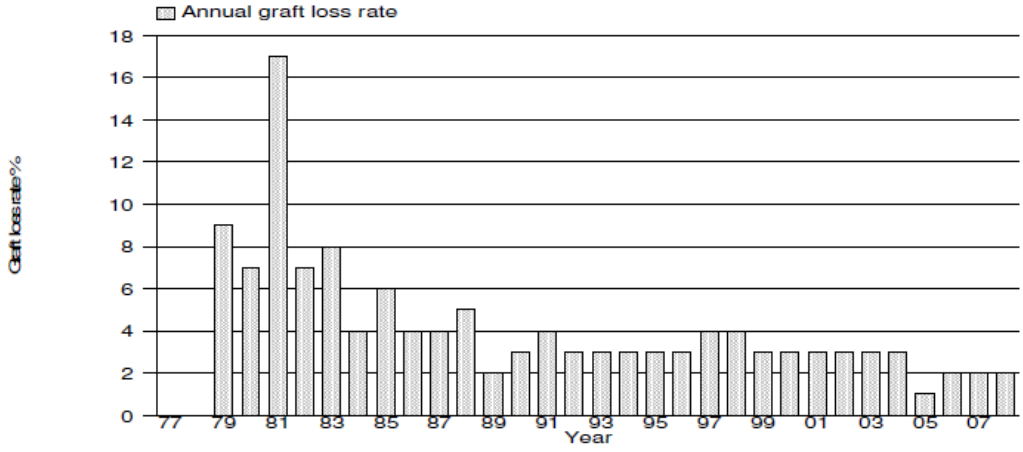


Table 5.4.3: Causes of Death in Transplant Recipients, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	4	13	10	29	7	16	5	15	9	23
Died at home	6	19	1	3	5	12	5	15	5	13
Infection	7	23	12	35	20	47	10	30	11	28
Graft failure	0	0	2	6	0	0	0	0	0	0
Cancer	3	10	2	6	6	14	4	12	6	15
Liver disease	3	10	1	3	1	2	3	9	2	5
Accidental death	1	3	1	3	1	2	1	3	0	0
Others	5	16	3	9	2	5	3	9	5	13
Unknown	2	6	2	6	1	2	2	6	2	5
TOTAL	31	100	34	100	43	100	33	100	40	100

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	4	9	5	11	10	18	7	16	7	13
Died at home	6	13	5	11	7	13	5	11	12	23
Infection	11	24	22	50	22	40	15	34	14	26
Graft failure	3	7	0	0	0	0	4	9	1	2
Cancer	8	17	5	11	4	7	6	14	10	19
Liver disease	3	7	3	7	5	9	0	0	0	0
Accidental death	0	0	0	0	0	0	0	0	0	0
Others	10	22	3	7	4	7	3	7	8	15
Unknown	1	2	1	2	3	5	4	9	1	2
TOTAL	46	100	44	100	55	100	44	100	53	100

Table 5.4.4: Causes of Graft Failure, 1999-2008

Year	1999		2000		2001		2002		2003	
	No.	%	No.	%	No.	%	No.	%	No.	%
Rejection	23	62	19	59	25	61	23	56	21	47
Calcineurin toxicity	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0	0	0	0	0	0	0	0	0	0
Ureteric obstruction	0	0	0	0	0	0	0	0	0	0
Infection	0	0	1	3	2	5	0	0	2	4
Vascular causes	1	3	3	9	1	2	0	0	3	7
Recurrent/ de novo renal disease	0	0	0	0	2	5	2	5	2	4
Others	0	0	2	6	0	0	4	10	1	2
Unknown	13	35	7	22	11	27	12	29	16	36
TOTAL	37	100	32	100	41	100	41	100	45	100

Year	2004		2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%	No.	%
Rejection	33	70	18	75	28	65	26	68	26	72
Calcineurin toxicity	0	0	0	0	1	2	0	0	0	0
Other drug toxicity	1	2	0	0	0	0	0	0	0	0
Ureteric obstruction	0	0	0	0	0	0	1	3	0	0
Infection	1	2	1	4	3	7	1	3	2	6
Vascular causes	4	9	2	8	4	9	1	3	2	6
Recurrent/ de novo renal disease	1	2	0	0	1	2	0	0	0	0
Others	0	0	1	4	3	7	4	11	2	6
Unknown	7	15	2	8	3	7	5	13	4	11
TOTAL	47	100	24	100	43	100	38	100	36	100

5.5: PATIENT AND GRAFT SURVIVAL

Overall patient survival rates from 1995 to 2008 have been 95%, 91%, 88% and 81% at year 1, 3, 5 and 10 respectively. Overall graft survival rate has been 91%, 85%, 80% and 66% at year 1, 3, 5 and 10 respectively.

Table 5.5.1: Patient Survival, 1995-2008

Interval (years)	No.	% Survival	SE
0	1925	100	-
1	1689	95	1
3	1351	91	1
5	971	88	1
10	296	81	1
12	125	75	2

*No.=Number at risk SE=standard error

Figure 5.5.1: Patient Survival, 1995-2008

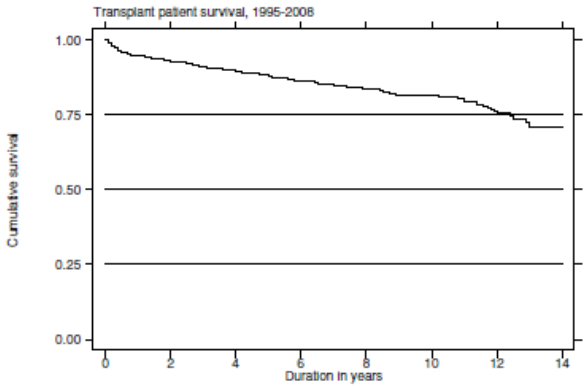
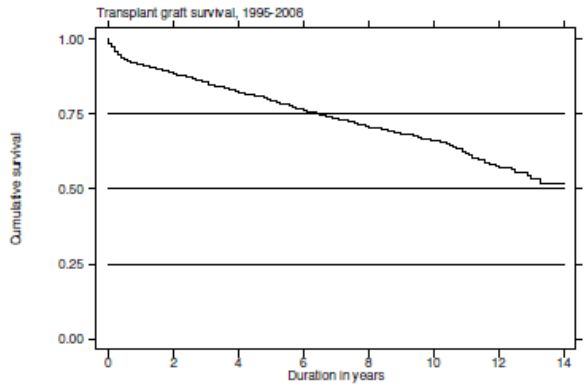


Table 5.5.2: Graft Survival, 1995-2008

Interval (years)	No.	% Survival	SE
0	1925	100	-
1	1689	91	1
3	1351	85	1
5	971	80	1
10	296	66	1
12	125	57	2

*No.=Number at risk SE=standard error

Figure 5.5.2: Graft Survival, 1995-2008



Outcomes of renal transplantation from the 4 donor groups are shown in respect to patient and graft survival in the Kaplan Meier survival graphs in Figures 5.5.3 and 5.5.4 respectively. In terms of patient survival, live donor grafts maintained good survival rates with 96%, 95%, 94% and 89% at years 1, 3, 5 and 10 respectively. In terms of graft survival, commercial cadaver grafts performed similarly well with a survival of 94%, 89%, 82% and 70% at year 1, 3, 5 and 10 compared to 92%, 88%, 84% and 68% for the same intervals for live donor grafts.

Table 5.5.3: Patient Survival by Type of Transplant, 1995-2008

Type of Transplant	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
0	1125	100	-	89	100	-	454	100	-	235	100	-
1	1022	96	1	85	98	2	395	96	1	168	85	2
3	843	92	1	64	89	3	320	95	1	110	78	3
5	576	88	1	46	85	4	249	94	1	90	75	3
10	177	81	2	16	67	7	83	89	2	15	71	4
12	74	75	3	5	58	10	44	85	3	4	63	8

*No.=Number at risk SE=standard error

Figure 5.5.3: Patient Survival by Type of Transplant, 1995-2008

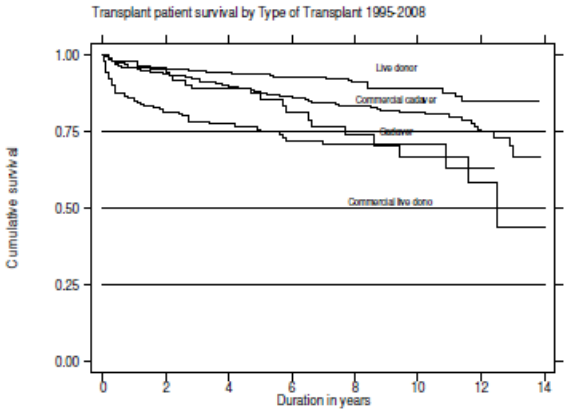


Figure 5.5.4: Graft Survival by Type of Transplants, 1995-2008

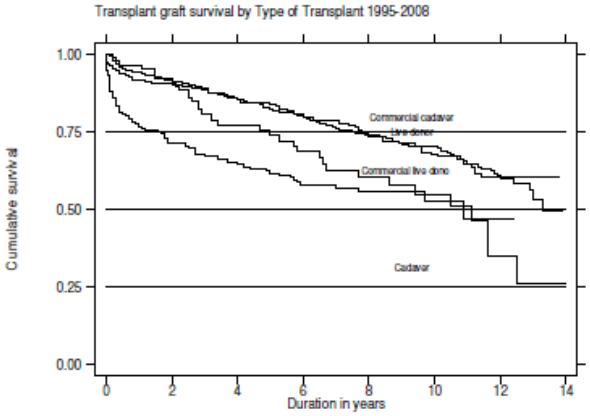


Table 5.5.4: Graft Survival by Type of Transplant, 1995-2008

Type of Transplant	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
0	1125	100	-	89	100	-	454	100	-	235	100	-
1	1022	94	1	85	97	2	395	92	1	168	77	3
3	843	89	1	64	81	4	320	88	2	110	67	3
5	576	82	1	46	74	5	249	84	2	90	62	3
10	177	70	2	16	54	7	83	68	3	15	53	5
12	74	60	3	5	35	9	44	60	4	4	47	7

*No.=Number at risk SE=standard error

Patient and graft survival for living related transplants were compared for two cohorts. The 1995-2000 cohort and the 2001-2008 cohort were compared for patient survival (Figures 5.5.5) but both were comparable and survival remained excellent for both groups.

Graft survival for living related transplants (Figure 5.5.6) however was much better in patients in the 2001-2008 cohort even from the outset probably due to increased usage of newer immunosuppressive agents.

Table 5.5.5: Patient Survival by Year of Transplant (Living Related Transplant, 1995-2008)

Year of Transplant	1995-2000			2001-2008		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE
0	206	100	-	248	100	-
1	184	97	1	212	95	1
3	175	96	1	146	94	2
5	164	95	2	86	93	2
7	155	94	2	27	92	2

*No.=Number at risk SE=standard error

Figure 5.5.5: Patient Survival by Year of Transplant (Living Related Transplant, 1995-2008)

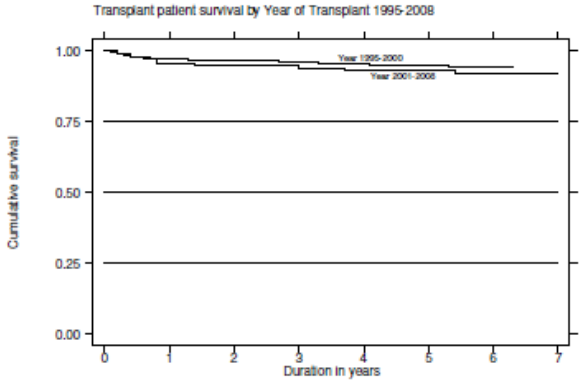


Figure 5.5.6: Graft Survival by Year of Transplant (Living Related Transplant, 1995-2008)

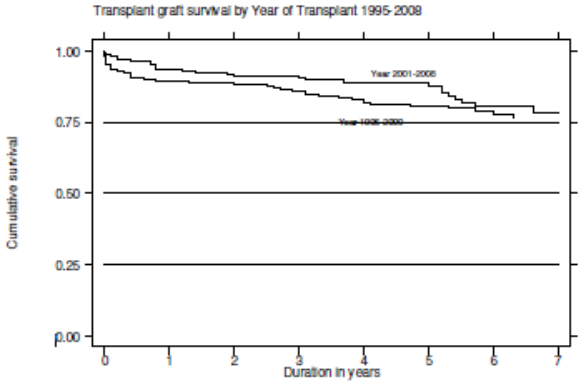


Table 5.5.6: Graft Survival by Year of Transplant (Living Related Transplant, 1995-2008)

Year of Transplant	1994-1999			2000-2007		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE
0	206	100	-	248	100	-
1	184	89	2	212	94	2
3	175	86	2	146	91	2
5	164	80	3	86	87	2
7	155	76	3	27	78	4

*No.=Number at risk SE=standard error

In terms of commercial cadaveric transplantation, the comparison between the 1995-2000 cohort and 2001-2008 cohort was performed. Both patient and graft survival showed comparable results to living related transplants done within the country.

Table 5.5.7: Patient Survival by Year of Transplant (Commercial Cadaver Transplant, 1995-2008)

Year of Transplant	1995-2000			2001-2008		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE
0	417	100	-	708	100	-
1	394	96	1	630	95	1
3	373	93	1	473	91	1
5	336	88	2	240	87	1
7	305	85	2	57	82	2

*No.=Number at risk SE=standard error

Figure 5.5.7: Patient Survival by Year of Transplant (Commercial Cadaver Transplant, 1995-2008)

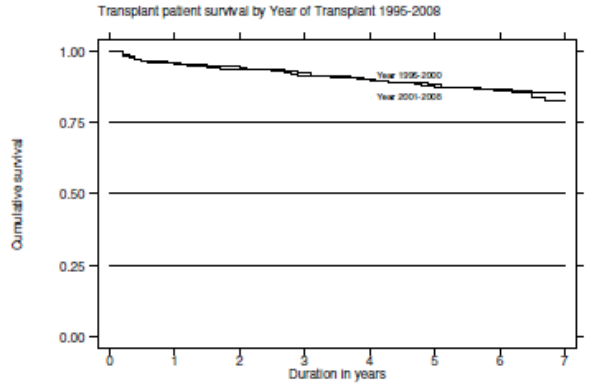


Figure 5.5.8: Graft Survival by Year of Transplant (Commercial Cadaver Transplant, 1995-2008)

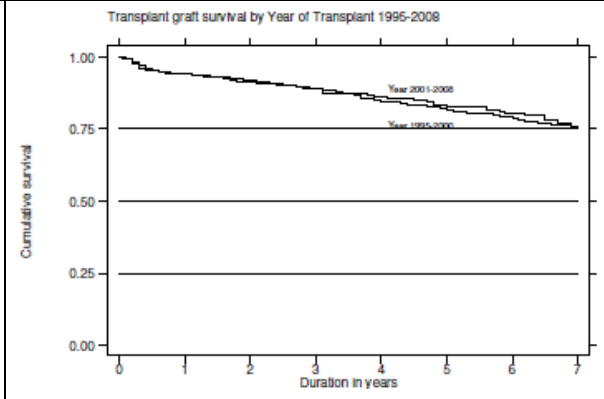


Table 5.5.8: Graft Survival by Year of Transplant (Commercial Cadaver Transplant, 1995-2008)

Year of Transplant	1995-2000			2001-2008		
Interval (years)	No.	% Survival	SE	No.	% Survival	SE
0	417	100	-	708	100	-
1	394	94	1	630	94	1
3	373	89	2	473	89	1
5	336	82	2	240	83	2
7	305	75	2	57	76	3

*No.=Number at risk SE=standard error

SECTION 5.6: CARDIOVASCULAR RISK IN RENAL TRANSPLANT RECIPIENTS

5.6.1 Risk Factors for Ischaemic Heart Disease

In 2008, 85.2% of patients were hypertensive, 23.2% were diabetic and 56.8% had renal insufficiency fulfilling CKD III and above. Forty-five percent of patients had 2 cardiovascular risk factors while 10% had all 3 major risk factors.

Table 5.6.1: Risk Factors for IHD in Renal Transplant Recipients at Year 2006, 2007 and 2008

	2006	2007	2008
Diabetes	21 (1.4)	25 (1.6)	17 (1.2)
Hypertension**	455 (31.1)	590 (37.5)	514 (36.8)
CKD	177 (12.1)	127 (8.1)	116 (8.3)
Diabetes + Hypertension**	155 (10.6)	174 (11.0)	172 (12.3)
Diabetes + CKD	18 (1.2)	11 (0.7)	21 (1.5)
CKD + Hypertension**	490 (33.5)	516 (32.8)	451 (32.3)
Diabetes + CKD + Hypertension**	147 (10.0)	132 (8.4)	106 (7.6)

**Hypertension: BP systolic > 140 and BP diastolic > 90 OR have either Beta blocker / Calcium channel blocker / ACE inhibitor / AIIRB / Other anti-hypertensive drugs
GFR (mL/min/1.73m2) = 1.2*(140-age(year))*weight(kg) / creatinine (µmol/L) if male
GFR (mL/min/1.73m2) = 0.85*(1.2*(140-age(year))*weight(kg) / creatinine (µmol/L) if female
CKD stage III-GFR, 30-60
CKD stage IV-GFR, 15-30
CKD stage V-GFR, <15

Figure 5.6.1(a): Venn Diagram for Pre and Post Transplant Complications (in %) at year 2006

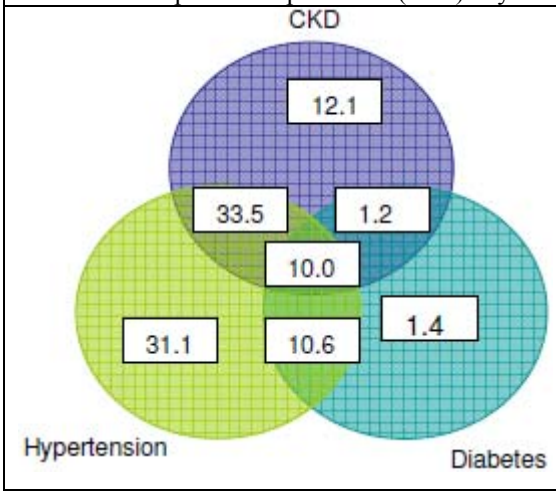


Figure 5.6.1(b): Venn Diagram for Pre and Post Transplant Complications (in %) at year 2007

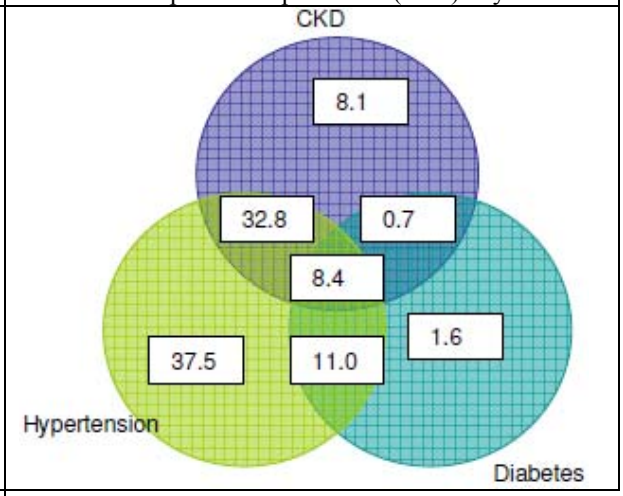
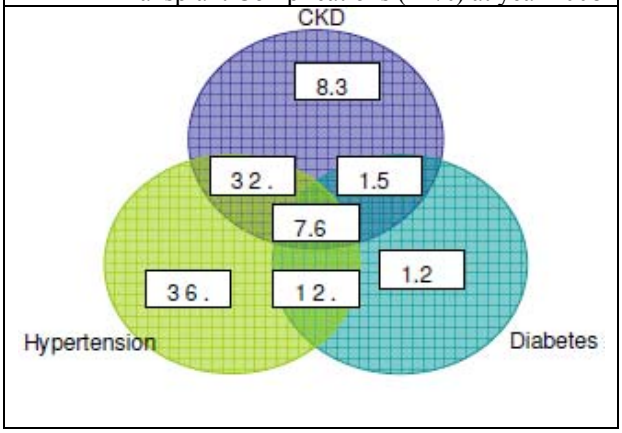


Figure 5.6.1 (c): Venn Diagram for Pre and Post Transplant Complications (in %) at year 2008



5.6.2 Blood Pressure Classification According to JNC VI Criteria, 2006, 2007, and 2008

In 2008, 22% of renal transplant recipients had stage I hypertension whereas 5% had stage II hypertension and 0.7% had stage III hypertension despite being on treatment. In terms of diastolic hypertension 13% had stage I hypertension, 1.4% of patients had stage II diastolic hypertension and 0.33% of patients had stage III diastolic hypertension despite being on treatment.

Table 5.6.2(a): Systolic BP, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Systolic BP<120	249	(15.64)	240	(14.23)	279	(18.61)
Systolic BP <130	395	(24.81)	392	(23.25)	367	(24.48)
Systolic BP 130-139	483	(30.34)	529	(31.38)	441	(29.42)
Systolic BP 140-159	353	(22.17)	409	(24.26)	329	(21.95)
Systolic BP 160-179	93	(5.84)	99	(5.87)	73	(4.87)
Systolic BP >=180	19	(1.19)	17	(1.01)	10	(0.67)

Figure 5.6.2(a): Systolic BP, 2006-2008

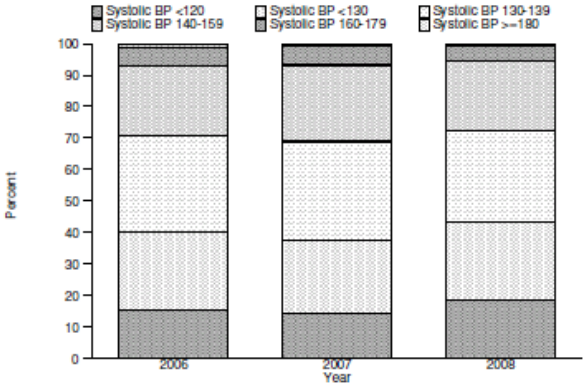


Figure 5.6.2(b): Diastolic BP, 2006-2008

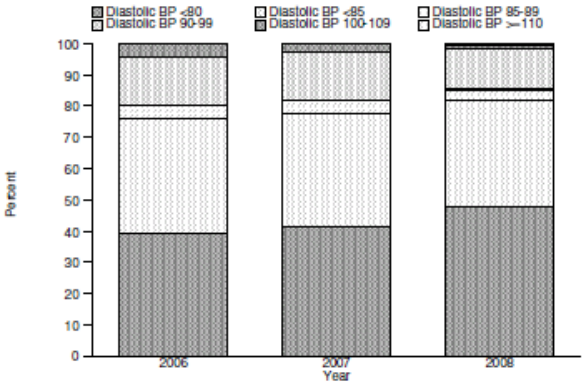


Table 5.6.2(b): Diastolic BP, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Diastolic BP<80	624	(39.20)	698	(41.40)	714	(47.63)
Diastolic BP <85	586	(36.81)	609	(36.12)	514	(34.29)
Diastolic BP 85-89	73	(4.59)	74	(4.39)	50	(3.34)
Diastolic BP 90-99	244	(15.33)	261	(15.48)	195	(13.01)
Diastolic BP 100-109	61	(3.83)	39	(2.31)	21	(1.40)
Diastolic BP >=110	4	(0.25)	5	(0.30)	5	(0.33)

Table 5.6.3: CKD stages, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
CKD stage 1	116	(7.33)	180	(10.79)	145	(9.82)
CKD stage 2	533	(33.67)	592	(35.49)	561	(37.98)
CKD stage 3	805	(50.85)	760	(45.56)	642	(43.47)
CKD stage 4	107	(6.76)	113	(6.77)	106	(7.18)
CKD stage 5	22	(1.39)	23	(1.38)	23	(1.56)

Table 5.6.3 shows the CKD Stage classification by year and in 2008, 43.5% of renal transplant recipients had CKD Stage III whilst another 7.2% had CKD Stage IV. CKD Stage V (impending renal replacement therapy) was found in 1.6% of renal transplant recipients.

Figure 5.6.3: CKD stages by year

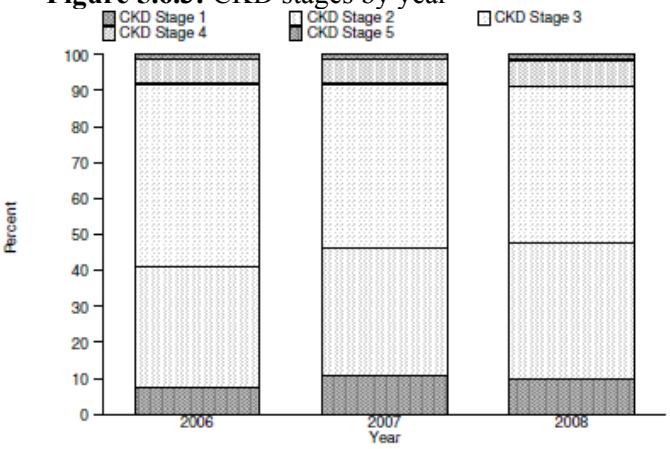


Table 5.6.4: BMI, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
BMI <20	242	(15.20)	253	(15.01)	244	(16.28)
BMI 20-25	647	(40.64)	658	(39.03)	588	(39.23)
BMI 25-30	498	(31.28)	533	(31.61)	455	(30.35)
BMI > 30	205	(12.88)	242	(14.35)	212	(14.14)

In terms of BMI for 2008, 55.5% of renal transplant recipients had BMIs of 25 or below. However 30.1% were overweight and another 14% were obese. There seems to be a slow but steady increase in numbers of obese patients over the last few years.

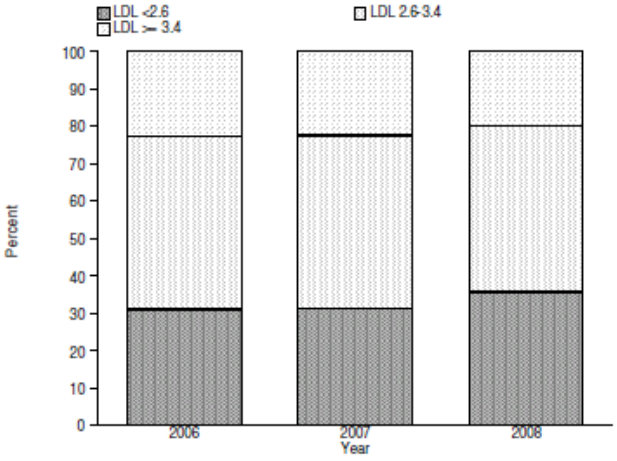
Figure 5.6.4: BMI by year

Table 5.6.5(a): LDL, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
LDL < 2.6	492	(30.90)	527	(31.26)	534	(35.62)
LDL 2.6-3.4	738	(46.36)	778	(46.14)	669	(44.63)
LDL >= 3.4	362	(22.74)	381	(22.60)	296	(19.75)

LDL cholesterol has been identified as the primary lipid target for prevention of coronary heart disease by NCEP with a log linear relationship between risk of CHD and level of LDL cholesterol. In terms of renal transplant recipients in 2008 35.6% have LDL levels below 2.6 mol/l and this shows an increasing trend from 18.1% in 2004, possibly due to the more widespread and aggressive use of statins. Whether or not this translates into less cardiovascular mortality in the transplant population is still questionable. Patients with serum LDL >3.4 also demonstrated downward trend over the last few years.

Figure 5.6.5 (a): LDL, 2006-2008



In terms of other cholesterol parameters for 2008, 56% had total cholesterol levels >= 5.2 and 6.2% had HDL cholesterol levels <1.0 .

Table 5.6.5(b): Total Cholesterol, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
Total Cholesterol <4.1	160	(10.05)	210	(12.46)	184	(12.27)
Total Cholesterol 4.1-5.1	490	(30.78)	539	(31.97)	476	(31.75)
Total Cholesterol 5.1-6.2	700	(43.97)	719	(42.65)	629	(41.96)
Total Cholesterol 6.2- 7.2	173	(10.87)	159	(9.43)	143	(9.54)
Total Cholesterol > 7.2	69	(4.33)	59	(3.50)	67	(4.47)

Figure 5.6.5(b): Total Cholesterol, 2006-2008

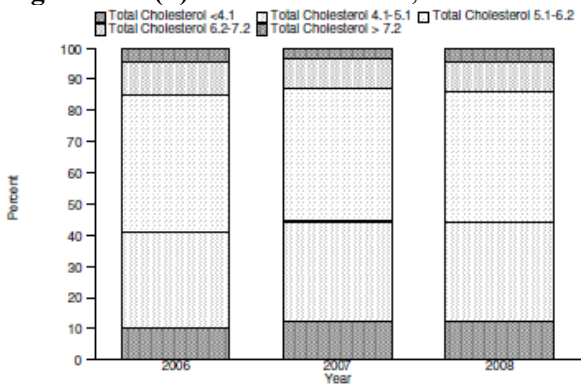
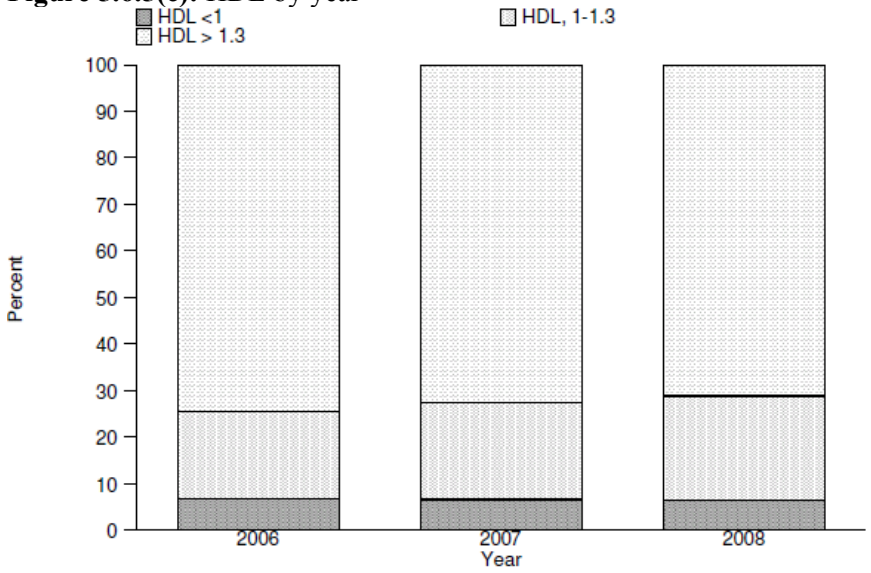


Table 5.6.5(c): HDL, 2006-2008

Year	2006		2007		2008	
	No.	(%)	No.	(%)	No.	(%)
HDL <1	104	(6.53)	108	(6.41)	93	(6.20)
HDL 1-1.3	302	(18.97)	350	(20.76)	338	(22.55)
HDL >1.3	1186	(74.50)	1228	(72.84)	1068	(71.25)

Figure 5.6.5(c): HDL by year



Eighty-six percent of patients in 2008 were on antihypertensives and the majority were on more than 1 antihypertensive drug with 31% on 2 antihypertensives and 21% on 3 antihypertensives. Six percent of patients still had systolic BP of > 160 mmHg and 17% had diastolic BP of > 90 mmHg despite being given antihypertensive(s), however, this is an improvement from previous years.

Table 5.6.6(a): Treatment for hypertension, 2006-2008

Year	No.	% on anti-hypertensives	% no 1 anti-hypertensive drug	% on 2 anti-hypertensives	% on 3 anti-hypertensives
2006	1592	86	34	26	17
2007	1686	85	25	31	21
2008	1499	86	27	31	21

Table 5.6.6(b): Distribution of Systolic BP without anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 160mmHg
2006	189	123.8	14.4	120	117	130	4
2007	196	125.2	16.5	120	113	134	4
2008	171	124	15.6	120	110	130	4

Table 5.6.6(c): Distribution of Diastolic BP without anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% patients ≥ 90mmHg
2006	189	76.4	10.3	80	70	80	11
2007	196	76.6	10	80	70	80	12
2008	170	75.2	10.2	80	70	80	11

Table 5.6.6(d): Distribution of Systolic BP on anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 160mmHg
2006	1334	131.7	16.3	130	120	140	8
2007	1388	132.6	16	130	120	140	8
2008	1241	129.9	16.6	130	120	140	6

Table 5.6.6(e): Distribution of Diastolic BP on anti-hypertensives, 2006-2008

Year	No.	Mean	SD	Median	LQ	UQ	% Patients ≥ 90 mmHg
2006	1334	79.2	9.9	80	70	86	22
2007	1387	79.1	9.6	80	70	85	20
2008	1227	77.6	9.9	80	70	80	17

SECTION 5.7: QOL INDEX SCORE IN RENAL TRANSPLANT RECIPIENTS

1179 patients who were transplanted between 1999-2008 were analysed for QoL index score. They reported median QoL index score of 10 (Table 5.7.1 and Figure 5.7.1). It was interesting to note that for those who underwent renal transplantation between this period, diabetics and non-diabetics had the same median QoL index score of 10 (Table 5.7.2 and Figure 5.7.2), and this is in contrast to HD and CAPD patients where diabetics reported lower QoL index score than non-diabetics. There was also no difference seen between gender (Table 5.7.3 and Figure 5.7.3) and age (Table 5.7.4 and Figure 5.7.4). It is worthwhile to note that those above 60 years old also enjoyed the same QoL index score (10) as their younger counterparts (Table 5.7.4 and Figure 5.7.4). This trend of high QoL index score among renal transplant patients was maintained over the last 10 years (Table 5.7.5 and Figure 5.7.5).

Table 5.7.1: Cumulative distribution of QoL-Indexscore in Transplant recipients 1999 - 2008

	QoL score
Number of patients	1179
Centile	
0	0
0.05	9
0.1	9
0.25 (LQ)	10
0.5 (median)	10
0.75 (UQ)	10
0.9	10
0.95	10
1	10

Figure 5.7.1: Cumulative distribution of QoL-Index score in Transplant recipients, 1999 - 2008

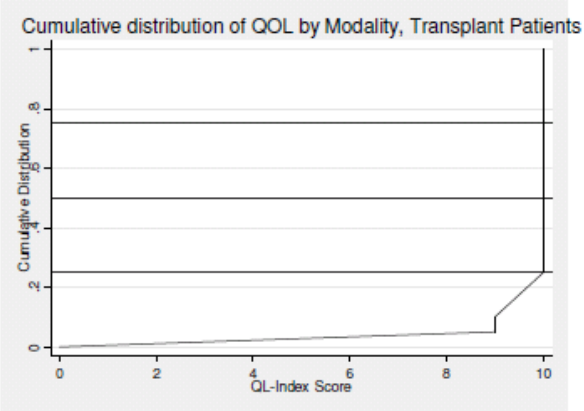


Table 5.7.2: Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipients 1999 - 2008

Diabetes mellitus	No	Yes
Number of patients	1054	125
Centile		
0	0	0
0.05	9	7
0.1	10	8
0.25 (LQ)	10	9
0.5 (median)	10	10
0.75 (UQ)	10	10
0.9	10	10
0.95	10	10
1	10	10

Figure 5.7.2: Cumulative distribution of QoL-Index score in relation to Diabetes mellitus, Transplant recipients 1999 – 2008

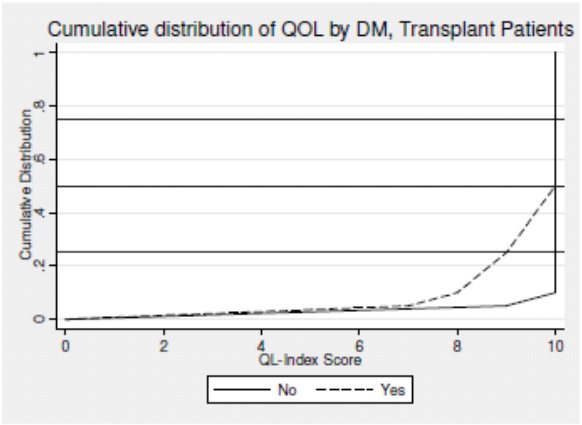


Table 5.7.3: Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipients 1999-2008

Gender	Male	Female
Number of patients	730	449
Centile		
0	0	0
0.05	9	9
0.1	10	9
0.25 (LQ)	10	10
0.5 (median)	10	10
0.75 (UQ)	10	10
0.9	10	10
0.95	10	10
1	10	10

Figure 5.7.3: Cumulative distribution of QoL-Index score in relation to Gender, Transplant recipients 1999-2008

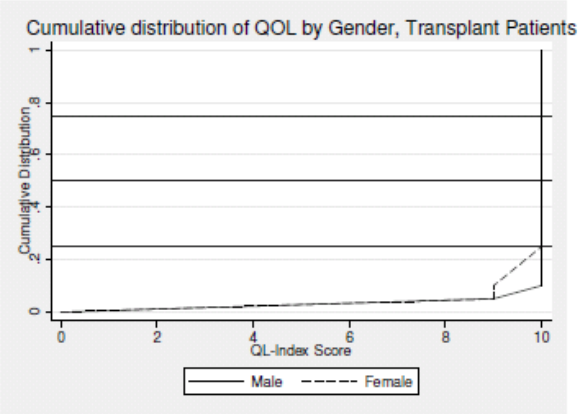


Table 5.7.4: Cumulative distribution of QoL-Index score in relation to Age, Transplant recipients 1999-2008

Age group (years)	<20	20-39	40-59	≥60
Number of patients	117	472	515	75
Centile				
0	0	0	0	0
0.05	9	9	8	7
0.1	10	10	9	8
0.25 (LQ)	10	10	10	9
0.5 (median)	10	10	10	10
0.75 (UQ)	10	10	10	10
0.9	10	10	10	10
0.95	10	10	10	10
1	10	10	10	10

Figure 5.7.4: Cumulative distribution of QoL-Index score in relation to Age, Transplant recipients 1999-2008

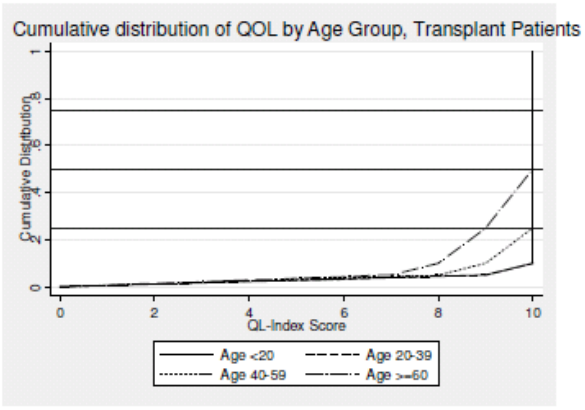
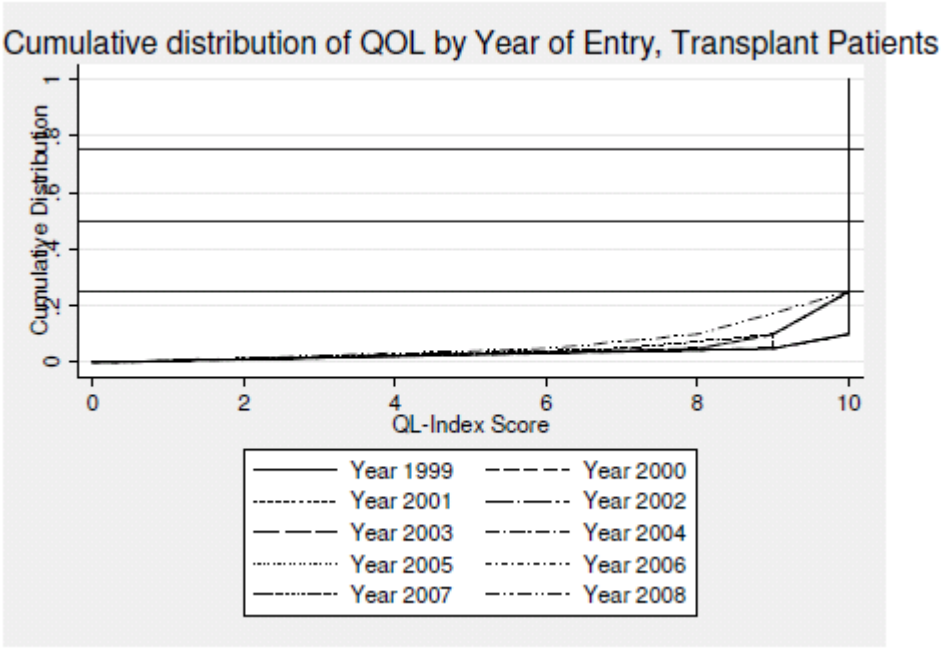


Table 5.7.5: Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipients 1999-2008

Year of Entry	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of patients	101	110	126	143	136	167	137	128	76	55
Centile										
0	0	0	0	0	0	0	0	0	0	0
0.05	9	8	9	9	8	9	9	9	7	6
0.1	10	9	9	10	9	10	10	10	9	8
0.25 (LQ)	10	10	10	10	10	10	10	10	10	10
0.5 (median)	10	10	10	10	10	10	10	10	10	10
0.75 (UQ)	10	10	10	10	10	10	10	10	10	10
0.9	10	10	10	10	10	10	10	10	10	10
0.95	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10

Figure 5.7.5: Cumulative distribution of QoL-Index score in relation to Year of entry, Transplant recipients 1999-2008



CHAPTER 6

HOMOGRAFT - HEART VALVE TRANSPLANTATION

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6.0 INTRODUCTION

Valvular homografts are used routinely in cardiac surgery especially for patients with congenital valvular heart disease. They are used as biological conduits to replace absent valves or to reconstruct outflow tracks in the heart. Homografts are superior to artificial valves due to their inherent traits such as superior perfusion parameters, durability, ease of handling and reduced risk of thrombo-embolic phenomenon. This removes the need for tight anticoagulation treatment post operatively and is extremely convenient for children and women of childbearing age in whom anticoagulation is contraindicated. Homografts have inherent resistance to infection and are preferred in an environment where sepsis is of concern.

Institut Jantung Negara (IJN) established the cardiovascular tissue bank in 1995. This was in response to the rising need for homografts and also the rising cost of importing homografts from overseas.

The Homograft Unit in IJN comprises of surgeons and medical technicians who are involved in retrieving, processing and cryopreserving the homografts for storage. The detailed records of the size of the homografts are documented. The infective state and the serology status of the donors are also documented.

The outcome of patients that had been implanted with homografts has been encouraging and these patients have been having good quality of life.

The continued efforts by the Ministry of Health in promoting organ and tissue donation have helped to improve the availability of homografts in the country. The efficient and better streamlining of organisation structure has improved networking between various hospitals and transplant units with better public and medical staff awareness.

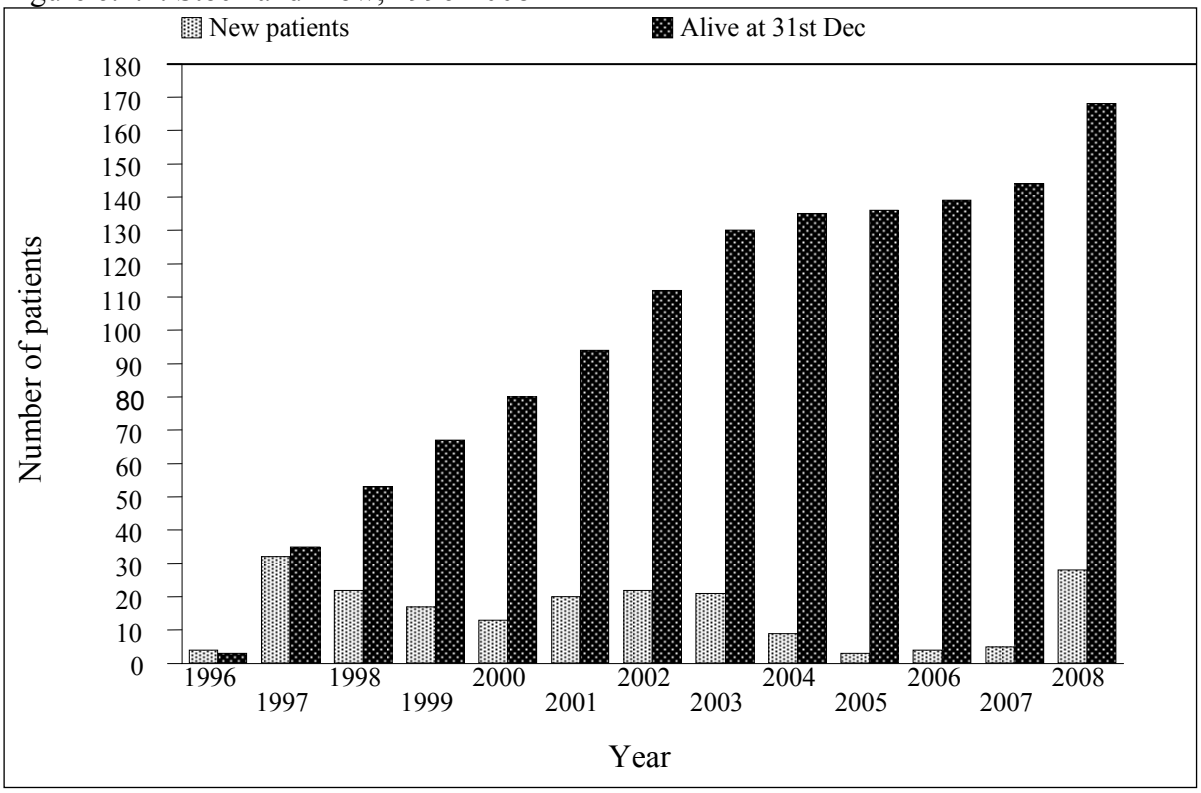
6.1 STOCK AND FLOW

Table 6.1.1: Stock and Flow, 1996-2008

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
New transplant	4	32	22	17	13	20	22	21	9	3	4	5	28
Deaths*	1	0	4	3	0	6	4	3	4	2	1	0	3
Lost to follow up	0	0	0	0	0	0	0	0	0	0	0	0	0
Alive with functioning graft at 31st December	3	35	53	67	80	94	112	130	135	136	139	144	168

*based on year of death

Figure 6.1.1: Stock and Flow, 1996-2008



6.2 RECIPIENTS' CHARACTERISTICS

Table 6.2.1: Distribution of Patients by Gender, 1996-2008

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**TOTAL**
Gender	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Male	2	19	9	9	10	6	9	14	3	0	4	2	13	100
Female	2	13	13	8	3	14	13	7	6	3	0	3	15	100
TOTAL	**4**	**32**	**22**	**17**	**13**	**20**	**22**	**21**	**9**	**3**	**4**	**5**	**28**	**200**

Figure 6.2.1: Distribution of Patients by Gender, 1996-2008

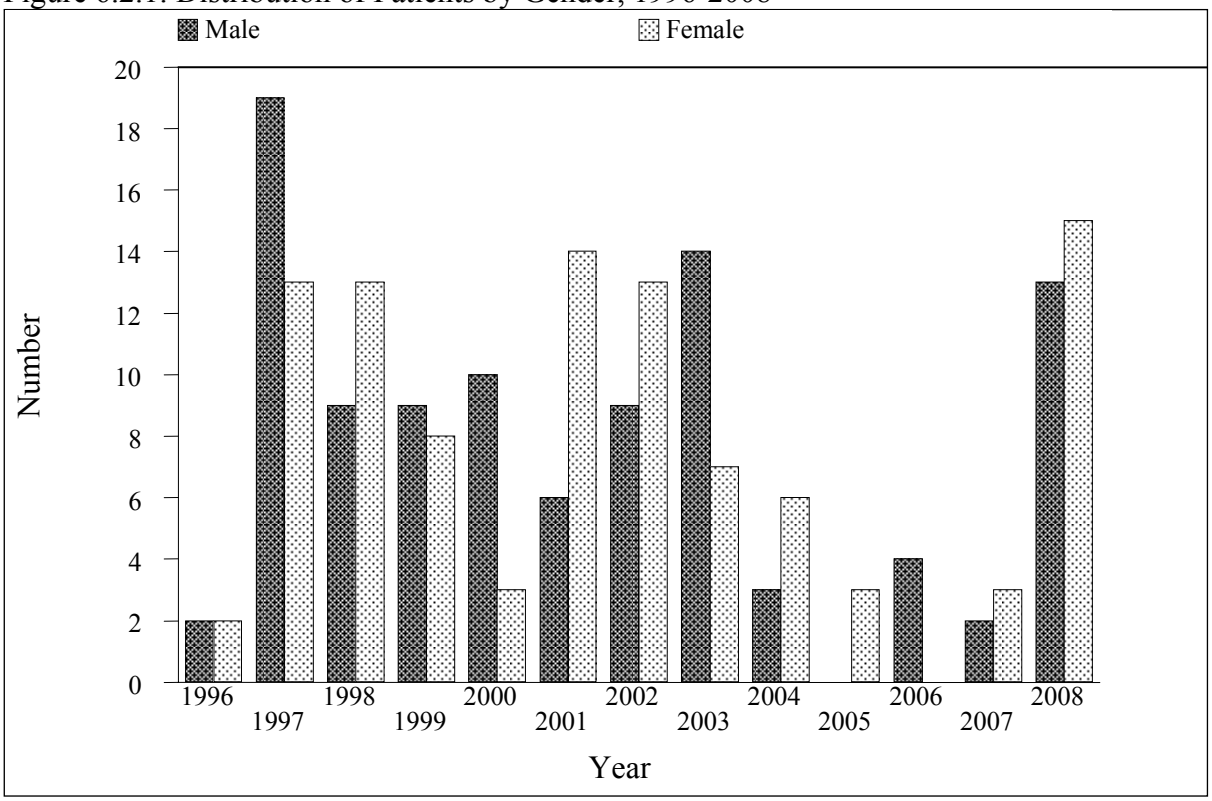


Table 6.2.2: Distribution of Patients by Ethnic Group, 1996-2008

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**TOTAL**
Ethnic group	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Malay	1	19	15	9	9	10	16	12	6	3	2	3	18	123
Chinese	3	11	4	3	2	9	4	6	1	0	1	0	7	51
Indian	0	2	2	2	0	1	2	2	1	0	1	0	1	14
Others	0	0	1	3	2	0	0	1	1	0	0	2	2	12
TOTAL	**4**	**32**	**22**	**17**	**13**	**20**	**22**	**21**	**9**	**3**	**4**	**5**	**28**	**200**

Figure 6.2.2: Distribution of Patients by Ethnic Group, 1996-2008

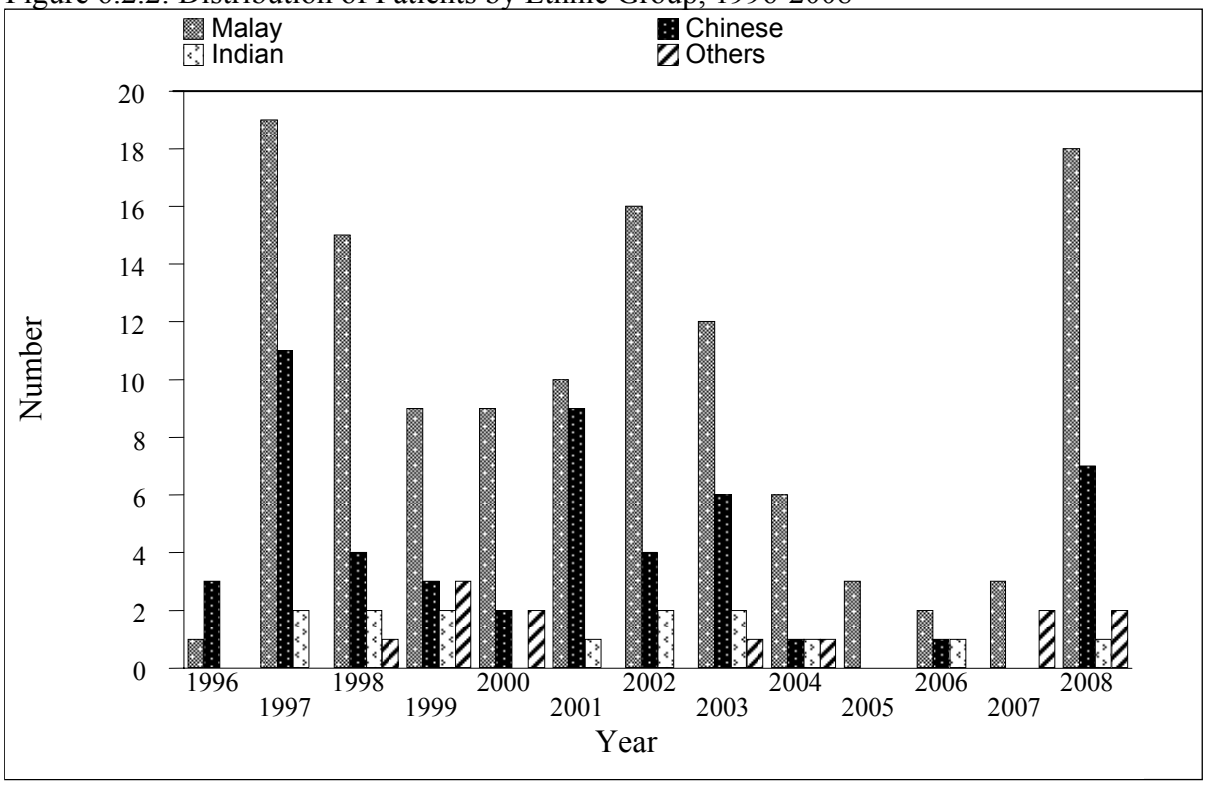
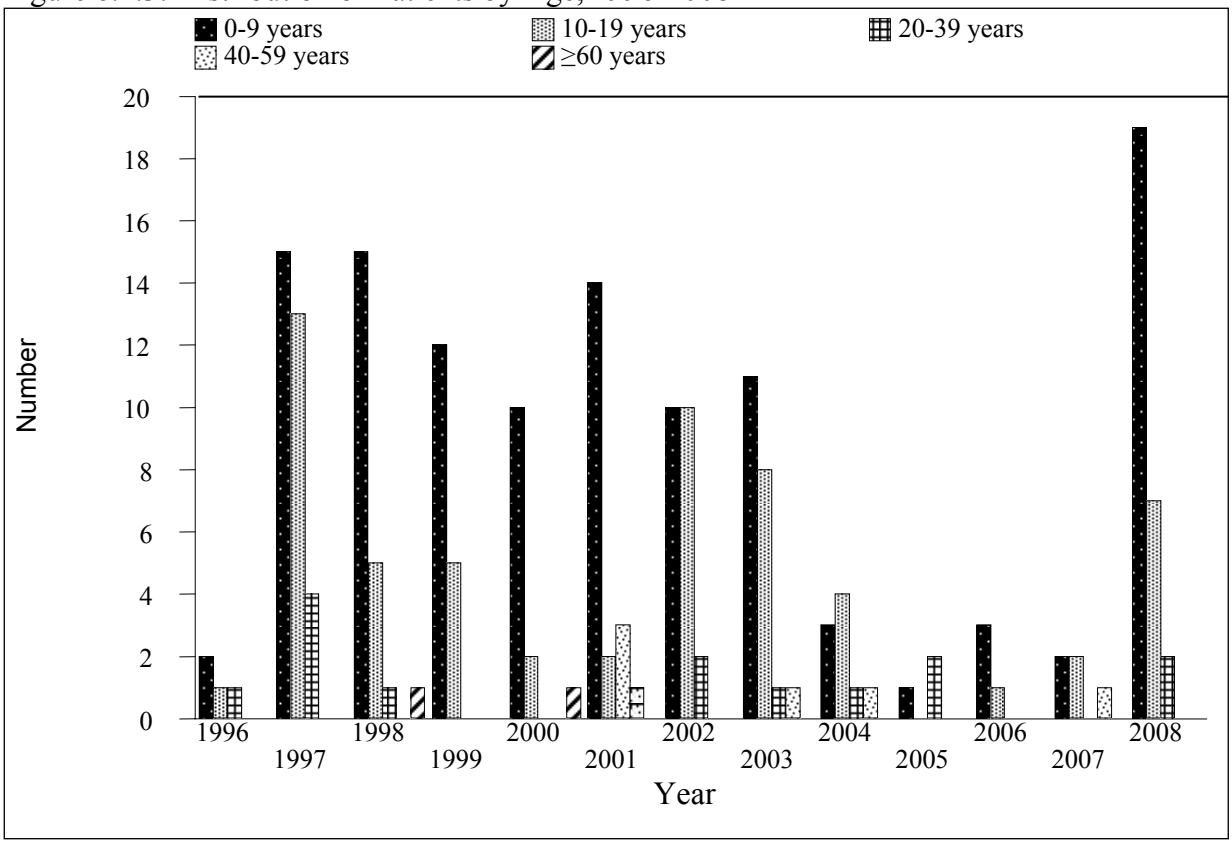


Table 6.2.3: Distribution of Patients by Age, 1996-2008

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**TOTAL**
Age group	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
0-9	2	15	15	12	10	14	10	11	3	1	3	2	19	117
10-19	1	13	5	5	2	2	10	8	4	0	1	2	7	60
20-39	1	4	1	0	0	3	2	1	1	2	0	0	2	17
40-59	0	0	0	0	0	1	0	1	1	0	0	1	0	4
≥60	0	0	1	0	1	0	0	0	0	0	0	0	0	2
TOTAL	**4**	**32**	**22**	**17**	**13**	**20**	**22**	**21**	**9**	**3**	**4**	**5**	**28**	**200**
Mean	12	11	11	7	12	11	10	12	15	15	6	16	7	11
SD	7	7	15	4	17	14	6	11	11	8	5	18	6	10
Median	11	10	8	7	8	5	10	9	10	20	5	11	7	8
Min	5	3 months	3 months	1	2	5 months	3	2	5	6	1	4 months	1 months	1 months
Max	21	30	70	17	67	53	28	53	42	20	12	47	21	70

* Age=date of implantation – date of birth

Figure 6.2.3: Distribution of Patients by Age, 1996-2008



6.3 TRANSPLANT PRACTICES

6.3.1 Donor Details

Table 6.3.1: Number of Valves Harvested by Type of Homograft, 1996-2008

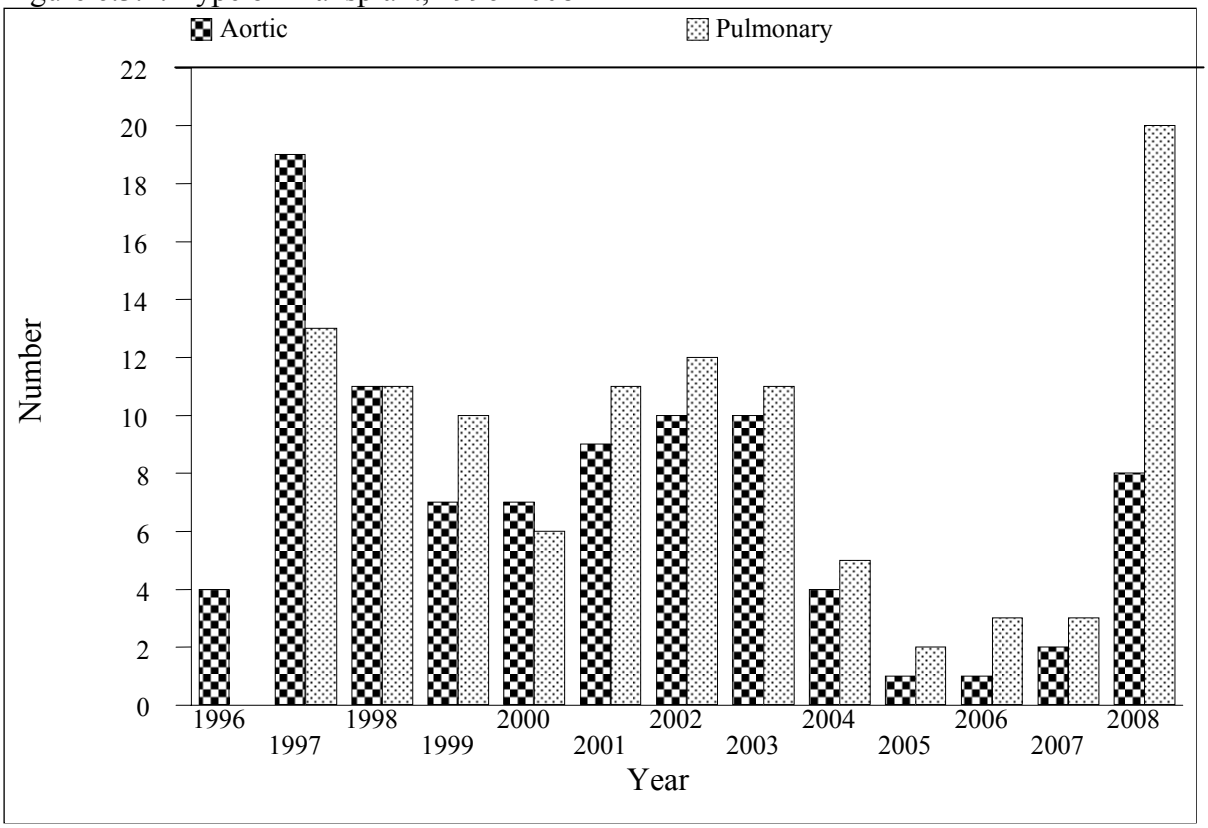
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Type of homograft	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Aortic	8	17	10	8	11	14	10	8	7	5	14	9	15	136
Pulmonary	1	14	11	10	12	12	14	9	8	5	15	8	13	132
TOTAL	**9**	**31**	**21**	**18**	**23**	**26**	**24**	**17**	**15**	**10**	**29**	**17**	**28**	**268**

6.3.2 Transplant Details

Table 6.3.2: Type of Transplant, 1996-2008

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Type of transplant	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**	**No.**
Aortic	4	19	11	7	7	9	10	10	4	1	1	2	8	93
Pulmonary	0	13	11	10	6	11	12	11	5	2	3	3	20	107
TOTAL	**4**	**32**	**22**	**17**	**13**	**20**	**22**	**21**	**9**	**3**	**4**	**5**	**28**	**200**

Figure 6.3.2: Type of Transplant, 1996-2008



6.4 TRANSPLANT OUTCOMES

Table 6.4.1: Patient Survival by Gender, 1996-2008

Gender	Male		Female	
Interval (years)	% Survival	SE	% Survival	SE
1	92	3	89	3
3	89	3	86	4
5	87	4	86	4

SE=standard error

Figure 6.4.1: Patient Survival by Gender, 1996-2008

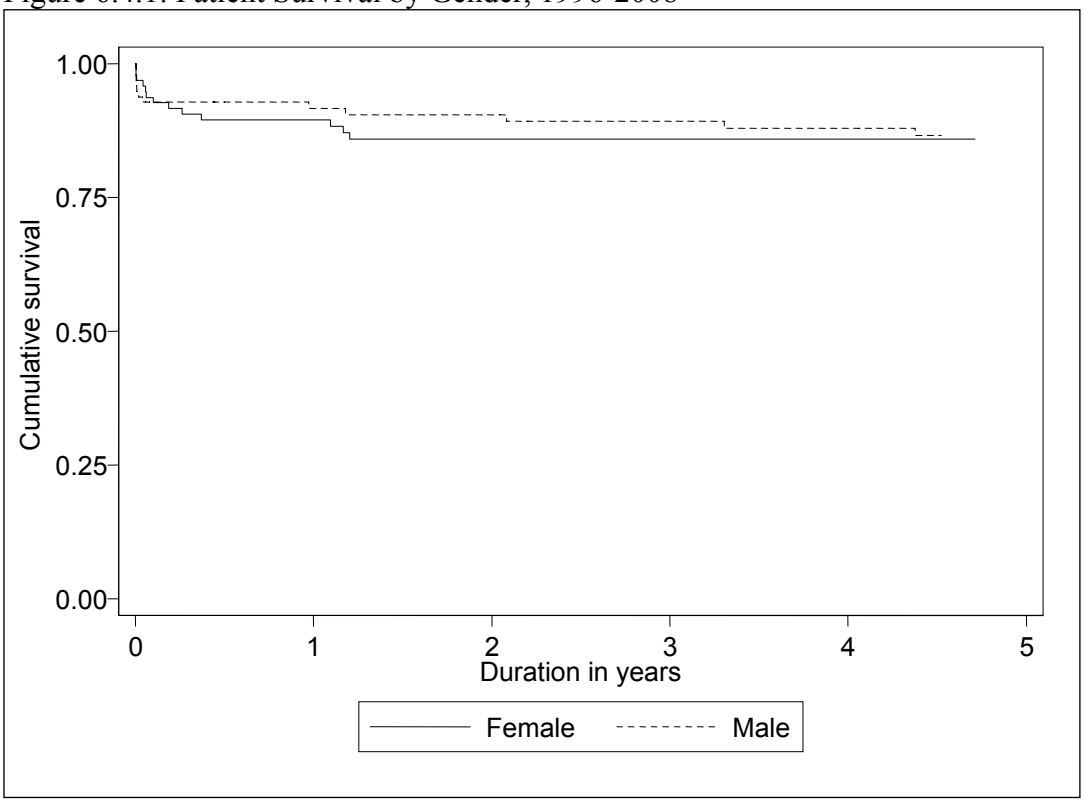


Table 6.4.2: Patient Survival by Age Group, 1996-2008

Age group	**0-9 years**		**10-19 years**		**≥20 years**	
Interval (months)	**% Survival**	**SE**	**% Survival**	**SE**	**% Survival**	**SE**
1	88	3	97	2	85	8
3	87	3	91	4	80	9
5	87	3	89	4	74	10

SE=standard error

Figure 6.4.2: Patient Survival by Age Group, 1996-2008

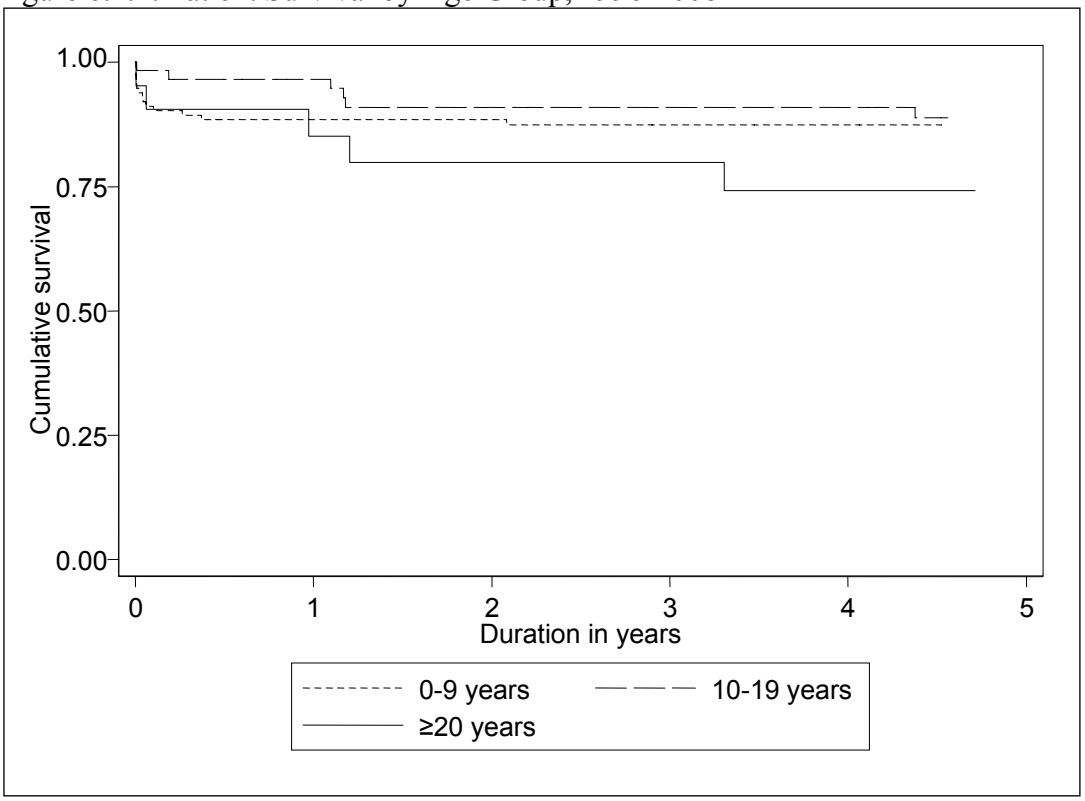
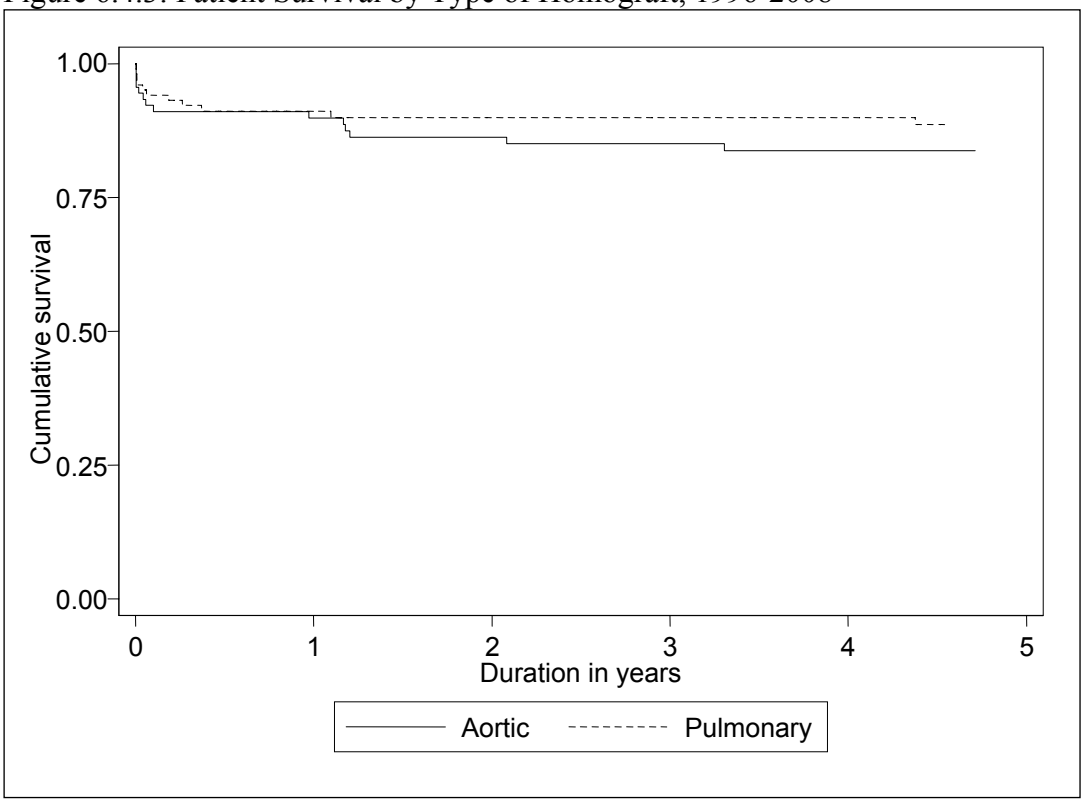


Table 6.4.3: Patient Survival by Type of Homograft, 1996-2008

Type of homograft	Aortic		Pulmonary	
Interval (years)	% Survival	SE	% Survival	SE
1	90	3	91	3
3	85	4	90	3
5	84	4	89	3

SE=standard error

Figure 6.4.3: Patient Survival by Type of Homograft, 1996-2008



CHAPTER 7

BONE AND TISSUE TRANSPLANTATION

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7.0 INTRODUCTION

The first part of this chapter presents data on tissue allografts that have been distributed and data about recipient centres. These data were provided by Universiti Sains Malaysia (USM) Tissue Bank as the bank involves in human tissue procurement, processing, storage and distribution. However, there are other centres/hospitals that participated in these activities but did not report to NTR.

The second part presents data obtained from the Bone and Tissue Transplant Notification Form submitted by surgeons to NTR. The data is tabulated from 2004 to 2008 to identify the trend of tissue transplant activities. The notification is still very poor and the limited data has restricted further analysis and definitive conclusions could not be made.

Thus, the report does not reflect the actual magnitude of human tissue supply and transplant activity in the country. The deficiency would affect the evaluation and planning of the tissue transplant programme and service by the Ministry of Health and other organisations.

Aggressive and continuous effort has to be made to ensure that all cases of tissue allograft transplantation are reported. In addition, the Ministry of Health has to make new initiatives to enforce notification to NTR by other centres/hospitals that are involved in tissue allograft provision.

7.1 STOCK OF TISSUE ALLOGRAFTS AND HOSPITALS WHERE TISSUES ARE UTILISED FROM 2004 TO 2008

In 2008 and in the previous years, the main tissue allografts that were distributed were amniotic membranes and deep-frozen femoral heads (Table 7.1.1). USM Tissue Bank provided tissue allografts to the Ministry of Health hospitals, private hospitals and other sectors (Table 7.1.2 and 7.1.3).

Table 7.1.1 Types of Tissue Allografts Supplied by USM Tissue Bank, 2004-2008

Types of Tissue Allograft	No. of pieces					
	2004	2005	2006	2007	2008	Total
Deep Frozen Bone						
Knee Slices	1	0	0	0	0	**1**
Femur	9	7	5	2	7	**30**
Femoral Head	50	88	75	65	54	**332**
Humerus	1	3	0	2	2	**8**
Tibia	6	1	4	4	8	**23**
Radius	1	2	1	0	3	**7**
Ulna	0	3	0	0	0	**3**
Patella/ Bone-Patella-Bone	1	1	4	2	7	**15**
Others (Type not stated)	3	0	0	0	0	**3**
Deep Frozen Tendon						
Achilles Tendon	0	0	0	2	1	**3**
Quadriceps Tendon	0	0	0	0	5	**5**
Others (Type not stated)	0	0	1	3	3	**7**
Freeze Dried Bone						
Cancellous chip	17	19	37	2	27	**102**
Cortical	2	0	0	0	0	**2**
Cortico-cancellous	5	2	0	0	0	**7**
Others (Type not stated)	0	0	0	8	0	**8**
Skin						
Deep Frozen Skin	0	0	0	0	36	**36**
Amniotic membrane						
Air-dried & Glycerol Preserved	1128	64	379	175	2081	**3827**
Total	**1224**	**190**	**506**	**265**	**2234**	**4419**

Table 7.1.2 Hospitals/Other Sectors Using Bone, Tendon and Skin Allografts Provided by USM Tissue Bank, 2004-2008

Recipients	No. of pieces					
	2004	2005	2006	2007	2008	Total
MOH						
Hospital Sultanah Bahiyah, Alor Setar	1	10	6	2	0	**19**
Hospital Umum Sarawak, Kuching	3	13	10	6	3	**35**
Hospital Ipoh	0	4	9	3	0	**16**
Hospital Kemaman	0	0	10	0	0	**10**
Hospital Sultanah Nurzahirah, Kuala Terengganu	0	0	2	0	0	**2**
Hospital Melaka	1	0	0	3	0	**4**
Hospital Pulau Pinang	5	1	7	7	0	**20**
Queen Elizabeth Hospital, Kota Kinabalu	0	0	12	2	0	**14**
Hospital Raja Perempuan Zainab II, Kota Bharu	5	2	1	0	8	**16**
Hospital Seberang Jaya, Pulau Pinang	0	2	0	3	0	**5**
Hospital Selayang	0	0	3	0	0	**3**
Hospital Seremban	2	2	1	0	0	**5**
Hospital Sultanah Aminah, Johor Bahru	9	19	11	1	0	**40**
Hospital Sultan Ismail, Johor Bahru	0	0	0	2	73	**75**
Hospital Tengku Ampuan Afzan, Kuantan	0	1	2	0	0	**3**
Hospital Tengku Ampuan Rahimah, Klang	0	5	0	0	0	**5**
Hospital Muar	0	0	0	0	2	**2**
Total	**26**	**59**	**74**	**29**	**86**	**274**
University Hospitals						
HUSM	39	23	30	3	20	**115**
HUKM	3	2	3	5	0	**13**
UMMC	9	3	0	0	0	**12**
Total	**51**	**28**	**33**	**8**	**20**	**140**
Private and other sectors						
Amin Dental Surgery, Johor Bahru	0	0	0	5	0	**5**
Antal Rastu Sdn Bhd	0	0	2	0	0	**2**
Borneo Indah Sdn. Bhd.	0	0	0	0	4	**4**
Chong Dental Surgery, Seri Kembangan Selangor	0	0	0	1	0	**1**
Hospital Fatimah, Ipoh	1	12	0	2	11	**26**
Pantai Medical Centre, Air Keroh	0	0	5	0	0	**5**
Mahkota Medical Centre, Melaka	0	2	1	0	0	**3**
Hospital Tawakal, KL	0	0	0	3	9	**12**
Hospital Tung Shin, Kuala Lumpur	0	2	0	0	0	**2**
Jasa Dental Surgery, Kuala Lumpur	5	0	0	0	0	**5**
Johnson & Johnson Medical	0	0	0	2	16	**18**
Kemajuan Abadi Sdn. Bhd.	0	5	0	2	0	**7**
Klinik Pergigian Chong, Tangkak, Johor	0	0	0	1	0	**1**
Kota Bahru Medical Centre, Kota Bharu	0	0	2	0	0	**2**
Lam Wah Ee Hospital, Pulau Pinang	0	0	3	0	0	**3**
Normah Medical Center, Kuching	0	0	0	3	3	**6**
Pantai Medical Center, Bangsar	0	0	0	1	0	**1**
Island Hospital, Pulau Pinang	0	0	0	0	1	**1**
Sentosa Medical Centre, Kuala Lumpur	0	1	0	0	0	**1**
Sri Kota Medical Centre, Klang	2	0	0	0	0	**2**
Stryker	2	4	6	12	20	**44**
Sunway Medical Centre, Selangor	0	0	1	0	0	**1**
Teo Orthopaedic, Kuala Lumpur	0	10	0	0	0	**10**
Zimmer	9	3	0	21	18	**51**
Kuching Specialist Hospital, Sarawak	0	0	0	0	1	**1**
Total	**19**	**39**	**20**	**53**	**83**	**214**
Grand Total	**96**	**126**	**127**	**90**	**189**	**628**

Table 7.1.3 Hospitals/Other Sectors Using Amniotic Membranes provided by USM Tissue Bank, 2004-2008

Recipients	No. of pieces					
	2004	2005	2006	2007	2008	Total
Ministry of Health						
Hospital Miri, Sabah	0	0	0	5	10	**15**
Hospital Kuala Lumpur	22	15	13	40	0	**90**
Hospital Sultanah Bahiyah, Alor Setar	0	0	2	7	0	**9**
Hospital Umum Sarawak, Kuching	6	10	0	6	1	**23**
Hospital Sultanah Nurzahirah, Kuala Terengganu	0	1	0	5	0	**6**
Hospital Melaka	5	5	10	0	5	**25**
Hospital Pakar Sultanah Fatimah, Johor Bahru	0	0	100	0	0	**100**
Hospital Pulau Pinang	0	0	0	3	0	**3**
Queen Elizabeth Hospital, Kota Kinabalu	0	0	4	1	0	**5**
Hospital Raja Perempuan Zainab II, Kota Bharu	0	5	0	2	1	**8**
Hospital Selayang	0	0	1	0	0	**1**
Hospital Sultanah Aminah, Johor Bahru	73	0	200	0	0	**273**
Hospital Sultan Ismail, Johor Bahru	0	0	0	50	0	**50**
Hospital Teluk Intan	0	0	1	4	0	**5**
Hospital Tengku Ampuan Afzan, Kuantan	6	6	7	0	0	**19**
Hospital Tengku Ampuan Rahimah, Klang	4	5	0	0	0	**9**
Hospital Kuala Krai	0	0	0	0	1	**1**
Hospital Sungai Buloh	0	0	0	21	40	**61**
Total	**116**	**47**	**338**	**144**	**58**	**703**
University Hospitals						
HUSM	1001	1	8	7	4	**1021**
HUKM	4	0	0	7	32	**43**
UMMC	5	0	6	0	5	**16**
IIUM	0	0	0	6	0	**6**
Total	**1010**	**1**	**14**	**20**	**41**	**1086**
Private and other sectors						
Gleneagles Medical Centre, Pulau Pinang	2	4	8	0	6	**20**
Hospita Mata Tun Hussein Onn	0	4	0	0	5	**9**
Hospital Tawakal, KL	0	0	4	0	0	**4**
ISEC Sdn. Bhd.	0	0	0	2	0	**2**
Klinik Iman, Seremban	0	1	0	0	0	**1**
Kuala Terengganu Specialist Center, Kuala Terengganu	0	0	0	3	0	**3**
Peter Kong Eye Clinic, Kota Kinabalu	0	0	0	0	2	**2**
Pusat Rawatan Islam Al-Zahirah, Bangi, Selangor	0	0	10	0	0	**10**
Puteri Specialist Hospital, Johor Bahru	0	5	0	5	0	**10**
Putra Medical Centre, Alor Setar	0	0	1	1	0	**2**
Sri Kota Medical Centre, Klang	0	2	4	0	2	**8**
CryoCord Sdn. Bhd.	0	0	0	0	2081	**2081**
Total	**2**	**16**	**27**	**11**	**2096**	**2152**
Grand Total	**1128**	**64**	**379**	**175**	**2195**	**3941**

7.2 Reporting Centre

The recipient centres that reported to the National Transplant Registry using the Bone and Tissue Transplant Notification Form are shown on Table 7.2.1. The total number of reporting centres in 2008 has decreased compared to previous years.

Table 7.2.1 Distribution of Reporting Centre, 2004-2008

Reporting centre	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Orthopaedics Department						
Department of Orthopaedics, HUSM	1	7	2	1	0	**11**
Institute of Orthopaedic & Traumatology, Hospital Kuala Lumpur	2	0	0	0	0	**2**
Department of Orthopaedics Surgery, UMMC	1	0	0	0	0	**1**
Department of Orthopaedics, Hospital Pulau Pinang	0	0	0	1	0	**1**
Department of Orthopaedics, Hospital Ipoh	0	1	0	0	0	**1**
Department of Orthopaedics, Hospital Raja Perempuan Zainab II	9	3	0	0	0	**12**
Department of Orthopaedics, Hospital Umum Sarawak	1	0	1	0	0	**2**
Department of Orthopaedics, Hospital Tengku Ampuan Afzan	0	0	0	1	0	**1**
Department of Orthopaedics, Hospital Sultanah Aminah	0	1	0	0	0	**1**
Wan Orthopaedic, Trauma & Sports Injury Centre (WOTSIC), Seremban Specialist Hospital	0	0	2	0	0	**2**
Department of Orthopaedics, Island Hospital, Pulau Pinang	0	1	0	0	0	**1**
Department of Orthopaedics, Normah Medical Specialist Centre, Kuching	0	1	0	0	0	**1**
Department of Orthopaedics, Hospital Fatimah, Ipoh	0	3	0	1	0	**4**
Department of Orthopaedics, Kota Bharu Medical Centre	0	0	2	0	0	**2**
Department of Orthopaedics, Pantai Medical Centre, Kuala Lumpur	0	0	0	1	0	**1**
Department of Orthopaedics, Gleneagles Medical Centre, Pulau Pinang	0	0	0	0	1	**1**
Department of Orthopaedics, Penang Adventis Hospital, Pulau Pinang	0	0	0	0	1	**1**
Spine Unit, HUSM	0	0	1	0	0	**1**
Total	**14**	**17**	**8**	**5**	**2**	**46**
Ophthalmology Department						
Department of Ophthalmology, Hospital Tengku Ampuan Rahimah, Klang	1	1	0	0	0	**2**
Department of Ophthalmology, Hospital Tengku Ampuan Afzan, Kuantan	1	1	0	0	0	**2**
Department of Ophthalmology, Hospital Teluk Intan	0	0	1	0	0	**1**
Department of Ophthalmology, Hospital Kuala Lumpur	0	0	23	20	15	**58**
Department of Ophthalmology, Hospital Sultanah Bahiyah, Alor Setar	0	0	1	0	0	**1**
Department of Ophthalmology, Hospital Sungai Buloh	0	0	0	9	0	**9**
Department of Ophthalmology, Hospital Umum Sarawak	0	0	0	0	1	**1**
Department of Ophthalmology, Sri Kota Medical Centre, Klang	0	1	0	0	0	**1**
Department of Ophthalmology, HUSM	0	0	1	2	2	**5**
Pusat Pakar Mata Centre For Sight	0	0	0	0	1	**1**
Total	**2**	**3**	**26**	**31**	**19**	**81**
Others						
Maxillofacial Surgery, HUSM	1	1	0	0	0	**2**
Timberland Medical Centre, Kuching	0	1	0	0	0	**1**
Sri Kota Medical Centre, Klang	0	0	1	0	0	**1**
Total	**1**	**2**	**1**	**0**	**0**	**4**
Grand Total	**17**	**22**	**35**	**36**	**21**	**131**

7.3 Recipients Details

The bone and tissue allografts recipients' gender (Table 7.3.1), ethnicity (Table 7.3.1), age (Table 7.3.3) and diagnosis (Table 7.3.4) are presented in this section. One patient can undergo more than 1 transplant.

Table 7.3.1 Distribution of Number of Transplant by Gender, 2004-2008

Gender	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	9	53	10	45	27	77	21	58	9	43	**76**	**58**
Female	8	47	12	55	8	23	15	42	12	57	**55**	**42**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.3.2 Distribution of Number of Transplant by Ethnic Group, 2004-2008

Race	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	11	65	14	64	26	74	18	50	11	52	**80**	**61**
Chinese	3	18	5	23	7	20	12	33	6	29	**33**	**25**
Indian	1	6	1	5	1	3	4	11	1	5	**8**	**6**
Bumiputra Sabah	0	0	0	0	0	0	0	0	1	5	**1**	**1**
Bumiputra Sarawak	1	6	0	0	0	0	1	3	0	0	**2**	**2**
Others	1	6	2	9	1	3	1	3	2	10	**7**	**5**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.3.3 Distribution of Number of Transplant by Age Group, 2004-2008

Age group	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	0	0	1	5	4	11	5	14	4	19	14	11
10-11	1	6	6	27	2	6	1	3	5	24	15	11
20-39	9	53	6	27	16	46	8	22	5	24	44	34
40-59	5	29	3	14	8	23	11	31	4	19	31	24
≥60	2	12	5	23	5	14	10	28	3	14	25	19
Missing	0	0	1	5	0	0	1	3	0	0	2	2
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**
Mean	37		36		37		42		30		37	
SD	16		23		20		23		23		22	
Median	35		27		36		49		27		35	
Min	15		7		0		0		1		0	
Max	75		80		77		80		69		80	

Table 7.3.4 Distribution of Number of Transplant by Diagnosis Warranting Tissue Graft, 2004-2008

Diagnosis	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Congenital deformity	1	6	0	0	1	3	1	3	1	5	**4**	**3**
Infection	0	0	0	0	3	8	3	8	2	10	**8**	**6**
Trauma	5	28	1	5	6	16	1	3	1	5	**14**	**10**
Degenerative disease	1	6	2	9	0	0	1	3	1	5	**5**	**4**
Tumour - benign	5	28	4	18	1	3	1	3	0	0	**11**	**8**
Tumour - malignant	0	0	6	27	1	3	0	0	0	0	**7**	**5**
Burn	0	0	1	5	2	5	0	0	0	0	**3**	**2**
Scald	0	0	0	0	1	3	0	0	0	0	**1**	**1**
Sports injury	0	0	1	5	0	0	1	3	0	0	**2**	**1**
Failed primary surgery	1	6	2	9	1	3	2	5	0	0	**6**	**4**
Ophtalmological disease	0	0	0	0	16	42	7	19	4	19	**27**	**20**
Others	5	28	3	14	6	16	20	54	11	52	**45**	**33**
Missing	0	0	2	9	0	0	0	0	1	5	**3**	**2**
Total	**18**	**100**	**22**	**100**	**38**	**100**	**37**	**100**	**21**	**100**	**136**	**100**

** 1 transplantation performed in 2004 and 2007 had 2 diagnosis.*

** 3 transplantations performed in 2006 had 2 diagnosis.*

7.4 Pre-Transplant Data

This section presents data on the tissue provider (Table 7.4.1), origin of tissue graft (Table 7.4.2), tissue graft type (Table 7.4.3), type of sterilisation of the graft (Table 7.4.4), mode of transport storage of tissue graft to recipient hospital (Table 7.4.5) and temperature of storage tissue graft during transportation (Table 7.4.6).

Table 7.4.1 Distribution of Number of Transplantation according to Tissue Provider, 2004-2008

Name of Tissue Bank	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
USM Tissue Bank	13	76	18	82	31	89	34	94	21	100	**117**	**89**
Bone Bank, UMMC	1	6	0	0	0	0	0	0	0	0	**1**	**1**
Bone Bank, Hospital Kuala Lumpur	3	18	0	0	0	0	0	0	0	0	**3**	**2**
Eucara Pharmaceutical (P) Ltd., India	0	0	0	0	2	6	0	0	0	0	**2**	**2**
Osteo Tech Inc., USA	0	0	1	5	0	0	0	0	0	0	**1**	**1**
Missing	0	0	3	14	2	6	2	6	0	0	**7**	**5**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.4.2 Distribution of Number of Transplantation by Origin of Tissue Graft, 2004-2008

Origin of Tissue Graft	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Local	17	100	15	68	31	89	34	94	20	95	**117**	**89**
Imported	0	0	3	14	2	6	0	0	0	0	**5**	**4**
Missing	0	0	4	18	2	6	2	6	1	5	**9**	**7**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.4.3 Distribution of Number of Transplantation by Tissue Graft Types, 2004-2008

Tissue graft types	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Deep frozen tissues	9	53	14	64	5	14	5	14	2	10	**35**	**27**
Freeze dried (Lyophilised)	6	35	4	18	29	83	31	86	16	76	**86**	**66**
Not Available	2	12	2	9	0	0	0	0	0	0	**4**	**3**
Missing	0	0	2	9	1	3	0	0	3	14	**6**	**5**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.4.3(a) Distribution of Tissue Graft Types (breakdowns), 2004-2008

Tissue graft types (breakdowns)	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Femur	3	11	3	7	0	0	0	0	1	5	7	4
Femoral head	2	7	12	26	2	4	7	18	2	9	25	14
Humerus	0	0	1	2	3	7	0	0	0	0	4	2
Tibia	1	4	1	2	1	2	0	0	0	0	3	2
Radius	2	7	5	11	0	0	0	0	0	0	7	4
Patella	1	4	1	2	2	4	0	0	0	0	4	2
Other tendon fascia cartilage	0	0	0	0	0	0	1	3	0	0	1	1
Amniotic membranes	2	7	3	7	25	56	31	79	19	86	80	45
Cancellous	15	56	19	41	2	4	0	0	0	0	36	20
Cortical	0	0	0	0	6	13	0	0	0	0	6	3
Cortical cancellous	1	4	1	2	0	0	0	0	0	0	2	1
Bone granule	0	0	0	0	1	2	0	0	0	0	1	1
Bone powder	0	0	0	0	3	7	0	0	0	0	3	2
Total	**27**	**100**	**46**	**100**	**45**	**100**	**39**	**100**	**22**	**100**	**179**	**100**

Table 7.4.4 Distribution of Graft Sterilization Types, 2004-2008

Graft sterilization types	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Gamma irradiation	16	94	15	68	30	86	27	75	19	90	**107**	**82**
Glycerol	0	0	0	0	2	6	0	0	0	0	**2**	**2**
Sterile freeze dried human bone	0	0	1	5	0	0	0	0	0	0	**1**	**1**
Missing	1	6	6	27	3	9	9	25	2	10	**21**	**16**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.4.5 Distribution of Mode of Transport Storage to Recipient Hospital during Transportation, 2004-2008

Mode of transport storage to recipient hospital	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
By flight	1	6	1	5	2	6	2	6	1	5	**7**	**5**
By courier	2	12	3	14	24	69	23	64	17	81	**69**	**53**
By hand	4	24	8	36	1	3	0	0	0	0	**13**	**10**
Dry ice box	5	29	4	18	0	0	0	0	0	0	**9**	**7**
Sterile package	0	0	0	0	2	6	0	0	0	0	**2**	**2**
Missing	5	29	6	27	6	17	11	31	3	14	**31**	**24**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.4.6 Distribution of Temperature of Storage during Transportation, 2004-2008

Temperature of storage during transportation (ºC)	**2004**		**2005**		**2006**		**2007**		**2008**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
-80	2	12	0	0	0	0	0	0	0	0	**2**	**2**
-40	0	0	1	5	0	0	0	0	0	0	**1**	**1**
-20	4	24	4	18	0	0	1	3	0	0	**9**	**7**
-10	0	0	6	27	2	6	1	3	1	5	**10**	**8**
0	2	12	0	0	0	0	0	0	0	0	**2**	**2**
37	0	0	0	0	2	6	0	0	0	0	**2**	**2**
Room temperature	3	18	4	18	25	71	22	61	17	81	**71**	**54**
Missing	6	35	7	32	6	17	12	33	3	14	**34**	**26**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

7.5 Transplant Surgery Data

The data on mode of storage of tissues in recipient hospitals are presented in Table 7.5.1. This section also presents the data on the use of composite graft (Tables 7.5.2 and 7.5.3), presence of pre operative infection at implant site (Table 7.5.4), presence of infection of pre implanted grafts (Tables 7.5.5 and 7.5.6) and the usage of antibiotics (Tables 7.5.7, 7.5.8, 7.5.9, and 7.5.10)

Table 7.5.1 Distribution of Mode of Storage in Recipient Hospital, 2004-2008

Mode of storage in recipient hospital	**2004**		**2005**		**2006**		**2007**		**2008**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Refrigerator	0	0	1	5	25	71	28	78	12	57	**66**	**50**
Deep Freezer -20 ºC	0	0	3	14	2	6	3	8	0	0	**8**	**6**
Deep Freezer -40 ºC	1	6	2	9	0	0	0	0	1	5	**4**	**3**
Deep Freezer -80 ºC	3	18	4	18	1	3	1	3	0	0	**9**	**7**
Liquid Nitrogen	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Glycerol	0	0	1	5	3	9	4	11	6	29	**14**	**11**
Room Temperature	0	0	1	5	1	3	0	0	2	10	**4**	**3**
Others	12	71	5	23	2	6	0	0	0	0	**19**	**15**
Not Available	1	6	0	0	0	0	0	0	0	0	**1**	**1**
Missing	0	0	5	23	1	3	0	0	0	0	**6**	**5**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.5.2 Distribution of Additional Tissue Usage (Composite Graft), 2004-2008

Additional Tissue Used	**2004**		**2005**		**2006**		**2007**		**2008**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Yes	**9**	**53**	**7**	**32**	**1**	**3**	**2**	**6**	**1**	**5**	**20**	**15**
• Autografts	7	41	3	14	0	0	0	0	1	5	**11**	**8**
• Allografts	1	6	2	9	1	3	2	6	0	0	**6**	**5**
• Others	1	6	1	5	0	0	0	0	0	0	**2**	**2**
• Missing	0	0	1	5	0	0	0	0	0	0	**1**	**1**
No	**6**	**35**	**12**	**55**	**32**	**91**	**33**	**92**	**19**	**90**	**102**	**78**
Not Available	**2**	**12**	**1**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**
Missing	**0**	**0**	**2**	**9**	**2**	**6**	**1**	**3**	**1**	**5**	**6**	**5**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.5.3 Distribution of Presence of Pre Operative Infection at Implant Site, 2004-2008

Presence of pre operative infection at implant site	**2004**		**2005**		**2006**		**2007**		**2008**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Yes	0	0	0	0	4	11	9	25	3	14	**16**	**12**
No	15	88	21	95	31	89	27	75	18	86	**112**	**85**
Not Available	2	12	0	0	0	0	0	0	0	0	**2**	**2**
Missing	0	0	1	5	0	0	0	0	0	0	**1**	**1**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.5.4 Distribution of Pre Implant Graft Cultural Swab, 2004-2008

Pre implant graft cultural swab	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	**0**	**0**	**1**	**5**	**0**	**0**	**1**	**3**	**0**	**0**	**2**	**2**
• Cytomegalovirus	0	0	1	5	0	0	0	0	0	0	**1**	**1**
• Proteus	0	0	0	0	0	0	1	3	0	0	**1**	**1**
No	**15**	**88**	**16**	**73**	**17**	**49**	**22**	**61**	**18**	**86**	**88**	**67**
Not Available	**2**	**12**	**0**	**0**	**6**	**17**	**5**	**14**	**0**	**0**	**13**	**10**
Missing	**0**	**0**	**5**	**23**	**12**	**34**	**8**	**22**	**3**	**14**	**28**	**21**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.5.5 Distribution of Grafts Soaked in Antibiotics Prior to Transplantation, 2004-2008

Grafts soaked in antibiotics prior to transplantation	2004		2005		2006		2007		2008		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	**7**	**41**	**16**	**73**	**6**	**17**	**6**	**17**	**1**	**5**	**36**	**27**
• Ceftriazone	4	24	9	41	3	9	0	0	0	0	**16**	**12**
• Gentamicin	3	18	4	18	3	9	4	11	1	5	**15**	**11**
• Povidone iodine, Ceftriazone	0	0	1	5	0	0	0	0	0	0	**1**	**1**
• Ceftriazone and Gentamicin	0	0	0	0	0	0	1	3	0	0	**1**	**1**
• Vancomycin, Postome iodine	0	0	1	5	0	0	0	0	0	0	**1**	**1**
• Missing	0	0	1	5	0	0	1	3	0	0	**2**	**2**
No	**8**	**47**	**5**	**23**	**28**	**80**	**28**	**78**	**20**	**95**	**89**	**68**
Not Available	**2**	**12**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**3**	**2**
Missing	**0**	**0**	**1**	**5**	**0**	**0**	**2**	**6**	**0**	**0**	**3**	**2**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

Table 7.5.6 Distribution of Number of Transplant by Systemic Antibiotics Given Prior to Transplantation, 2004-2008

Systemic antibiotics given prioir to transplantation	**2004**		**2005**		**2006**		**2007**		**2008**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Yes	**12**	**71**	**17**	**77**	**9**	**26**	**10**	**28**	**3**	**14**	**51**	**39**
• Cefeperazone	2	12	2	9	0	0	0	0	0	0	**4**	**3**
• Ceftriazone/ Imipenam	2	12	2	9	3	9	3	8	0	0	**10**	**8**
• Cefuroxine	7	41	7	32	4	11	2	6	1	5	**21**	**16**
• Ciproflaxacin	0	0	2	9	0	0	2	6	1	5	**5**	**4**
• Chloramphenicol	0	0	0	0	1	3	0	0	0	0	**1**	**1**
• Gentamicin	0	0	0	0	0	0	0	0	1	5	**1**	**1**
• Metronidazole	1	6	1	5	0	0	0	0	0	0	**2**	**2**
• Ceftazidime	0	0	0	0	1	3	0	0	0	0	**1**	**1**
• T. Augmentin	0	0	0	0	0	0	1	3	0	0	**1**	**1**
• T.Flurariazole	0	0	0	0	0	0	2	6	0	0	**2**	**2**
• Ampicillin / Sulbactam	0	0	2	9	0	0	0	0	0	0	**2**	**2**
• Missing	0	0	1	5	0	0	0	0	0	0	**1**	**1**
No	**4**	**24**	**3**	**14**	**26**	**74**	**26**	**72**	**17**	**81**	**76**	**58**
Not Available	**1**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
Missing	**0**	**0**	**2**	**9**	**0**	**0**	**0**	**0**	**1**	**5**	**3**	**2**
Total	**17**	**100**	**22**	**100**	**35**	**100**	**36**	**100**	**21**	**100**	**131**	**100**

CHAPTER 8

CADAVERIC ORGAN AND TISSUE DONATION

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CADAVERIC ORGAN AND TISSUE DONATION

There was an increase in the number of potential cadaveric donors referred to the National Transplant Procurement Unit (NTPMU) nationwide from 73 the previous year to 112 in 2008. The number of actual donors remained about the same at 26 for the year, which translated to a conversion rate of 23% and a donation rate of 0.94 per million population (Table 8.1). Of these 13 (50%) were brain dead donors who donated organs and tissues which were procured in the operating theatre, while another 13 were tissue donations after cardiac death (Table 8.2, Table 8.11). In total 87 organs and tissues were procured, comprising 40 corneas, 26 kidneys, 4 livers, 13 pairs of heart valves and 4 sets of long bones.

The number of donations throughout the year did not conform to any particular trend (Table 8.3). There were 4 paediatric donors (age 1 – 9 years) and 4 teenage donors which together constitute 31% of the total number of donors (Table 8.4). Another 23% (6/26) were in their twenties which means that 54% of donors were under the age of thirty. The mean age was 30.8 years, age range 2 – 71 years. Male donors outnumber female three to one (Table 8.5).

Two thirds of donors were Chinese, 23% Indian and 12% others by ethnicity (Table 8.6), 62% were Buddhist by religion (Table 8.7). Two donors were non-Malaysian (Table 8.8). Majority of the donors came from the Federal Territory of Kuala Lumpur (31%) followed by Johor, Selangor and Perak (12% each) (Table 8.9). Only two out of the 26 actual donors (8%) had pledged to donate before and carried the donor card (Table 8.10).

Cardiac disease was the most common cause of death, accounting for 23% of the brain death and 54% of the cardiac death. Another 23% of brain dead donors and 15% of post-cardiac death tissue donors died from motor vehicle accidents (Table 8.12). In 2008, the most common blood group among the 13 organ donors was group O rhesus positive (46%), followed by A positive (31%), B positive (15%), only 1 (8%) from group A negative and no AB group (Table 8.13). When considered in totality since 1997, blood group O positive remained the most common group (40%) followed by B positive and A positive.

Most of the donations (58%) took place in Ministry of Health hospitals with 6 (23%) from private hospitals and 3 (12%) from University hospitals (Table 8.14a). Sixty-five percent of the donors were found in the ICU, but there were also four direct referrals for tissue donation from the mortuary with three from the ward and one from emergency department ("brought in dead" BID) (Table 8.14b).

Organ donors were sent to the operating theatre for procurement of organs (13/13) while tissues were mainly procured in the mortuary (12/13) (Table 8.14c). For the organ donors all were on inotropic support before procurement with the commonest combination being dopamine and noradrenaline (6/13) (Table 8.15).

Table 8.1: Number of Donations by Year, 1997-2008

Number of procurement by year N=213												
Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Number of donors	5	7	4	13	24	30	25	16	13	25	25	26
Rate of procurement (per million population)	0.23	0.32	0.18	0.55	1.00	1.22	1.00	0.63	0.50	0.94	0.92	0.94

Figure 8.1: Number of Donations by Year, 1997-2008

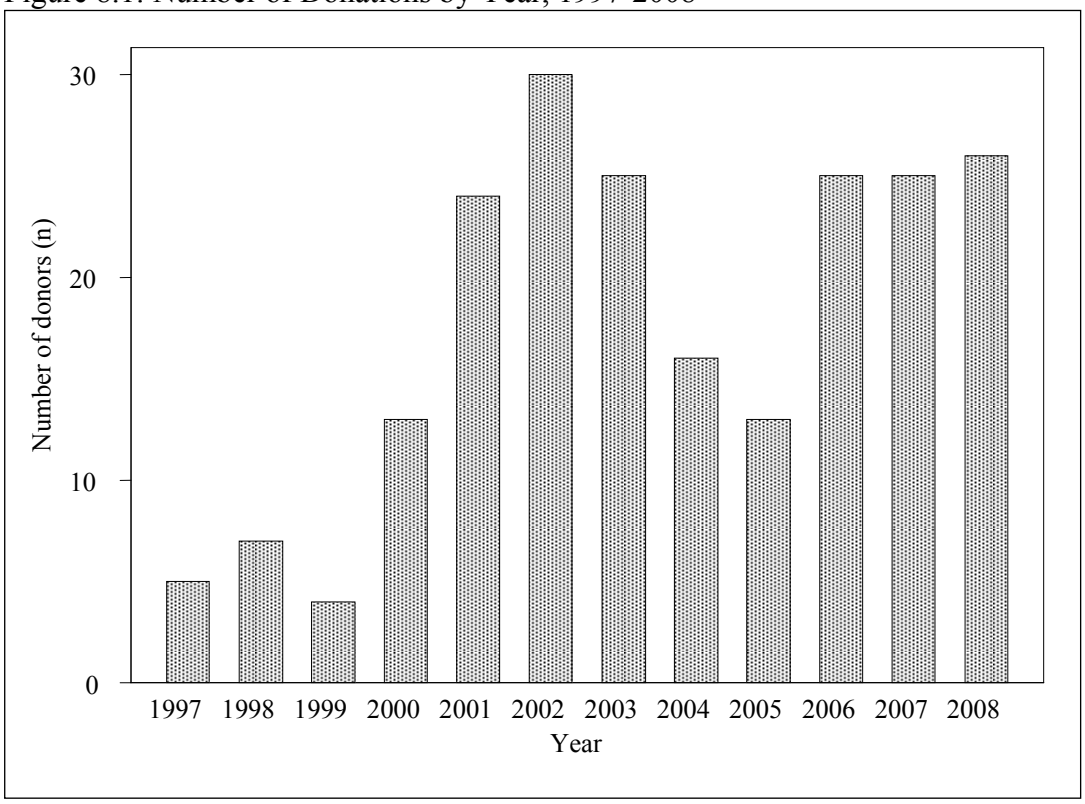


Table 8.2: Number of organs procured, 1997-2008

Organs procured	Number of procurement by year N=213											
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cornea	4	10	6	18	32	48	40	20	22	38	32	40
Heart	1	3	2	3	4	0	2	0	1	1	3	0
Liver	0	0	2	2	1	2	1	3	3	6	5	4
Kidney	8	10	6	22	38	26	16	18	8	26	28	26
Heart valve	0	1	2	8	10	10	10	10	6	15	8	13
Bone	0	1	0	3	2	6	4	5	2	5	5	4
Skin	0	0	0	2	2	2	0	1	0	3	0	0
Lung	0	0	0	0	0	0	0	0	1	1	2	0

Table 8.3: Potential Donor Referrals and Actual Donations by month, 2008

Month	No. of donors			
	Potential Donor Referrals	Actual Donors		
		Brain Death Organ Donors (BD)	Cardiac Death Tissue Donors (CD)	Total
Jan	10	1	0	1
Feb	10	1	3	4
Mar	14	3	0	3
Apr	9	0	1	1
May	6	1	0	1
Jun	17	3	3	6
Jul	11	0	2	2
Aug	9	2	0	2
Sep	8	0	1	1
Oct	5	0	0	0
Nov	3	1	1	2
Dec	9	1	2	3
TOTAL	**112**	**13**	**13**	**26**

Figure 8.3: Potential Donor Referrals and Actual Donations by month, 2008

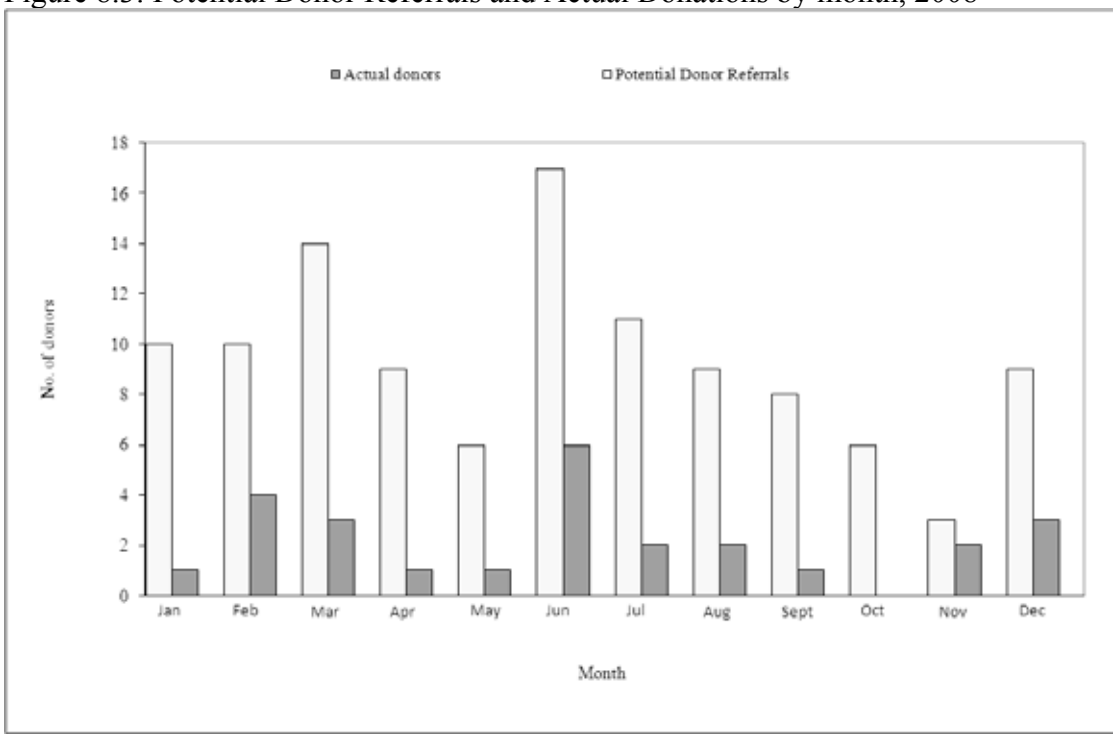
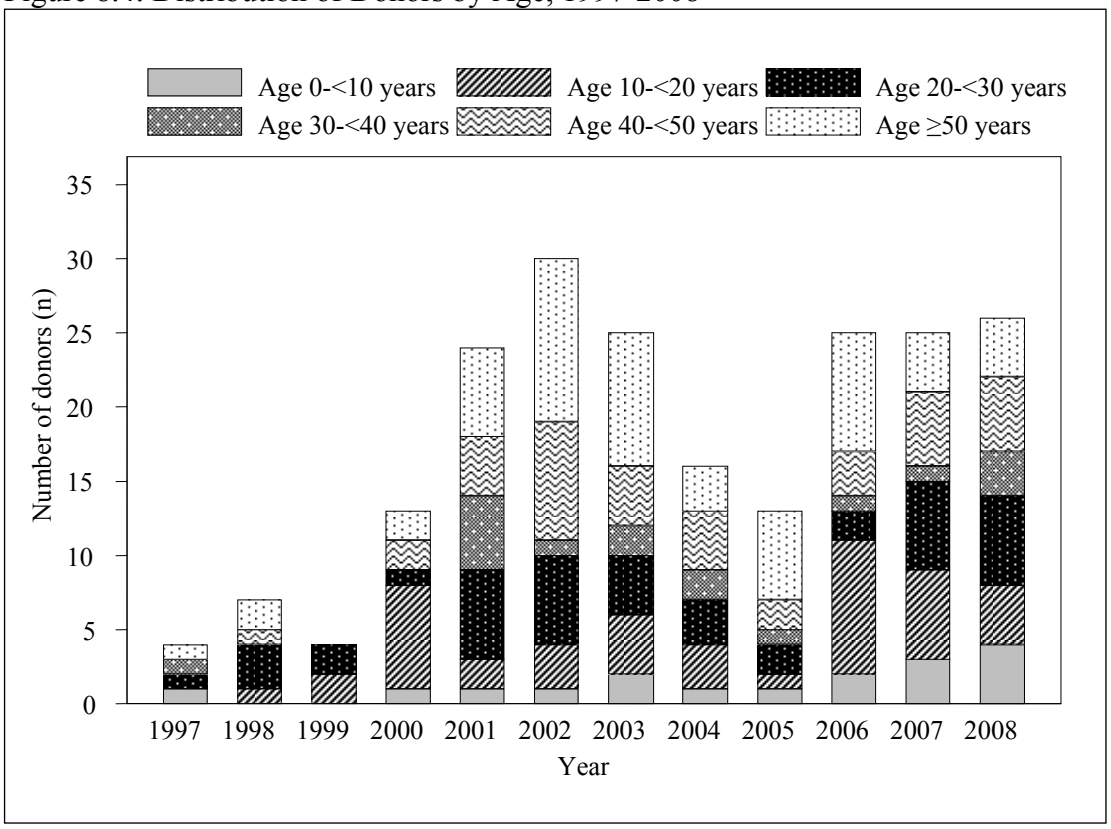


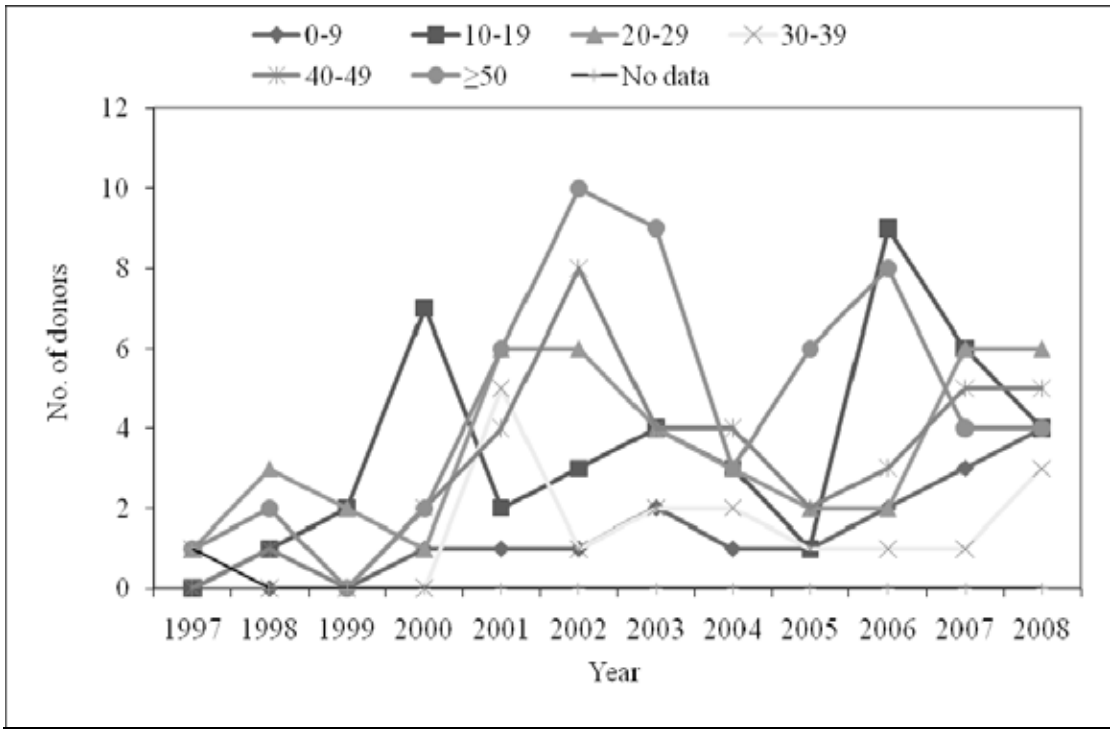
Table 8.4: Distribution of Donors by Age, 1997-2008

Donor's age (years)	No. (%)												
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25	2004 N=16	2005 N=13	2006 N=25	2007 N=25	2008 N=26	Total N=213
<1	0	0	0	0	0	0	1 (4)	0	0	0	0	0	1 (0)
1-9	1 (20)	0	0	1 (8)	1 (4)	1 (3)	1 (4)	1 (6)	1 (8)	2 (8)	3 (12)	4 (15)	16 (8)
10-19	0	1 (14)	2 (50)	7 (54)	2 (8)	3 (10)	4 (16)	3 (19)	1 (8)	9 (36)	6 (24)	4 (15)	42 (20)
20-29	1 (20)	3 (43)	2 (50)	1 (8)	6 (25)	6 (20)	4 (16)	3 (19)	2 (15)	2 (8)	6 (24)	6 (23)	42 (20)
30-39	1 (20)	0	0	0	5 (21)	1 (3)	2 (8)	2 (13)	1 (8)	1 (4)	1 (4)	3 (12)	17 (8)
40-49	0	1 (14)	0	2 (15)	4 (17)	8 (27)	4 (16)	4 (25)	2 (15)	3 (12)	5 (20)	5 (19)	38 (18)
50-59	1 (20)	2 (29)	0	1 (8)	4 (17)	7 (23)	3 (12)	3 (19)	1 (8)	2 (8)	2 (8)	2 (8)	28 (13)
60-69	0	0	0	1 (8)	2 (8)	1 (3)	3 (12)	0	3 (23)	4 (16)	2 (8)	1 (4)	17 (8)
70-79	0	0	0	0	0	3 (10)	3 (12)	0	1 (8)	2 (8)	0	1 (4)	10 (5)
80-89	0	0	0	0	0	0	0	0	1 (8)	0	0	0	1 (0)
No data	1 (20)	0	0	0	0	0	0	0	0	0	0	0	1 (0)
Total	**5**	**7**	**4**	**13**	**24**	**30**	**25**	**16**	**13**	**25**	**25**	**26**	**213**
Mean	27.25	34.43	20.50	25.23	36.83	41.87	39.36	32.50	46.38	35.72	29.60	30.75	35.09
SD	21.06	17.12	4.43	18.71	15.71	18.92	22.26	15.57	24.78	23.45	18.75	19.06	19.99
Median	28.00	25.00	21.00	17.00	37.00	46.00	40.00	31.50	48.00	23.00	23.00	27.00	33.00
Minimum	2	16	15	5	8	4	<1*	8	3	3	1**	2	<1*
Maximum	51	57	25	60	66	79	77	55	81***	77	68	71	81***

* The youngest tissue donor was 37-days-old donated heart valves in 2003
** The youngest organ donor was 14.5-month old donated kidneys 2007.
*** The oldest tissue donor was 81-years-old donated eyes in 2005; the oldest organ donor was 65-years-old donated kidneys in 2001.

Figure 8.4: Distribution of Donors by Age, 1997-2008





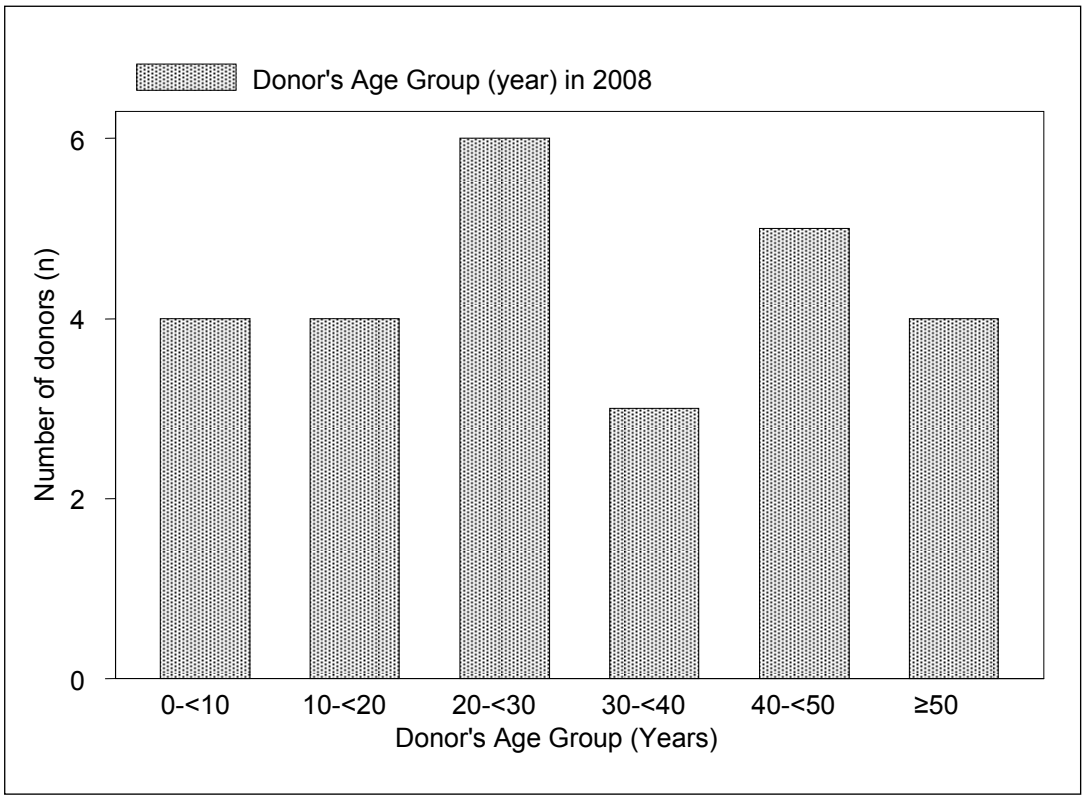
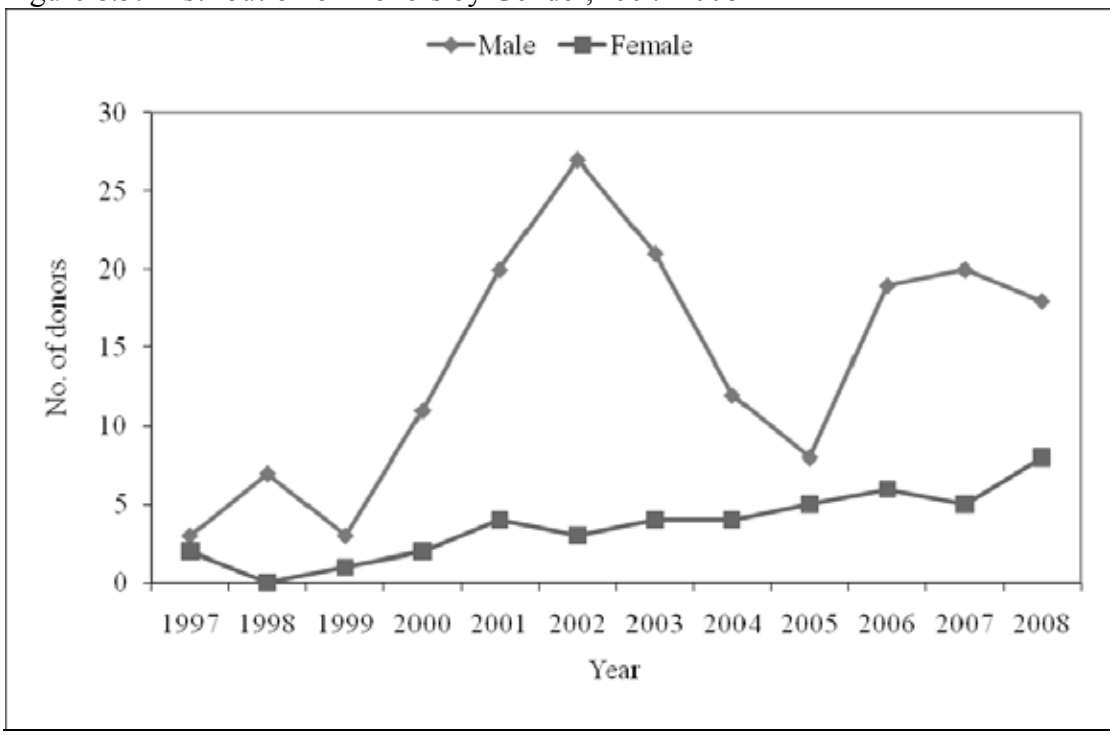

Donor's Age Group (year) in 2008
Number of donors (n)
0
2
4
6
0-<10
10-<20
20-<30
30-<40
40-<50
≥50
Donor's Age Group (Years)

Table 8.5: Distribution of Donors by Gender, 1997-2008

Donor's gender	No. (%)												
	1997 N=5	**1998 N=7**	**1999 N=4**	**2000 N=13**	**2001 N=24**	**2002 N=30**	**2003 N=25**	**2004 N=16**	**2005 N=13**	**2006 N=25**	**2007 N=25**	**2008 N=26**	**Total N=213**
Male	3 (60)	7 (100)	3 (75)	11 (85)	20 (83)	27 (90)	21 (84)	12 (75)	8 (62)	19 (76)	20 (80)	18 (69)	169 (79)
Female	2 (40)	0 (0)	1 (25)	2 (15)	4 (17)	3 (10)	4 (16)	4 (25)	5 (38)	6 (24)	5 (20)	8 (31)	44 (21)

Figure 8.5: Distribution of Donors by Gender, 1997-2008



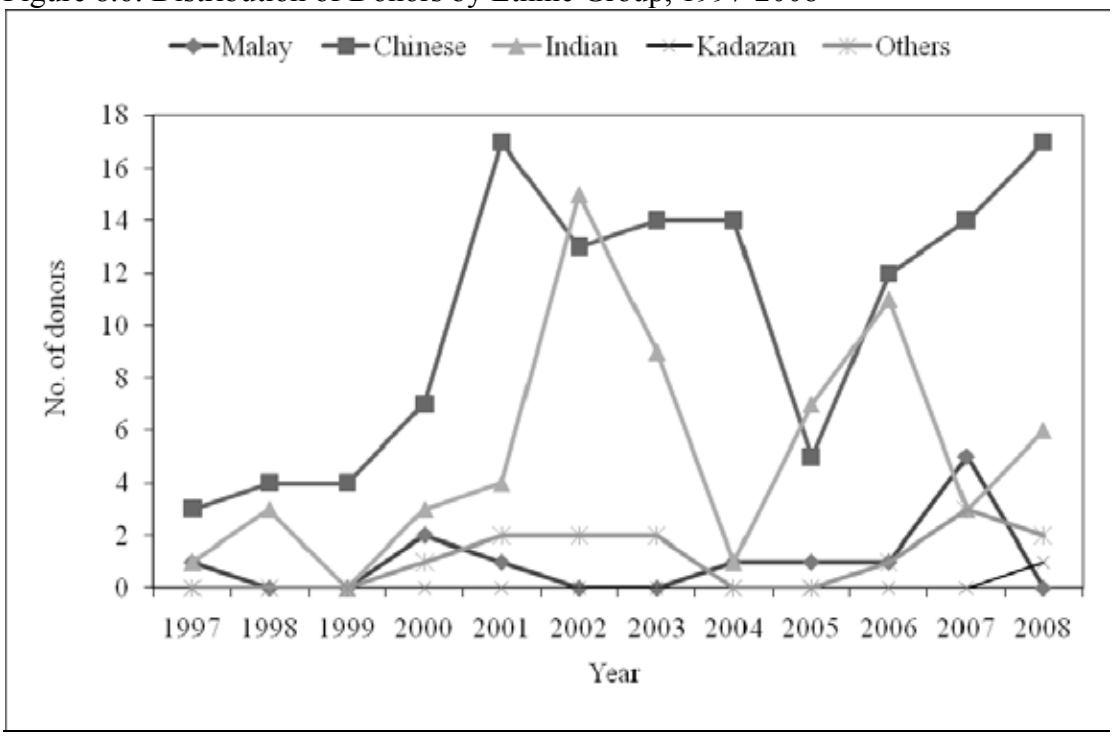

Male
Female
Number of donors (n)
0
5
10
15
20
25
30
35
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

Table 8.6: Distribution of Donors by Ethnic Group, 1997-2008

Donor's ethnic group	No. (%)						
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25
Malay	1 (20)	0 (0)	0 (0)	2 (15)	1 (4)	0 (0)	0 (0)
Chinese	3 (60)	4 (57)	4 (100)	7 (54)	17 (71)	13 (43)	14 (56)
Indian	1 (20)	3 (43)	0 (0)	3 (23)	4 (17)	15 (50)	9 (36)
Others	0 (0)	0 (0)	0 (0)	1 (8)	2 (8)	2 (7)	2 (8)

Donor's ethnic group	No. (%)					
	2004 N=16	2005 N=13	2006 N=25	2007 N=25	208 N=28	Total N=213
Malay	1 (6)	1 (8)	1 (4)	5 (20)	0 (0)	12 (6)
Chinese	14 (88)	5 (38)	12 (48)	14 (56)	17 (65)	124 (58)
Indian	1 (6)	7 (54)	11 (44)	3 (12)	6 (23)	63 (30)
Others	0 (0)	0 (0)	1 (4)	3 (12)	3 (12)	14 (7)

Figure 8.6: Distribution of Donors by Ethnic Group, 1997-2008



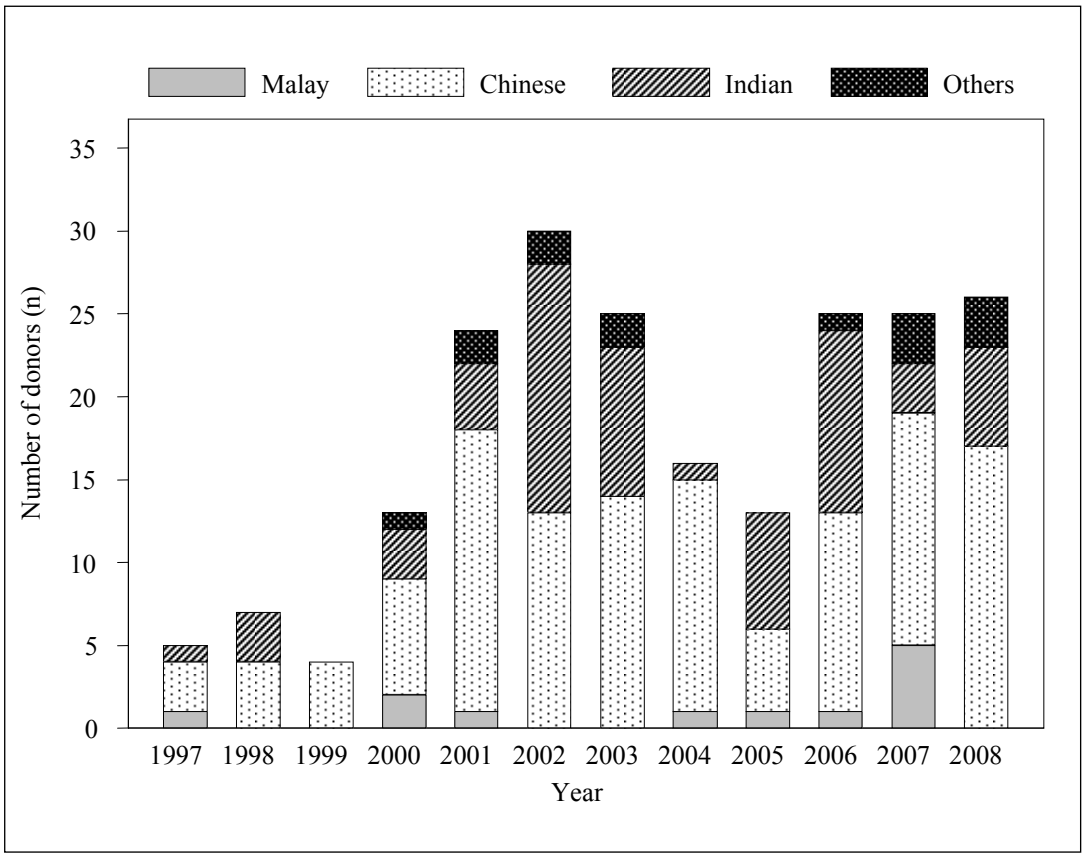
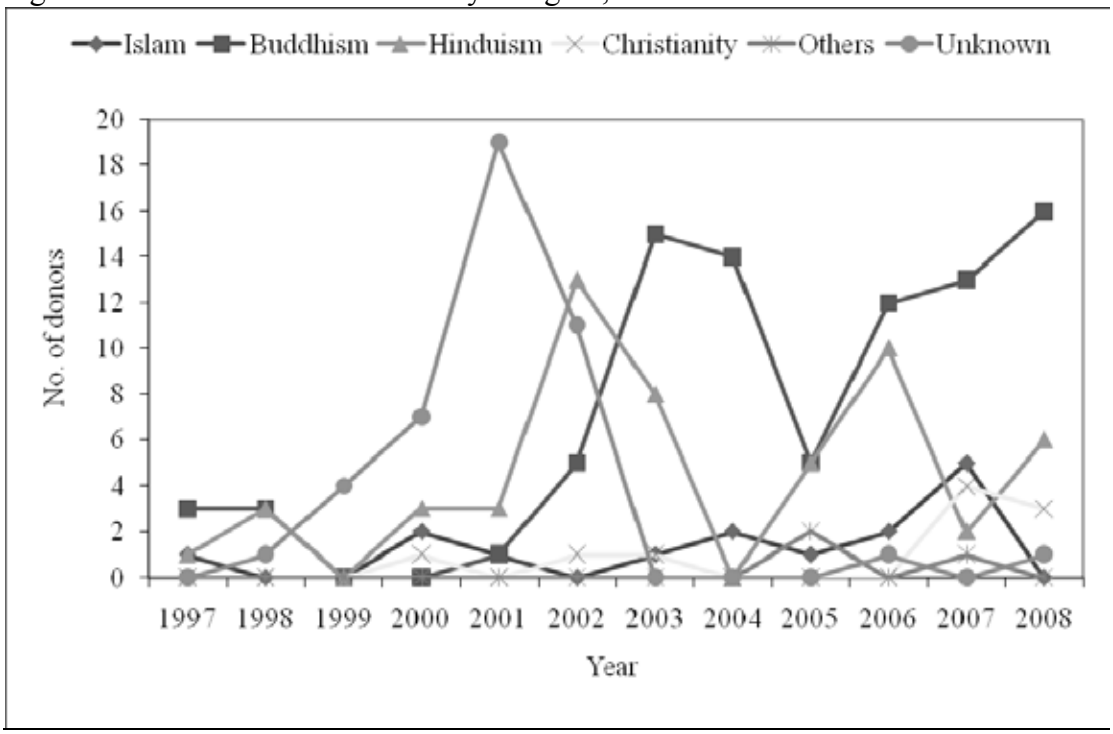

Malay
Chinese
Indian
Others
Number of donors (n)
0
5
10
15
20
25
30
35
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

Table 8.7: Distribution of Donors by Religion, 1997-2008

Donor's religion	No. (%)						
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25
Islam	1 (20)	0 (0)	0 (0)	2 (15)	1 (4)	0 (0)	1 (4)
Buddhism	3 (60)	3 (43)	0 (0)	0 (0)	1 (4)	5 (17)	15 (60)
Hinduism	1 (20)	3 (43)	0 (0)	3 (23)	3 (13)	13 (43)	8 (32)
Christianity	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)	1 (3)	1 (4)
Others	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Unknown	0 (0)	1 (14)	4 (100)	7 (54)	19 (79)	11 (37)	0 (0)

Donor's religion	No. (%)					
	2004 N=16	2005 N=13	2006 N=25	2007 N=25	2008 N=26	Total N=213
Islam	2 (13)	1 (8)	2 (8)	5 (20)	0 (0)	15 (7)
Buddhism	14 (88)	5 (38)	12 (48)	13 (52)	16 (62)	87 (41)
Hinduism	0 (0)	5 (38)	10 (40)	2 (8)	6 (23)	54 (25)
Christianity	0 (0)	0 (0)	0 (0)	4 (16)	3 (12)	10 (5)
Others	0 (0)	2 (15)	0 (0)	1 (4)	0 (0)	3 (1)
Unknown	0 (0)	0 (0)	1 (4)	0 (0)	1 (4)	44 (21)

Figure 8.7: Distribution of Donors by Religion, 1997-2008



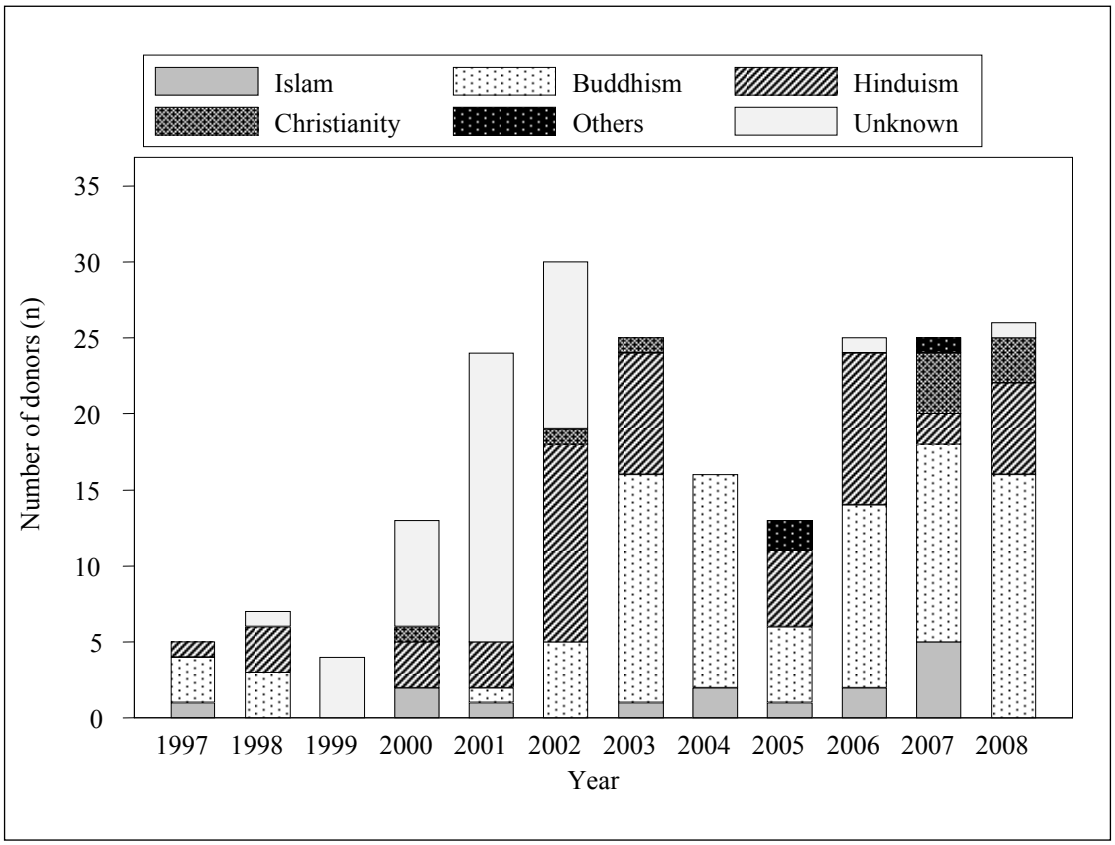
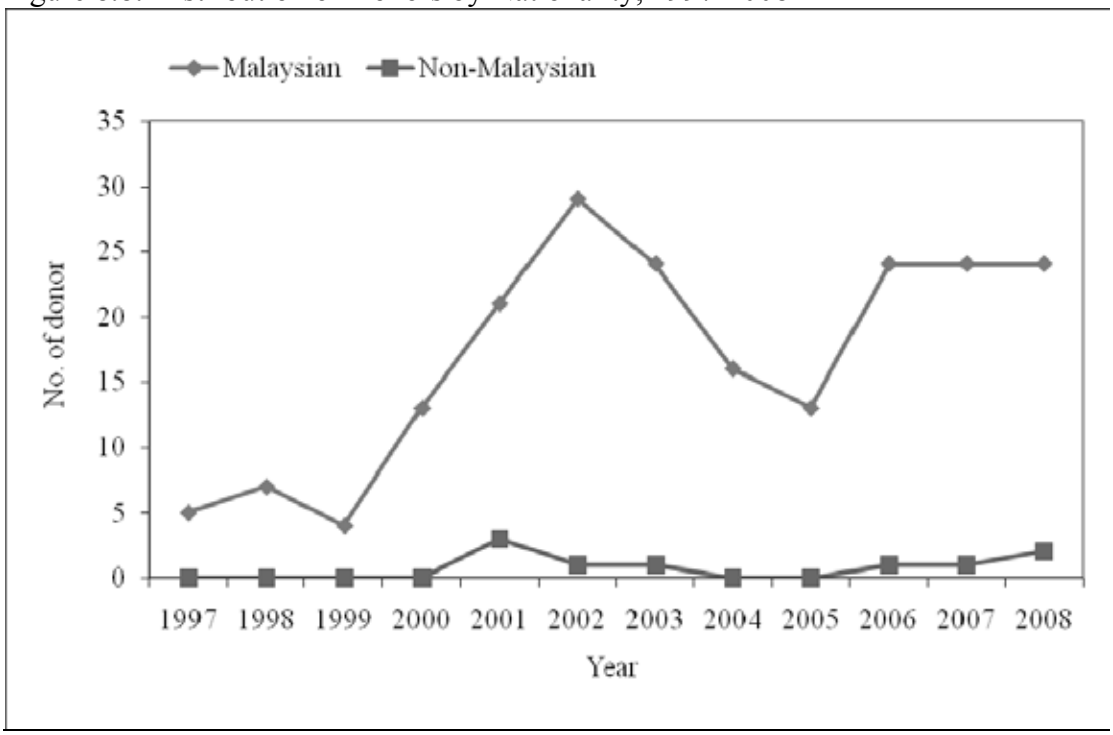

Islam
Buddhism
Hinduism
Christianity
Others
Unknown
Number of donors (n)
0
5
10
15
20
25
30
35
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

Table 8.8: Distribution of Donors by Nationality, 1997-2008

Donor's nationality	No. (%)												
	1997 N=5	**1998 N=7**	**1999 N=4**	**2000 N=13**	**2001 N=24**	**2002 N=30**	**2003 N=25**	**2004 N=16**	**2005 N=13**	**2006 N=25**	**2007 N=25**	**2008 N=26**	**Total N=213**
Malaysian	5 (100)	7 (100)	4 (100)	13 (100)	21 (88)	29 (97)	24 (96)	16 (100)	13 (100)	24 (96)	24 (96)	24 (92)	204 (96)
Non-Malaysian	0 (0)	0 (0)	0 (0)	0 (0)	3 (13)	1 (3)	1 (4)	0 (0)	0 (0)	1 (4)	1 (4)	2 (8)	9 (4)

Figure 8.8: Distribution of Donors by Nationality, 1997-2008



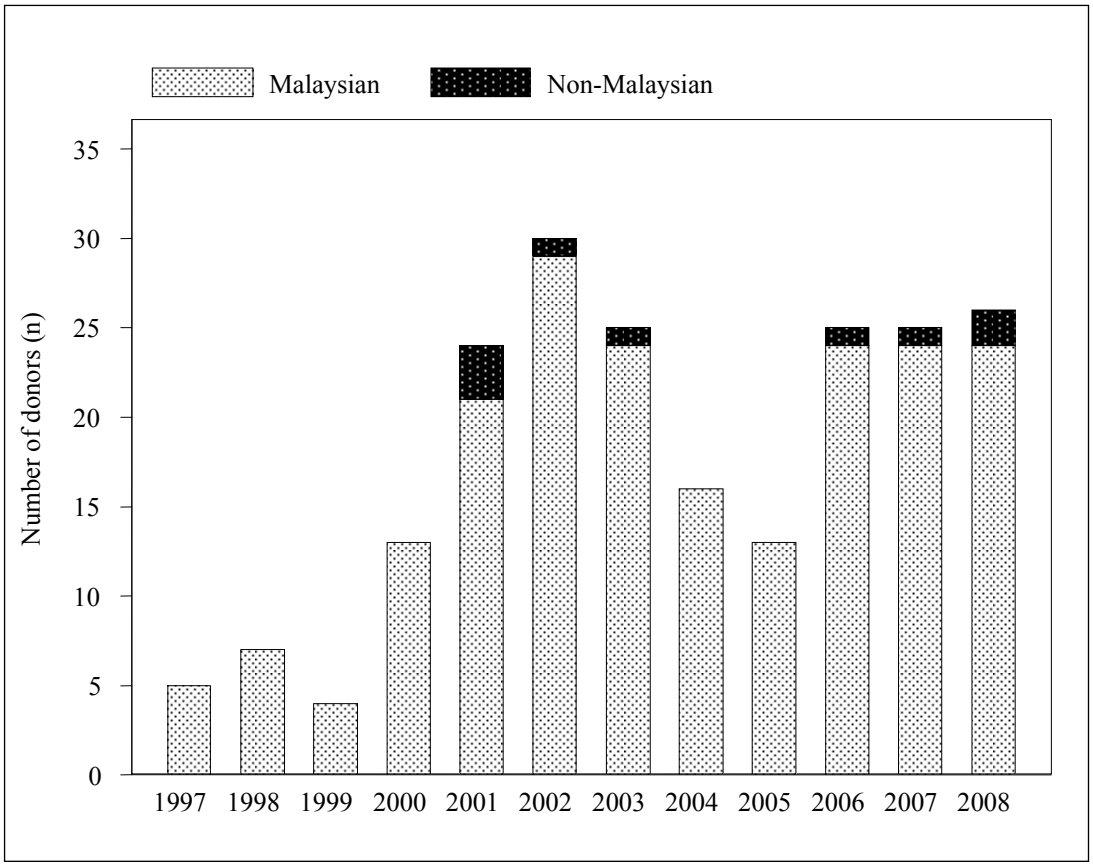

Malaysian
Non-Malaysian
Number of donors (n)
0
5
10
15
20
25
30
35
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008

Table 8.9: Distribution of Donors by State, 1997-2008

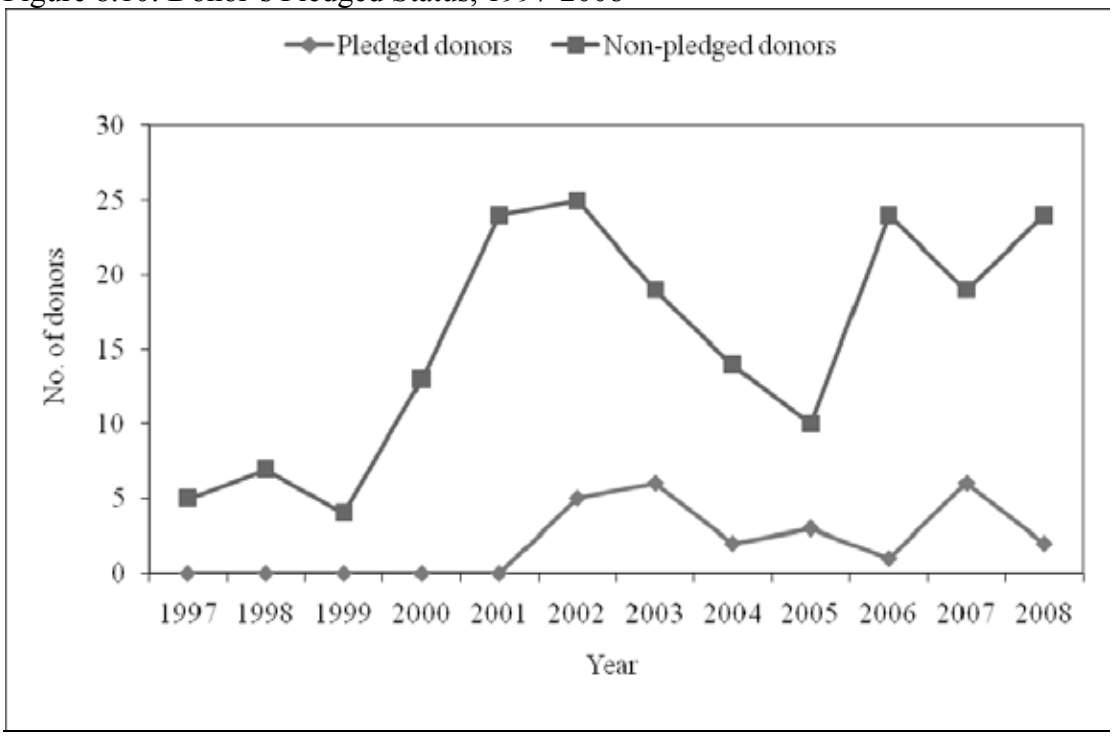
Donor's state of residence*	No. (%)						
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25
Johor	0	0	0	3 (23)	0	2 (7)	3 (12)
Malacca	0	1 (14)	1 (25)	0	0	1 (3)	2 (8)
Negeri Sembilan	0	1 (14)	0	1 (8)	0	1 (3)	4 (16)
Selangor	2 (40)	1 (14)	0	0	3 (13)	9 (30)	6 (24)
WP Kuala Lumpur	1 (20)	1 (14)	2 (50)	0	0	5 (17)	2 (8)
WP Putrajaya	0	0	0	0	0	1 (3)	0
Perak	1 (20)	2 (29)	1 (25)	3 (23)	0	4 (13)	0
Kedah	0	0	0	2 (15)	3 (13)	1 (3)	0
Perlis	0	0	0	0	0	0	0
Pulau Pinang	0	0	0	1 (8)	3 (13)	1 (3)	3 (12)
Pahang	0	1 (14)	0	0	3 (13)	2 (7)	2 (8)
Terengganu	0	0	0	0	1 (4)	0	0
Kelantan	0	0	0	1 (8)	0	0	0
Sabah	0	0	0	2 (15)	1 (4)	0	1 (4)
Sarawak	0	0	0	0	0	0	0
Others**	0	0	0	0	0	0	1 (4)
Unknown	1 (20)	0	0	0	10 (42)	3 (10)	1 (4)

Donor's state of residence*	No. (%)					
	2004 N=16	2005 N=13	2006 N=25	2007 N=25	2008 N=26	Total N=213
Johor	1 (6)	1 (8)	1 (4)	5 (20)	3 (12)	19 (9)
Malacca	0	1 (8)	2 (8)	1 (4)	0	9 (4)
Negeri Sembilan	0	1 (8)	2 (8)	1 (4)	2 (8)	13 (6)
Selangor	6 (38)	7 (54)	2 (8)	6 (24)	3 (12)	45 (21)
WP Kuala Lumpur	3 (19)	2 (15)	6 (24)	3 (12)	8 (31)	33 (15)
WP Putrajaya	0	0	0	0	0	1 (0)
Perak	2 (13)	1 (8)	4 (16)	2 (8)	3 (12)	23 (11)
Kedah	1 (6)	0	1 (4)	2 (8)	1 (4)	11 (5)
Perlis	0	0	0	0	0	0
Pulau Pinang	2 (13)	0	4 (16)	2 (8)	2 (8)	18 (8)
Pahang	0	0	1 (4)	1 (4)	2 (8)	12 (6)
Terengganu	0	0	0	1 (4)	0	2 (1)
Kelantan	0	0	1 (4)	0	0	2 (1)
Sabah	1 (6)	0	0	0	2 (8)	7 (3)
Sarawak	0	0	0	0	0	0
Others**	0	0	1 (4)	1 (4)	0	3 (1)
Unknown	0	0	0	0	0	15 (7)

Table 8.10: Donor's Pledged Status, 1997-2008

Donor's pledged status	**No. (%)**												
	1997 N=5	**1998 N=7**	**1999 N=4**	**2000 N=13**	**2001 N=24**	**2002 N=30**	**2003 N=25**	**2004 N=16**	**2005 N=13**	**2006 N=25**	**2007 N=25**	**2008 N=26**	**Total N=213**
Pledged donors	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (17)	6 (24)	2 (13)	3 (23)	1 (4)	6 (24)	2 (8)	25 (12)
Non-pledged donors	5 (100)	7 (100)	4 (100)	13 (100)	24 (100)	25 (83)	19 (76)	14 (88)	10 (77)	24 (96)	19 (76)	24 (92)	188 (88)

Figure 8.10: Donor's Pledged Status, 1997-2008



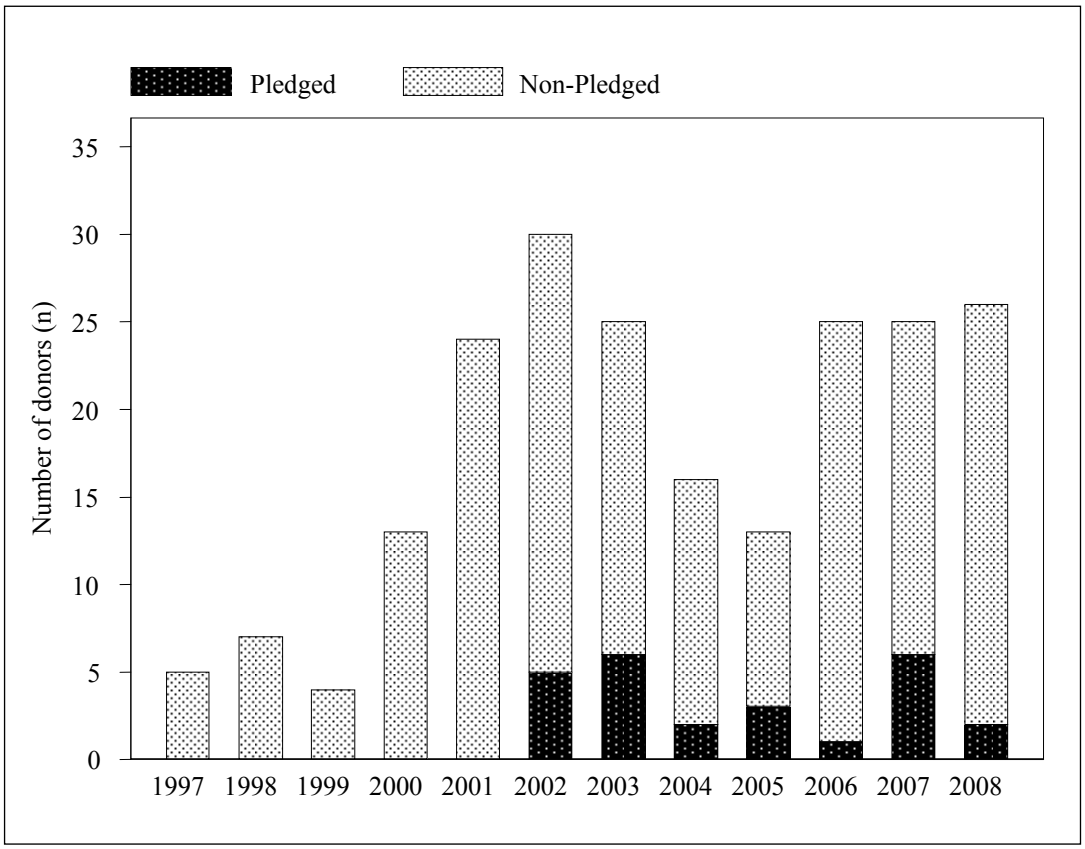

Pledged
Non-Pledged
Number of donors (n)
0
5
10
15
20
25
30
35
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008

Table 8.11: Distribution of Donors by Type, 1997-2008

Type of donors	No. (%)												
	1997 N=5	**1998 N=7**	**1999 N=4**	**2000 N=13**	**2001 N=24**	**2002 N=30**	**2003 N=25**	**2004 N=16**	**2005 N=13**	**2006 N=25**	**2007 N=25**	**2008 N=26**	**Total N=213**
BD (Brain Death donor)	4 (80)	6 (86)	4 (100)	11 (85)	20 (83)	17 (57)	8 (32)	10 (63)	5 (38)	14 (56)	15 (60)	13 (50)	127 (60)
CD (tissue donors after Cardiac Death)*	1 (20)	1 (14)	0 (0)	2 (15)	4 (17)	13 (43)	17 (68)	6 (38)	8 (62)	11 (44)	10 (40)	13 (50)	86 (40)

*CD involve tissue donations only.

Figure 8.11: Distribution of Donors by Type, 1997-2008

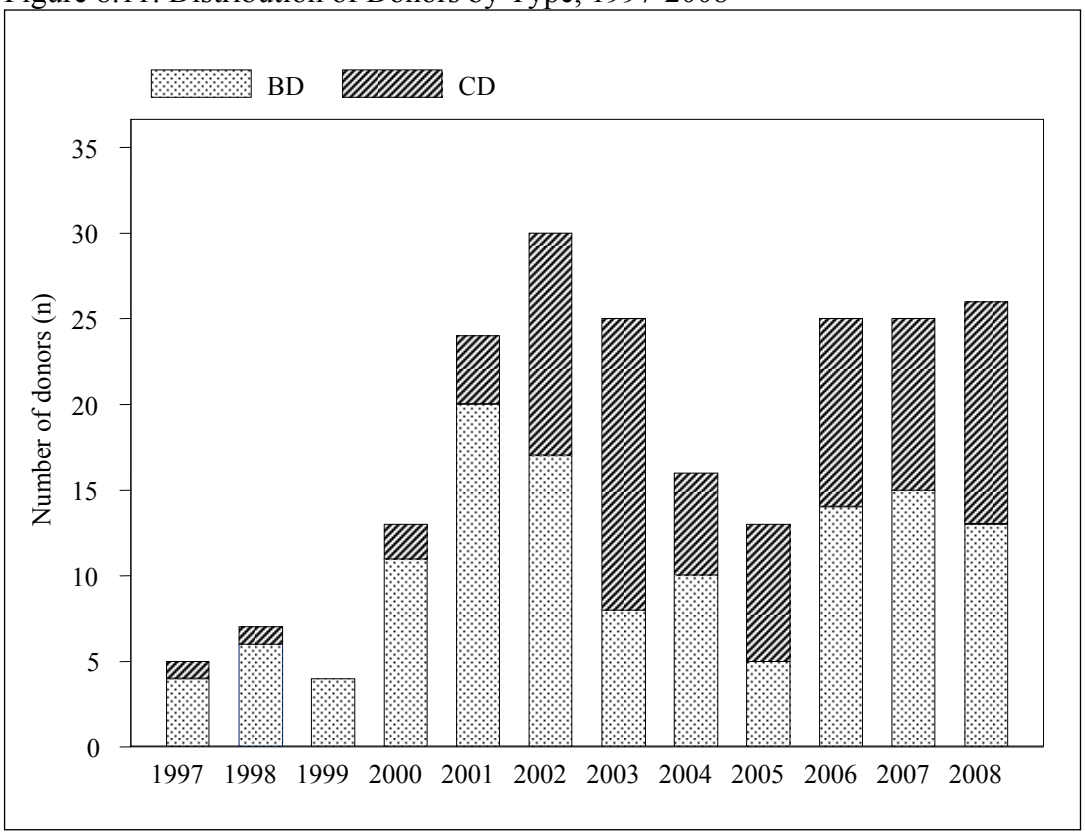


Table 8.12: Distribution of Donors by Cause of Death, 1997-2008

Causes of death	No. (%)													
	1997 N=5		1998 N=7		1999 N=4		2000 N=13		2001 N=24		2002 N=30	
	Brain dead donors N=4	Cardiac death tissue donors N=1	Brain dead donors N=6	Cardiac death tissue donors N=1	Brain dead donors N=4	Cardiac death tissue donors N=0	Brain dead donors N=11	Cardiac death tissue donors N=2	Brain dead donors N=20	Cardiac death tissue donors N=4	Brain dead donors N=17	Cardiac death tissue donors N=13
Injury from MVA	1 (25)	0	5 (83)	0	3 (75)	0	5 (45)	2 (100)	11 (55)	0	10 (59)	7 (54)
Injury from fall	0	0	0	0	0	0	0	0	1 (5)	0	0	0
Injury from assault	0	0	1 (17)	0	0	0	0	0	1 (5)	0	0	0
Injury from industrial accident	0	0	0	0	0	0	0	0	0	0	1 (6)	0
Spontaneous hypertensive intracranial bleed	2 (50)	0	0	0	0	0	2 (18)	0	3 (15)	1 (25)	1 (6)	0
Spontaneous AVM/Aneurysm intracranial bleed	0	0	0	0	0	0	1 (9)	0	1 (5)	0	2 (12)	0
Brain anoxia	0	0	0	0	0	0	0	0	0	0	1 (6)	0
Brain tumour	1 (25)	0	0	0	0	0	1 (9)	0	0	0	0	0
Thrombo embolic brain infarct	0	0	0	1 (100)	0	0	1 (9)	0	0	1 (25)	1 (6)	0
Cardiac disease	0	0	0	0	0	0	0	0	0	0	0	5 (38)
Others	0	0	0	0	0	0	0	0	1 (5)	1 (25)	0	1 (8)
Unknown	0	1 (100)	0	0	1 (25)	0	1 (9)	0	2 (10)	1 (25)	1 (6)	0

Causes of death	No. (%)															
	2003 N=25		2004 N=16		2005 N=13		2006 N=25		2007 N=25		2008 N=26		Total N=213			
	Brain dead donors N=8	Cardiac death tissue donors N=17	Brain dead donors N= 10	Cardiac death tissue donors N=6	Brain dead donors N=8	Cardiac death tissue donors N=17	Brain dead donors N= 10	Cardiac death tissue donors N=6	Brain dead donors N=15	Cardiac death tissue donors N=10	Brain dead donors N=13	Cardiac death tissue donors N=13	Brain dead donors N=127	Cardiac death tissue donors N=86
Injury from MVA	6 (75)	3 (18)	2 (20)	3 (50)	1 (20)	2 (25)	7 (50)	1 (9)	9 (60)	4 (40)	3 (23)	2 (15)	63 (50)	24 (28)
Injury from fall	1 (13)	0	2 (20)	0	0	0	1 (7)	1 (9)	1 (7)	2 (20)	1 (8)	1 (8)	7 (6)	4 (5)
Injury from assault	0	0	1 (10)	1 (17)	1 (20)	0	1 (7)	1 (9)	1 (7)	0	0	2 (15)	6 (5)	4 (5)
Injury from industrial accident	0	0	0	0	0	0	0	0	0	0	1 (8)	0	2 (2)	0
Spontaneous hypertensive intra cranial bleed	0	1 (6)	1 (10)	2 (33)	1 (20)	0	1 (7)	0	1 (7)	0	1 (8)	0	13 (10)	4 (5)
Spontaneous VM/ Aneurysm intra cranial bleed	0	1 (6)	3 (30)	0	0	0	0	0	2 (13)	0	1 (8)	1 (8)	10 (8)	2 (2)
Brain anoxia	0	1 (6)	0	0	0	0	0	0	0	0	0	0	1 (1)	1 (1)
Brain tumour	0	0	0	0	0	0	2 (14)	0	0	0	2 (15)	0	6 (5)	0
Thrombo embolic brain infarct	1 (13)	0	0	0	1 (20)	0	0	2 (18)	0	0	0	0	4 (3)	4 (5)
Cardiac disease	0	7 (41)	1 (10)	0	1 (20)	3 (38)	2 (14)	5 (45)	0	4 (40)	3 (23)	7 (54)	7 (6)	31 (36)
Others	0	4 (24)	0	0	0	3 (38)	0	0	1 (7)	0	0	0	2 (2)	9 (10)
Unknown	0	0	0	0	0	0	0	1 (9)	0	0	1 (8)	0	6 (5)	3 (3)

Table 8.13: Distribution of Organ Donors by Blood Group, 1997-2008

Blood group	No. (%)						
	1997 N=4	1998 N=6	1999 N=4	2000 N=11	2001 N=20	2002 N=15	2003 N=7
A positive	1 (25)	2 (33)	0 (0)	1 (9)	5 (25)	4 (27)	4 (57)
B positive	0 (0)	1 (17)	1 (25)	5 (45)	4 (20)	4 (27)	2 (29)
AB positive	1 (25)	1 (17)	0 (0)	0 (0)	1 (5)	0 (0)	0 (0)
O positive	2 (50)	2 (33)	3 (75)	5 (45)	10 (50)	7 (47)	1 (14)
A negative	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Blood group	No. (%)					
	2004 N=10	2005 N=5	2006 N=14	2007 N=15	2008 N=13	Total N=124
A positive	2 (20)	1 (20)	4 (29)	6 (40)	4 (31)	34 (27)
B positive	4 (40)	2 (40)	5 (36)	3 (20)	2 (15)	33 (27)
AB positive	0 (0)	0 (0)	2 (14)	0 (0)	0 (0)	5 (4)
O positive	4 (40)	2 (40)	3 (21)	5 (33)	6 (46)	50 (40)
A negative	0 (0)	0 (0)	0 (0)	1 (7)	1 (8)	2 (2)

Blood group is only ascertained in brain dead donors and is not done for tissue donors post -cardiac deaths

Figure 8.13a: Distribution of Organ Donors by Blood Group, 1997-2008

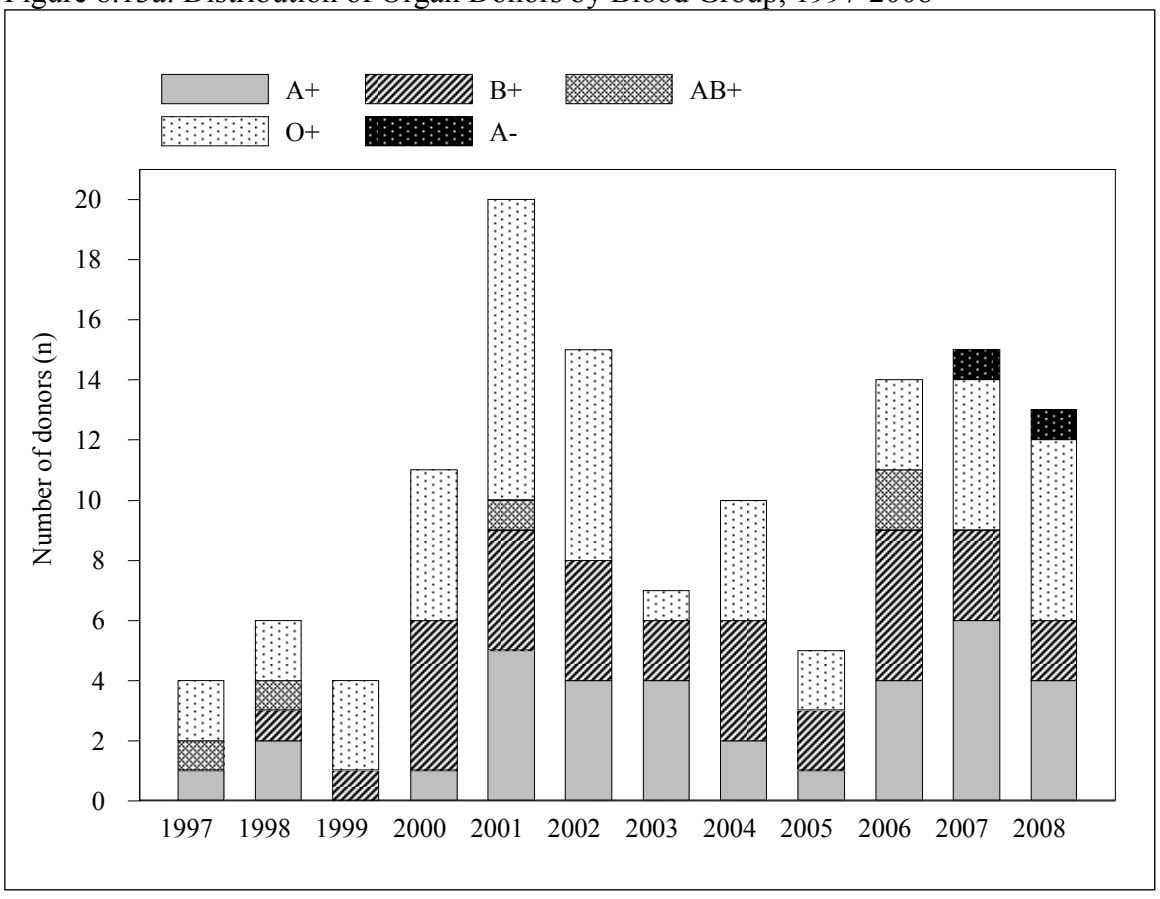


Figure 8.13b: Distribution of Organ Donor by Blood Group Type (pie chart), 1997-2008

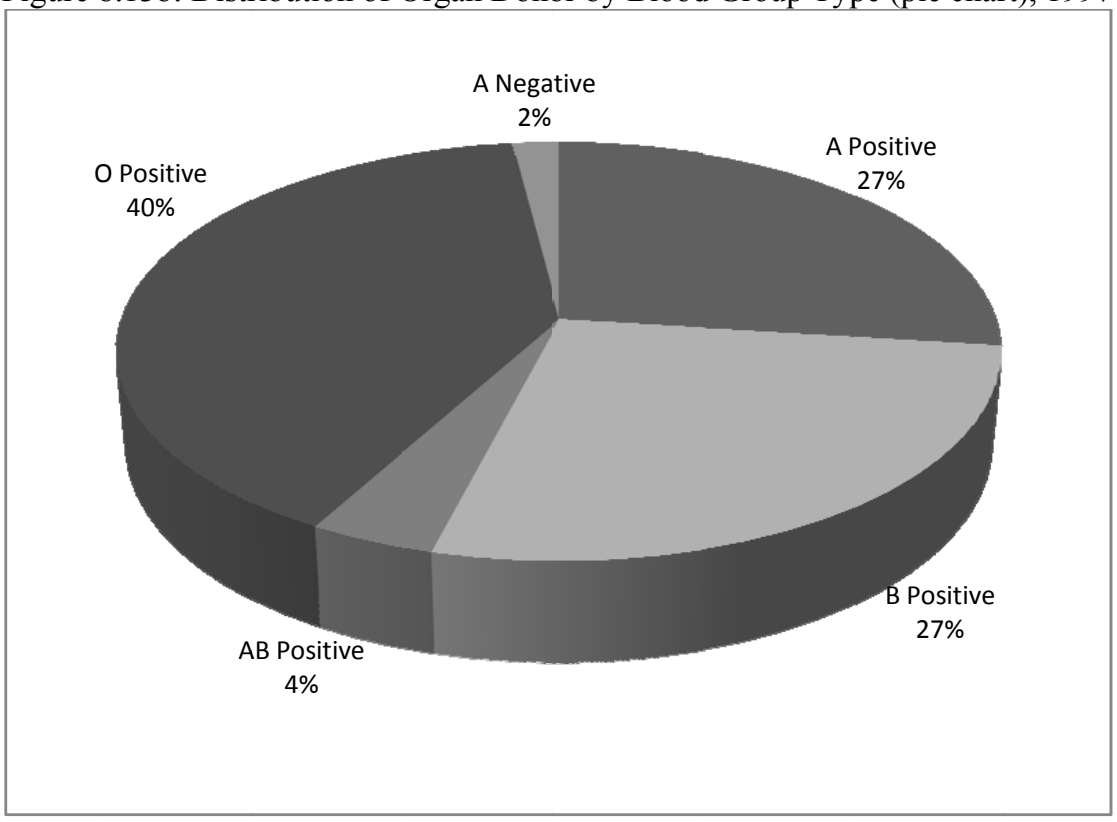


Figure 8.13c: Distribution of Organ Donor by Blood Group Type (pie chart), 2008

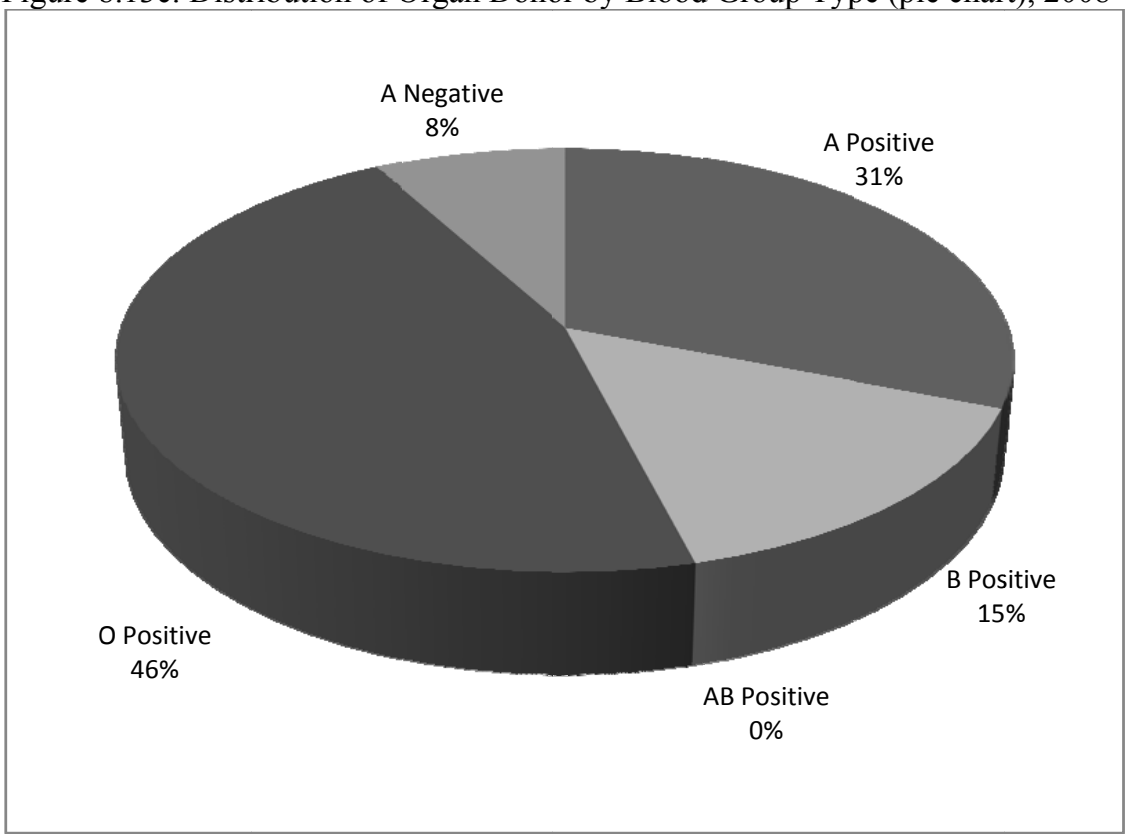


Table 8.14a: Distribution of Donors by Institution of Origin, 1997-2008

Donors' Institution of Origin	No. (%)						
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25
MOH state/general hospitals	2 (40)	5 (71)	1 (25)	10 (77)	16 (67)	19 (63)	15 (60)
MOH district hospitals	0 (0)	0 (0)	0 (0)	2 (15)	0 (0)	3 (10)	4 (16)
University hospitals	1 (20)	1 (14)	0 (0)	0 (0)	6 (25)	3 (10)	3 (12)
Private hospitals	1 (20)	1 (14)	3 (75)	1 (8)	2 (8)	4 (13)	3 (12)
Home	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)

Donors' Institution of Origin	No. (%)					
	2004 N=16	2005 N=13	2006 N=25	2007 N=25	2008 N=26	Total N=213
MOH state/general hospitals	12 (75)	8 (62)	20 (80)	18 (72)	15 (58)	141 (66)
MOH district hospitals	2 (13)	0 (0)	0 (0)	3 (12)	0 (0)	14 (7)
University hospitals	1 (6)	1 (8)	3 (12)	2 (8)	3 (12)	24 (11)
Private hospitals	1 (6)	4 (31)	2 (8)	2 (8)	6 (23)	30 (14)
Home	0 (0)	0 (0)	0 (0)	0 (0)	2 (8)	4 (2)

Figure 8.14a: Distribution of Donors by Institution of Origin, 1997-2008

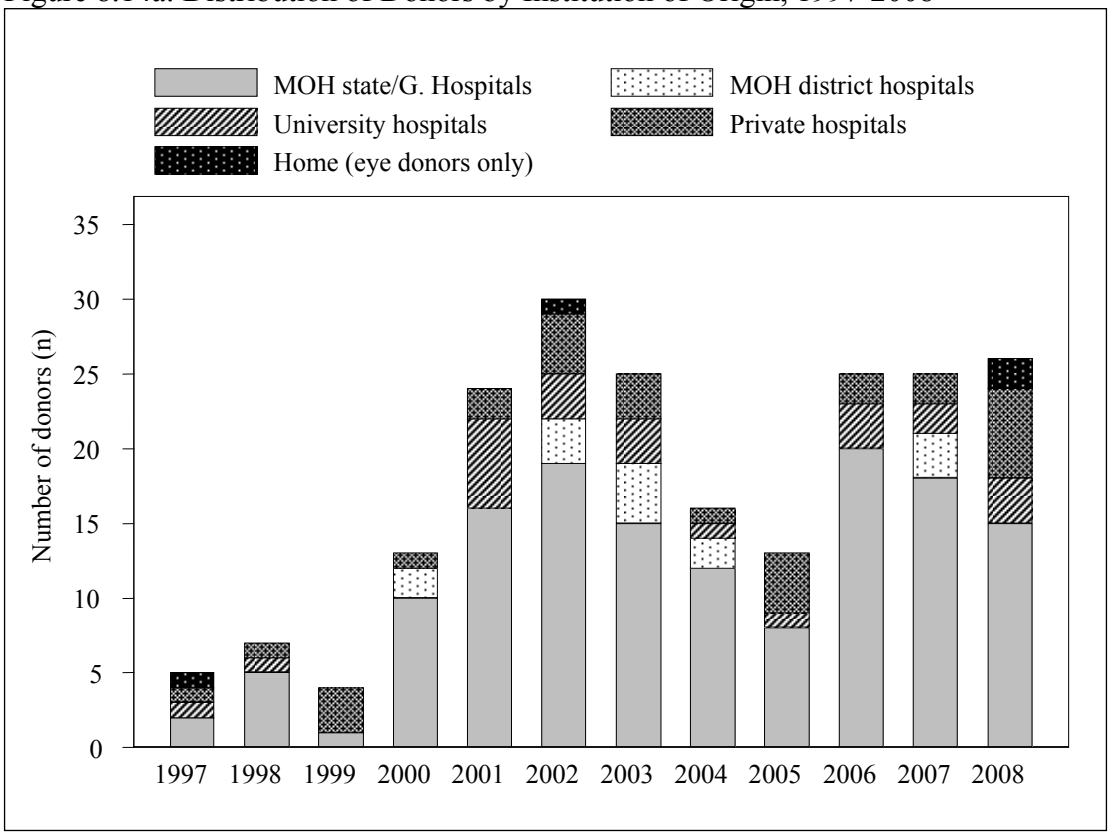


Table 8.14b: Distribution of Donors by Referral Site, 1997-2008

Donor Referral Site	No. (%)						
	1997 N=5	**1998 N=7**	**1999 N=4**	**2000 N=13**	**2001 N=24**	**2002 N=30**	**2003 N=25**
ICU	1 (20)	0 (0)	0 (0)	1 (8)	14 (58)	16 (53)	13 (52)
Ward	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	3 (12)
Emergency department	0 (0)	0 (0)	0 (0)	0 (0)	3 (13)	4 (13)	1 (4)
Mortuary	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (10)	6 (24)
Home	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)
Data not available	4 (80)	7 (100)	4 (100)	12 (92)	7 (29)	5 (17)	2 (8)

Donor Referral Site	No. (%)					
	2004 N=16	**2005 N=13**	**2006 N=25**	**2007 N=25**	**2008 N=26**	**Total N=213**
ICU	12 (75)	8 (62)	16 (64)	17 (68)	17 (65)	115 (54)
Ward	1 (6)	3 (23)	3 (12)	1 (4)	3 (12)	15 (7)
Emergency department	0 (0)	0 (0)	3 (12)	1 (4)	1 (4)	13 (6)
Mortuary	3 (19)	1 (8)	3 (12)	5 (20)	4 (15)	25 (12)
Home	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	2 (1)
Data not available	0 (0)	1 (8)	0 (0)	1 (4)	0 (0)	43 (20)

Figure 8.14b: Distribution of Donors by Referral Site, 1997-2008

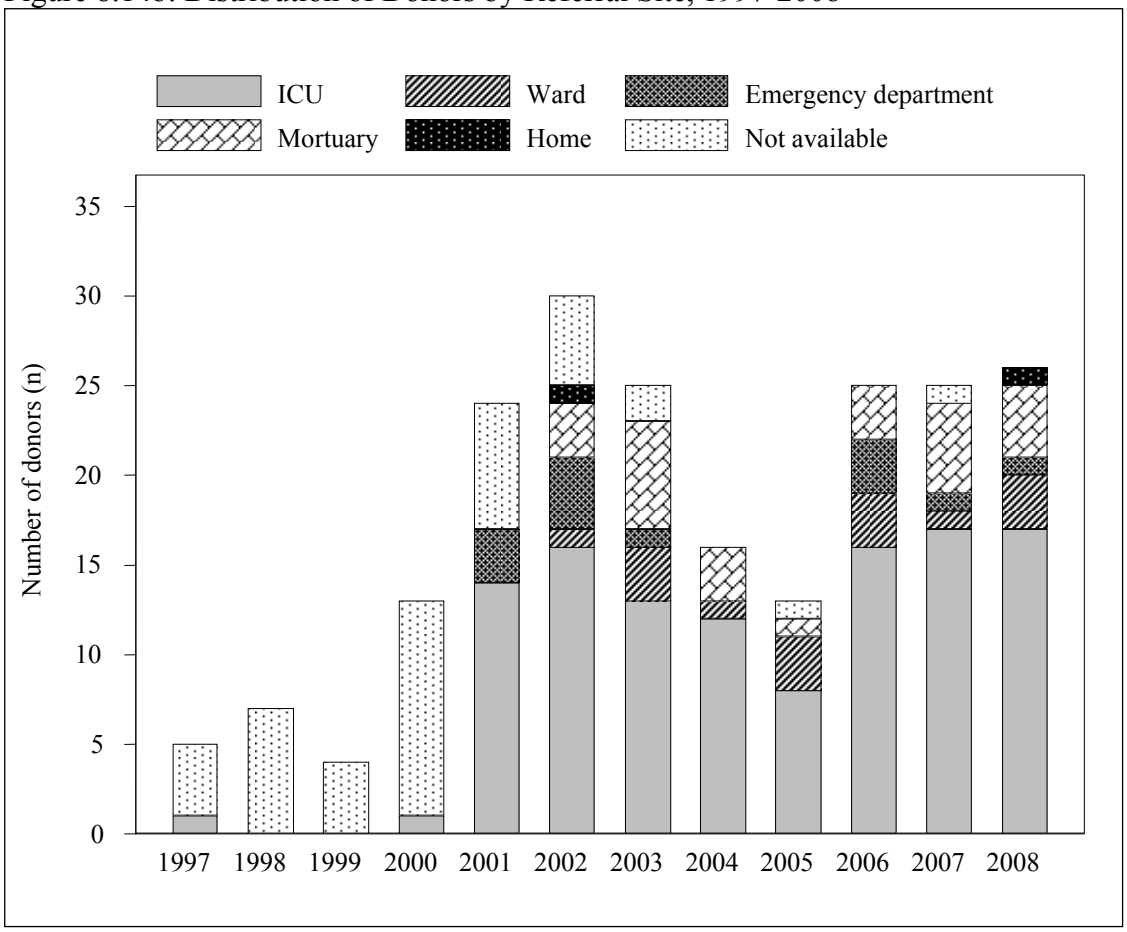


Table 8.14c: Distribution of Donors by Procurement Site, 1997-2008

Donor Procurement Site	No. (%)						
	1997 N=5	1998 N=7	1999 N=4	2000 N=13	2001 N=24	2002 N=30	2003 N=25
Operation theatre	4 (80)	6 (86)	4 (100)	11 (85)	20 (83)	14 (47)	8 (32)
Mortuary	0 (0)	1 (14)	0 (0)	2 (15)	3 (13)	14 (47)	14 (56)
Ward	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	1 (3)	3 (12)
Home	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)
Data not available	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Donor Procurement Site	No. (%)					
	2004 N=16	2005 N=13	2006 N=25	2007 N=25	2008 N=26	Total N=213
Operation theatre	9 (56)	5 (38)	14 (56)	16 (64)	13 (50)	124 (58)
Mortuary	7 (44)	5 (38)	10 (40)	7 (28)	12 (46)	75 (35)
Ward	0 (0)	2 (15)	1 (4)	2 (8)	0 (0)	10 (5)
Home	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	3 (1)
Data not available	0 (0)	1 (8)	0 (0)	0 (0)	0 (0)	1 (0)

Figure 8.14c: Distribution of Donors by Procurement Site, 1997-2008

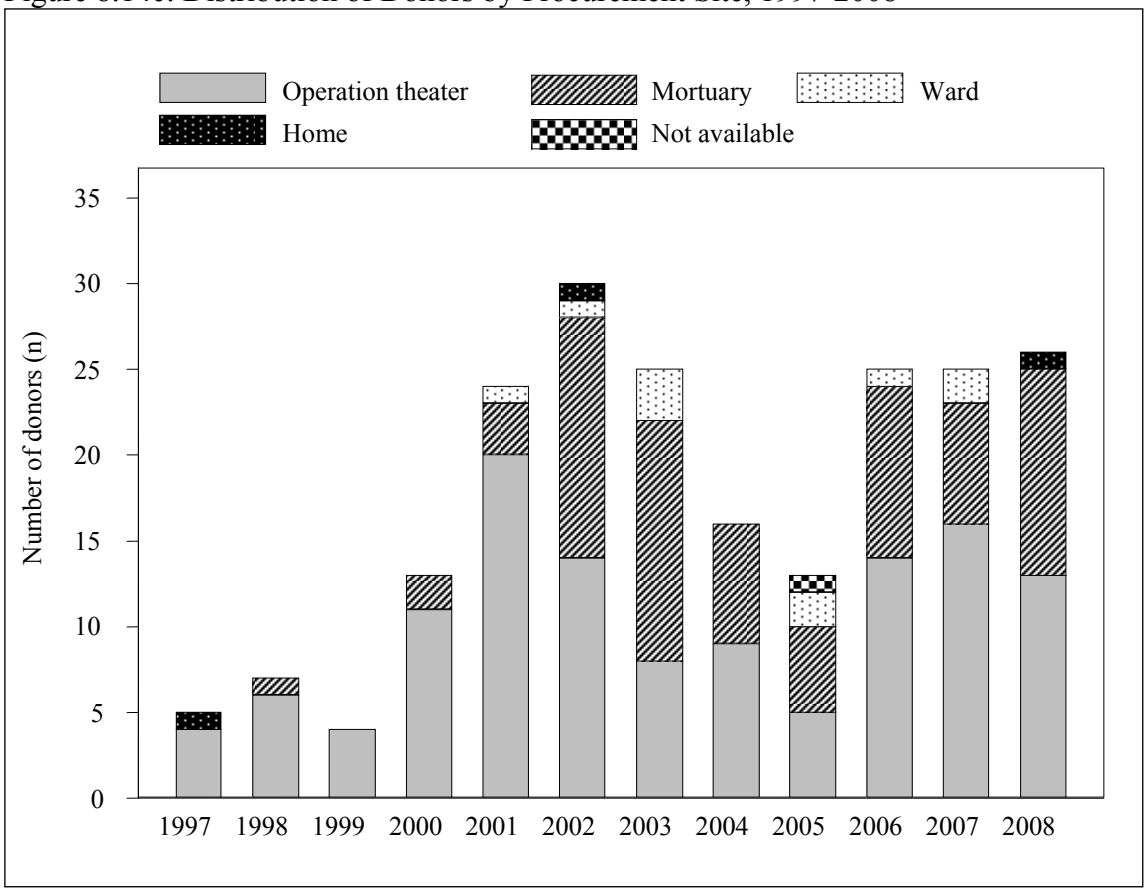


Table 8.15: Distribution of Donors by Inotrope, 2008

Inotrope	**No. (%)**
Dopamine	2 (15)
Dopamine/Noradrenaline	6 (46)
Dopamine/Adrenaline	2 (15)
Dopamine/Dobutamine/Adrenaline	1 (8)
Dopamine/Dobutamine/Adrenaline/Noradrenaline	1 (8)
Missing	1 (8)
Total	13 (100)

APPENDIX A

DATA MANAGEMENT

Data integrity of a register begins from the data source, data collection tools, data verification and data entry process. Registry data is never as perfect as the clinical trial data. Caution should be used when interpreting the result.

The data management personnel in the Register are trained based on the standard operating procedure (SOP). The data entry process is also designed to enhance data quality. Quality assurance procedures are in place at all stages to ensure the quality of data.

The NTR maintains different databases for each of the organs i.e. blood and marrow transplant, bone and tissue transplant, cornea transplant, heart and lung transplant, kidney transplant and liver transplant. Depending on the volume of data, each organ's data were stored in either Microsoft Access or SQL Server 2000.

Registry ICT infrastructure and data centre

The operations of the NTR are supported by an extensive ICT infrastructure to ensure operational efficiency and effectiveness.

NTR subscribes to co-location service with a high availability and highly secured data centre at Cyberjaya and at Jalan Pahang, Kuala Lumpur. This is in order to provide NTR with quality assured internet hosting services and state-of-the-art physical and logical security features without having to invest in costly data centre setup internally. State-of-the-art physical security features implemented includes anti-static raised flooring, fire protection with smoke and heat alarm warning system, biometric security access, video camera surveillance system, uninterrupted power supply, environmental control.

Other managed security services include patch management of the servers, antivirus signature monitoring and update, firewall traffic monitoring and intrusion detection, security incidence response, data backup service done on a daily, weekly and monthly basis, data recovery simulation to verify that backup works which is done at least once yearly, network security scan and penetration test done on a half-yearly basis, security policy maintenance, maintenance and monitoring of audit trail. Managed system services are also provided such as usage and performance report, operating system maintenance and monitoring, bandwidth monitoring and systems health monitoring.

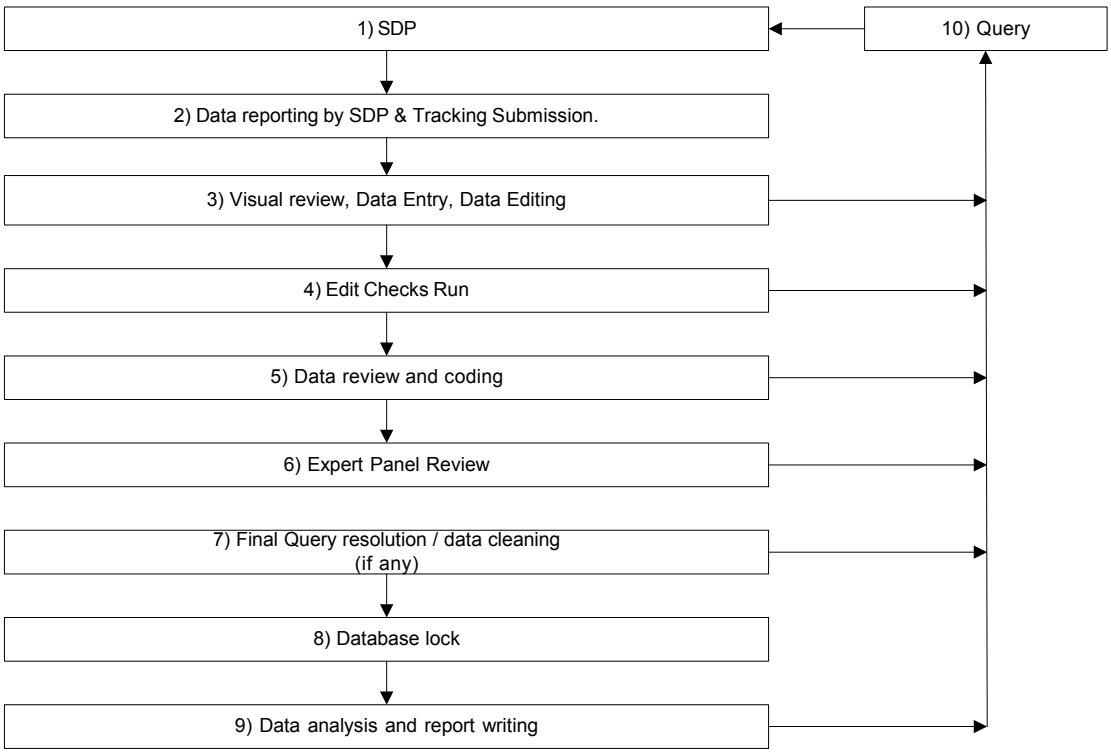
Data sources

SDPs or Source Data Providers of the National Transplant Registry comprise of centres for various transplanted organs throughout Malaysia. Bone and tissue transplant, cornea transplant, kidney transplant and liver transplant SDPs submit Case Report Forms (CRFs) to NTR. Blood and marrow transplant (BMT) and heart and lung transplant (HLT) SDPs submit data via web applications NTR-BMT and NTR-HLT respectively.

For the purpose of verifying patient's outcome regarding death and lost to follow-up, NTR uses data from the National Vital Registration System.

Data Flow Process

This section describes the data management flow process of the National Transplant Registry.



SDP Data reporting and Submission tracking

Data reporting by SDP is done via Case Report Forms or Web Applications e-Case Report Forms. Different types of forms are used for different organs/tissues.

For blood and marrow transplant, NTR collects data via Blood and Marrow Transplant Notification Form and Blood and Marrow Ad Hoc Event Notification Form through web application NTR-BMT. Data collected from NTR-BMT is synchronised daily to a master database in CRC to track data submission and generate queries to site. All retrospective data was mapped and transferred to the current system.

For bone and tissue transplant, NTR collects data via Bone and Tissue Transplant Notification Form.

For cornea transplant, NTR collects data via Cornea Transplant Notification Form and Cornea Transplant Outcome Form.

For heart and lung transplant, NTR collects data via Malaysian Heart and Lung Transplant Notification Form and Malaysian Heart and Lung Transplant Follow-Up Form through web application NTR-HLT. Data collected from NTR-HLT is

synchronised daily to a master database in NTR to track data submission and generate queries to site.

For kidney transplant, NTR collects data via Renal Transplant Notification Form and Renal Transplant Outcome Form. For annual survey purposes, NTR also collects data via Renal Transplant Annual Return Form and Renal Transplant Annual Quality of Life and Rehabilitation Assessment Form. To further ensure timeliness of notification, any patient who has been notified to National Renal Registry as transplanted will be automatically flagged to NTR. Similarly, NTR also automatically flags to NRR if there's a patient with graft failure.

For liver transplant, NTR collects data via Liver Transplant Notification Form.

Data submissions by SDPs of Bone and Tissue, Cornea, Kidney and Liver Transplant were tracked by NTR Computer System collectively.

Visual review will then be performed to check for completeness and obvious errors or problems. Data without obvious problems were entered into the relevant NTR organ's system. Data entry will not be performed if a critical variable on the CRF is missing or ambiguous. The CRF is returned to the SDP for verification. Prior to registering patient, a verification process is done to ensure there are no duplicate patients and/or notifications. After verification, data is then entered into the relevant NTR organ system.

There are a few in-built functionalities at the data entry page that serve to improve data quality. One such function is auto calculation functionality to reduce error of human calculation. There is also inconsistency check functionality that disables certain fields if they are answered in a certain manner. When value entered is out of range, user is prompted for correct value.

Real time reports are also provided in the web application. The aggregated data reports are presented in the form of tables and graphs. The aggregated data reports are typically presented in two manners, one as centre's own data aggregated data report and second as registry's overall aggregated data report. Each participating site submitting data via the web application is therefore able to compare itself against the overall registry's average.

Visual Review, Data Entry, Data Editing
Data received by the NTR was logged in and manually reviewed to check for completeness and obvious errors or problems. Data without obvious problems was entered into the relevant NTR's organ transplant system. Data with problems was sent to SDP as queries. As data for kidney transplant is inter-related with National Renal Registry's patient data, an additional verification process is performed to ensure no duplicate patient and renal replacement therapy is reported.

Edit Check Run
Edit checks were performed periodically to identify missing data, out of range values, inconsistent data, invalid values and error with duplication. Data cleaning is then performed based on the results of edit checks. Data discrepancies that were resolved were then entered into the system. Data update and data checking of the dataset is

performed when there is a query of certain fields when necessary. It could be due to request by user, correction of data based on checking from data query or after receiving results for preliminary data analysis. Any data discrepancy found is verified against the source CRF and resolved within the Register office where possible. Otherwise the specific data query report will be generated and forwarded to the SDP to clarify and resolve the data discrepancy. Data standardisation process is also done for missing data based on derivation from existing data.

Data Review and Coding

Data coding of retrospective data and free text data was performed by registry manager and further verified by expert panel member. The expert panel comprising of members with expertise and knowledge in the relevant area provided the quality control on the assessment of coding by data manager. They ensure that complex medical data are reviewed and assessed to detect clinical nuances in the data.

Final Query Resolution / Data Cleaning / Database Lock

A final edit check run was performed to ensure that data is clean. All queries were resolved before the database is locked to ensure data quality and integrity. Data is subsequently exported to the statistician for analysis.

Data Release Policy

One of the primary objectives of the Registry is to make data available to the transplant community. The Registry would appreciate that users acknowledge the Registry for the use of the data. Any request for data that requires a computer run must be made in writing (by e-mail, fax, or registered mail) accompanied with a Data Release Application Form and signed Data Release Agreement Form. These requests need prior approval by the NTR Steering Committee before data can be released.

Distribution of Report

The MST has made a grant towards the cost of running the registry and report printing. It is available on the website www.mst.org.my.

APPENDIX B

STATISTICAL METHODS FOR NTR

The statistical methods described were used to summarise the data collected from the National Transplant Registry (NTR). These analyses were generated for different types of transplant, such as bone and marrow, bone and tissue, cornea, heart and lung, liver and kidney.

1. Overall

The stock and flow tables summarised transplant activity in Malaysia. Places and centres of transplant activities were also reported. Treatment rate was calculated by the ratio of the count of number of new patients or prevalent patients in a given year to the mid-year population of Malaysia in that year, and expressed in per million-population. Annual death rates are calculated by dividing the number of deaths in a year by the estimated mid-year patient population.

2. Recipient's Characteristics

The information on recipient's characteristics was summarised in this section. These tables included the recipient's age, gender, ethnic group, serology data, primary disease(s), indication for transplantation, current immunosuppressive drug(s) treatment, etc. For summarising continuous data, the mean, standard deviation, median, minimum and maximum were reported. On the other hand, both the count and percentages were reported for discrete data. Invariably, there are situations where there is missing data. For purposes of analysis, subjects with missing continuous data had their values imputed by using the mean from measures of other records. For discrete data, analysis was confined to available data and no imputation was done.

3. Transplant Activity

These tables provided the information on transplant activity, such as the time of transplant, type of transplant, duration of surgery etc.

4. Outcome

The outcome of a transplant activity was tabulated in this section. Kaplan Meier method was used to estimate the probability of survival at different durations.

Time trend analysis was used to assess the association between time (e.g. year) and response variables (e.g. outcome). Statistical tests such as Spearman correlation test and chi-square test may be used to test whether or not the linear trend is statistically significant. Unfortunately, this was not performed as the registry is in its fifth year of operation. As more data is accrued to its database over time, time trend analysis will be of interest in future.

APPENDIX C

GLOSSARY

AIIRB	Angiotensin II Receptor Blocker
ACE	Angiotensin Converting Enzyme
ADPKD	Autosomal Dominant Polycystic Kidney Disease
AG	Antigen
ALL	Acute Lymphocytic Leukaemia
ALP	Alkaline Phosphatase
ALT	Alanine Transferase
AML	Acute Myelogenous Leukaemia
Apr	April
ASH	Ampang Puteri Specialist Hospital
ATG	Anti-thymocyte globulin
Aug	August
AVM	Arterio-venous Malformation
AZA	Azathioprine
BMI	Body Mass Index
BMT	Blood and Marrow Transplantation
BP	Blood Pressure
BD	Brain Death
BID	brought in dead
CAPD	Continuous Ambulatory Peritoneal Dialysis
CD	Cardiac Death
CDA	Congenital Dyserythropoeitic Anaemia
CF	Counting Fingers
CHD	Coronary Heart Disease
CKD	Chronic Kidney Disease
CMV	Cytomegalovirus
CRF	Case Report Form
Dec	December
DF	Deep Frozen
DFS	Disease-free Survival
FD	Freeze Dried
Feb	February
FK506	Tacrolimus
GCT	Germ Cell Tumour
GFR	Glomerular Filtration Rate
GMC	Gleneagles Medical Centre
GS	Gentamicin and Streptomycin
GVHD	Graft Versus Host Disease
HA	Hospital Ampang
Hb	Haemoglobin
HbsAg	Hepatitis B surface Antigen
HCV	Hepatitis C Virus
HD	Haemodialysis
HDL	High Density Lipoprotein

HKL	Hospital Kuala Lumpur
HLA	Human Leukocyte Antigen
HLT	Heart Lung Transplant
HM	Hand Movement
HPP	Hospital Pulau Pinang
HSCT	Haematopoietic Stem Cell Transplantation
HUKM	Hospital Universiti Kebangsaan Malaysia
HUSM	Hospital Universiti Sains Malaysia
ICT	Information and Communication Technology
ICU	Intensive Care Unit
IHD	Ischaemic Heart Disease
IJN	Institut Jantung Negara
IL2R	Interleukin 2 Receptor
IOL	Intraocular Lens
Jan	January
JNC	Joint National Committee
Jul	July
Jun	June
KLA	HKL, Adult
KLP	HKL, Paediatric
LDL	Low Density Lipoprotein
LQ	Lower Quartile
LWE	Lam Wah Ee Hospital
Mar	March
Max	Maximum
MDS	Myelodysplastic Syndrome
Min	Minimum
MK	McCarey and Kaufman
mm	millimetres
MMF	Mycophenolate Mofetil
MOH	Ministry of Health, Malaysia
Nov	November
MVA	Motor Vehicle Accident
NCEP	National Cholesterol Education Program
NET	Neuroectodermal Tumour
NPL	No Perception of Light
NTPMU	National Transplant Procurement and Management Unit
NTR	National Transplant Registry
Oct	October
Paed	Paediatric
PBSC	Peripheral Blood Stem Cells
PJ	Petaling Jaya
PK	Penetrating Keratoplastry
PL	Perception of Light
pmp	per million population
QoL	Quality of Life
RMS	Rhabdomyosarcoma
SD	Standard Deviation

SDP	Source Data Provider
Sept	September
SJA	Sime Darby Medical Centre, Subang Jaya (Adult)
SJP	Sime Darby Medical Centre, Subang Jaya (Paediatric)
SOP	Standard Operating Procedure
SQL	Structured Query Language
UKM	Universiti Kebangsaan Malaysia
UMA	UMMC, Adult
UMMC	University Malaya Medical Centre
UMP	UMMC, Paediatric
UQ	Upper Quartile
USA	United States of America
USM	Universiti Sains Malaysia
VA	Visual Acuity
VOD	Veno-Occlusive Disease
WP	Wilayah Persekutuan (Federal Territory)

APPENDIX D

DIRECTORY OF PARTICIPATING CENTRES

Blood and Marrow Transplant Services

MOH

Hospital Ampang
Jalan Mewah Utara
Pandan Mewah
68000 Ampang
Kuala Lumpur
Tel : (03)42896000 Ext : 6381
Fax : (03)42970059

Hospital Kuala Lumpur
Paediatrics BMT Unit
Institute Paediatrics
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26155555 Ext : 6905
Fax : (03)26948187

PRIVATE

Ampang Puteri Specialist Hospital
1 Jalan Mamanda 9
68000 Ampang
Selangor Darul Ehsan
Tel : (03)42702500 Ext : 4478
Fax : (03)42702938

Gleneagles Medical Centre, Penang
Oncology-Haematology Department
1, Jalan Pangkor
10050 Penang
Tel : (04)2202189
Fax : (04)2262994

Lam Wah Ee Hospital
Oncology-Haematology Department
Jalan Tan Sri Teh Ewe Lim
11600 Penang
Tel : (04)6528836
Fax : (04)6570940

Sime Darby Medical Centre Subang Jaya
Haematology Department
1, Jalan SS 12/1A
47500 Subang Jaya
Selangor Darul Ehsan
Tel : (03)56391212
Fax : (03)56391209

Sime Darby Medical Centre Subang Jaya
Paediatrics BMT Unit
1, Jalan SS 12/1A
47500 Subang Jaya
Selangor Darul Ehsan
Tel : (03)56306361
Fax : (03)56306209

Blood and Marrow Transplant Services

UNIVERSITY

Hospital Universiti Kebangsaan Malaysia
Maybank BMT Centre
Jalan Yaacob Latif
Bandar Tun Razak, Cheras
56000 Kuala lumpur
Tel : (03)91455555 Ext : 6336
Fax : (03)91738255

Hospital Universiti Sains Malaysia
Haemapoietic Stem Cell Transplant Unit
Jalan Sultanah Zainab II
16150 Kota Bharu
Kelantan Darul Naim
Tel : (09) 7663349

University of Malaya Medical Centre
Division of Haematology
Department of Medicine
Jalan Universiti
59100 Kuala Lumpur
Tel : (03)79492741
Fax : (03)79557740

University of Malaya Medical Centre
Paediatric BMT Unit
Department of Paediatrics
Jalan Universiti
59100 Kuala Lumpur
Tel : (03)79492065
Fax : (03)79556114

Bone and Tissue Transplant Services

MOH

Hospital Ipoh
Department of Orthopaedics
Jalan Hospital
30990 Ipoh
Perak Darul Ridzuan
Tel : (05)5222460
Fax : (05)2412826

Hospital Kajang
Orthopaedics Department
Jalan Semenyih
43000 Kajang
Selangor Darul Ehsan
Tel : (03)87363333

Hospital Kangar
Jabatan Ortopedik & Traumatologi
Jalan Kolam
01000 Kangar
Perlis Indera Kayangan
Tel : (04)9763333 Ext : 1184
Fax : (04)9767237

Hospital Kuala Lumpur
Institute of Orthopaedic &
Traumatology
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26155555 Ext : 5543/5534
Fax : (03)26927281

Hospital Kuala Lumpur
Ophthalmology Department
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26155555 Ext : 6801
Fax : (03)26925276

Hospital Kuantan
Department of Orthopaedics
Jalan Tanah Puteh
25100 Kuantan
Pahang Darul Makmur
Tel : (09)5133333 Ext : 2903
Fax : (09)5142712

Hospital Pakar Sultanah Fatimah
Orthopaedics Department
Jalan Salleh
84000 Muar
Johor Darul Takzim
Tel : (06)9521901

Hospital Pulau Pinang
Department of Orthopaedics
Jalan Residensi
10990 Pulau Pinang
Tel : (04)2225127
Fax : (04)2226127

Hospital Raja Perempuan Zainab II
Department of Surgery
Jalan Hospital
15590 Kota Bharu
Kelantan Darul Naim
Tel : (09)7452000 Ext : 2013/2237
Fax : (09) 7475418

Hospital Raja Perempuan Zainab II
Department of Orthopaedics
Jalan Hospital
15590 Kota Bharu
Kelantan Darul Naim
Tel : (09)7485533 Ext : 2374/2364
Fax : (09)7486951

Bone and Tissue Transplant Services

MOH

Hospital Seberang Jaya
Orthopaedics Department
Bandar Baru
13700 Seberang Jaya
Pulau Pinang
Tel : (04)3983333

Hospital Sultanah Aminah
Orthopaedics Department
80100 Johor Bahru
Johor Darul Takzim
Tel : (07)2231666

Hospital Sultanah Bahiyah
Ophthalmology Department
06550 Alor Setar
Kedah Darul Aman
Tel : (04)7002248
Fax : (04)7323770

Hospital Sultanah Bahiyah
Department of Orthopaedic Surgery
06550 Alor Setar
Kedah Darul Aman
Tel : (04)7303333 Ext : 179
Fax : (04)7323770

Hospital Sultanah Nur Zahirah
Orthopaedic Department
Jalan Sultan Mahmud
20400 Kuala Terengganu
Terengganu Darul Iman
Tel : (09)6212121

Hospital Sungai Buloh
Ophthalmology Department
47000 Sungai Buloh
Selangor Darul Ehsan
Tel : (03)61561324

Hospital Taiping
Department of Orthopaedic Surgery
Jalan Taming Sari
34000 Taiping
Perak Darul Ridzuan
Tel : (05)8408037
Fax : (05)8073894

Hospital Teluk Intan
Ophthalmology Department
Jalan Changkat Jong
36000 Teluk Intan
Perak Darul Ridzuan
Tel :(05)6213333 Ext : 1330
Fax : (05)6237343

Hospital Tengku Ampuan Afzan
Ophthalmology Department
25100 Kuantan
Pahang Darul Makmur
Tel : (09)5133333 Ext : 2454
Fax : (09)5142712

Hospital Tengku Ampuan Rahimah
Ophthalmology Department
41200 Klang
Selangor Darul Ehsan
Tel : (03)33723333 Ext : 1336
Fax : (03)33729089

Bone and Tissue Transplant Services

MOH

Hospital Tengku Ampuan Rahimah
Orthopaedic Clinic
41200 Klang
Selangor Darul Ehsan
Tel : (03)33723333 Ext : 1225
Fax : (03)33729089

Hospital Umum Sarawak
Orthopaedic Department
93586 Kuching
Sarawak
Tel : (082)276433
Fax : (082)419495

PRIVATE

Hospital Fatimah
1, Jalan Chew Peng Loon
Ipoh Garden
31400 Ipoh
Perak Darul Ridzuan
Tel : (05)5455777
Fax : (05)5477050

Island Hospital
308, Macalister Road
10450 Penang
Pulau Pinang
Tel : (04)2205527
Fax : (04)2267989

Kota Bharu Medical Centre
Lot 179-184, Section 24
Jalan Sultan Yahya Petra
15200 Lundang, Kota Bharu
Kelantan Darul Naim
Tel : (09)7433399
Fax : (09)7433800

Normah Medical Specialist Centre
P.O Box 3298
93764 Kuching
Sarawak
Tel : (082)440055
Fax : (082)442600

Seremban Specialist Hospital
Wan Orthopaedic, Trauma & Sports
Injury Centre (WOTSIC)
Suite 17, Seremban Specialist Hospital,
Jalan Toman 1, Kemayan Square
70200 Seremban
Negeri Sembilan Darul Khusus
Tel : (06)7677800 Ext : 130 / 131
Fax : (06)7675900

Sri Kota Medical Centre
Ophthalmology Department
Jalan Mohet
41000 Klang
Selangor Darul Ehsan
Tel : (03)33733636
Fax : (03)33736888

Timberland Medical Centre
Lorong 2, 2 1/2 miles Rock Road
93250 Kuching
Sarawak
Tel : (082)234466 Ext : 503
Fax : (082)232259

Bone and Tissue Transplant Services

UNIVERSITY

Hospital Universiti Sains Malaysia
Ophthalmology Department
16150 Kubang Kerian
Kelantan Darul Naim
Tel : (09)7664370
Fax : (09)7653370

Hospital Universiti Sains Malaysia
Orthopaedics Department
16150 Kota Bharu
Kelantan Darul Naim
Tel : (09) 7664509
Fax : (09) 7653370

International Islamic University Malaysia
Department of Orthopaedics,
Traumatology and Rehabilitation
Kulliyah of Medicine
Jalan Hospital
25100 Kuantan
Pahang Darul Makmur
Tel : (09)5132797
Fax : (09)5151518

University of Malaya Medical Centre
Department of Orthopaedics Surgery
Jalan Universiti
59100 Kuala Lumpur
Tel : (03)79492061
Fax : (03)79535642

TISSUE BANK

National Tissue Bank
Universiti Sains Malaysia
Health Campus
16150 Kota Bharu
Kelantan Darul Naim
Tel : (09)7664344
Fax : (09)7653307

Bone and Tissue Transplant Services

BONE BANK

Bone Bank, Hospital Kuala Lumpur
Institute of Orthopaedic &
Traumatology
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26155555 Ext : 5543/5534
Fax : (03)26927281

Bone Bank, University of Malaya
Medical Centre
Department of Orthopaedics Surgery
Jalan Universiti
59100 Kuala Lumpur
Tel : (03)79492061
Fax : (03)79535642

IRRADIATION CENTRE

Malaysian Nuclear Agency
Research Tissue Bank
Nuclear Agensi Malaysia
Bangi
43000 Kajang
Selangor Darul Ehsan
Tel : (03) 89250510 Ext : 1611
Fax : (03) 89282956

Cornea Transplant Services

MOH

Hospital Batu Pahat
Ophthalmology Department
83000 Batu Pahat
Johor Darul Takzim
Tel : (07)4341999
Fax : (07)4322544

Hospital Bukit Mertajam
Ophthalmology Department
Jalan Kulim
14000 Bukit Mertajam
Pulau Pinang
Tel : (04)5383333 Ext : 256 / 259
Fax : (04)5388435

Hospital Duchess of Kent
Ophthalmology Department
KM 3.2 Jalan Utara
90000 Sandakan
Sabah
Tel : (089)212111
Fax : (089)213607

Hospital Ipoh
Ophthalmology Department
Jalan Hospital
30990 Ipoh
Perak Darul Ridzuan
Tel : (05)5222034
Fax : (05)2531541

Hospital Kangar
Ophthalmology Department
Jalan Kolam
01000 Kangar
Perlis Indera Kayangan
Tel : (04)9763333 Ext : 2031
Fax : (04)9767237

Hospital Kuala Lipis
Ophthalmology Department
27200 Kuala Lipis
Pahang Darul Makmur
Tel : (09)3123333 Ext : 114
Fax : (09)3121787

Hospital Kuala Lumpur
Ophthalmology Department
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26155555 Ext : 6801
Fax : (03)26925276

Hospital Kuala Pilah
Ophthalmology Department
72000 Kuala Pilah
Negeri Sembilan Darul Khusus
Tel : (06)4818001 Ext : 170 / 175
Fax : (06)4818010

Hospital Melaka
Ophthalmology Department
Jalan Mufti Haji Khalil
75400 Melaka
Melaka
Tel : (06)2707215
Fax : (06)2818488

Hospital Mentakab
Ophthalmology Department
Jalan Maran
28900 Temerloh
Pahang Darul Makmur
Tel : (09)2955333 Ext : 1570
Fax : (09)2972468

Cornea Transplant Services

MOH

Hospital Miri
Ophthalmology Department
Jalan Cahaya
98000 Miri
Sarawak
Tel : (085)420033 Ext : 148
Fax : (085)416514

Hospital Pulau Pinang
Eye Clinic
Jalan Residensi
10990 Georgetown
Pulau Pinang
Tel : (04)2002283
Fax : (04)2281737

Hospital Queen Elizabeth
Ophthalmology Department
88586 Kota Kinabalu
Sabah
Tel : (088)206153
Fax : (088)252827

Hospital Selayang
Ophthalmology Department
Lebuhraya Selayang-Kepong
Batu Caves
68100 Bandar Baru Selayang
Selangor Darul Ehsan
Tel : (03)61367788 Ext : 4069/3254
Fax : (03)61207564

Hospital Sultan Ismail
Ophthalmology Department
Jalan Persiaran Mutiara Emas Utama
81100 Johor Bahru
Johor Darul Takzim
Tel : (07)3565000
Fax : (07)3565034

Hospital Pakar Sultanah Fatimah
Ophthalmology Department
Jalan Salleh
84000 Muar
Johor Darul Takzim
Tel : (07)9521901 Ext : 147 / 227

Hospital Putrajaya
Ophthalmology Department
Pusat Pentadbiran Kerajaan
Persekutuan Presint 7
62250 Putra Jaya
Selangor Darul Ehsan
Tel : (03)83124200 Ext : 4231/4279
Fax : (03)88880137

Hospital Raja Perempuan Zainab II
Ophthalmology Department
Jalan Hospital
15586 Kota Bharu
Kelantan Darul Naim
Tel : (09)7485533 Ext : 2254
Fax : (09)7502236

Hospital Sibu
Ophthalmology Department
Batu 5 1/2 Jalan Ulu Oya
96000 Sibu
Sarawak
Tel : (084)343333 Ext : 1008/1009
Fax : (084)337354

Hospital Sultanah Aminah
Ophthalmology Department
80100 Johor Bahru
Johor Darul Takzim
Tel : (07)2231666 Ext : 2690
Fax : (07)2242694

Cornea Transplant Services

MOH

Hospital Sultanah Bahiyah
Ophthalmology Department
05460 Alor Setar
Kedah Darul Aman
Tel : (04)7407873
Fax : (04)7406154

Hospital Sultanah Nur Zahirah
Ophthalmology Department
Jalan Sultan Mahmud
20400 Kuala Terengganu
Terengganu Darul Iman
Tel : (09)6212121 Ext : 2727/2024
Fax : (09)6317871

Hospital Sungai Buloh
Ophthalmology Department
Jalan Hospital
47000 Sungai Buloh
Selangor Darul Ehsan
Tel : (03)61561324
Fax : (03)61562470

Hospital Sungai Petani
Ophthalmology Department
08000 Sungai Petani
Kedah Darul Aman
Tel : (04)4213333 Ext : 127
Fax : (04)4212403

Hospital Taiping
Ophthalmology Department
Jalan Taming Sari
34000 Taiping
Perak Darul Ridzuan
Tel : (05)8083333 Ext : 8050/8053
Fax : (05)8073894

Hospital Tawau
Ophthalmology Department
P.O. Box 67
91007 Tawau
Sabah
Tel : (089)773533 Ext : 179
Fax : (089)768626

Hospital Teluk Intan
Ophthalmology Department
Jalan Changkat Jong
36000 Teluk Intan
Perak Darul Ridzuan
Tel : (05)6213333 Ext : 1330
Fax : (05)6237343

Hospital Tengku Ampuan Afzan
Ophthalmology Department
25100 Kuantan
Pahang Darul Makmur
Tel : (09)5133333 Ext : 2454
Fax : (09)5142712

Hospital Tengku Ampuan Rahimah
Ophthalmology Department
Jalan Langat
41200 Klang
Selangor Darul Ehsan
Tel : (03)33723333 Ext : 1336/1338
Fax : (03)33729089

Hospital Tuanku Ja'afar
Ophthalmology Department
Jalan Rasah
70300 Seremban
Negeri Sembilan Darul Khusus
Tel : (06)7623333 Ext : 5120
Fax : (06)7625771

Cornea Transplant Services

MOH

Hospital Umum Sarawak
Opthalmology Department
Jalan Tun Ahmad Zaidi Adruce
93586 Kuching
Sarawak
Tel : (082)276513
Fax : (082)419495

ARMED FORCES

94 Hospital Angkatan Tentera Kem
Terendak
Ophthalmology Department
76200 Melaka
Melaka
Tel : (06)3573201 Ext : 1134/1127
Fax : (06)3572108

PRIVATE

International Specialist Eye Centre
Level 8, Centrepoint South,
The Boulevard, Midvalley City
Lingkaran Syed Putra
59200 Kuala Lumpur
Tel : (03)22848989
Fax : (03)22844330

Gleneagles Intan Medical Centre
Hope Eye Centre
Suite 618
282, Jalan Ampang
50450 Kuala Lumpur
Tel : (03)42578112
Fax : (03)42576112

Gleneagles Medical Centre
Ophthalmology Department
Pulau Pinang Clinic Sdn Bhd
1, Jalan Pangkor
10050 Pulau Pinang
Tel : (04)2202147
Fax : (04)2272498

Hospital Pantai Indah
Ophthalmology Department
Jalan Perubatan 1
Pandan Indah
55100 Kuala Lumpur
Tel : (03)42892947

Cornea Transplant Services

PRIVATE

K. C. Yeo Eye Specialist Centre
No. 309-310, Jalan Melaka Raya 1
Tmn Melaka Raya
75000 Melaka
Tel : (06)2833510

Mahkota Medical Centre
Suite 101, 1st Floor,
3, Mahkota Melaka, Jalan Merdeka
75000 Melaka
Tel : (06)2818222

Pusat Pakar Mata Centre For Sight
1-1, Jalan SS23/15,
Taman SEA
47400 Petaling Jaya
Selangor Darul Ehsan
Tel : (03)78044051

Puteri Specialist Hospital, JB
33, Jalan Tun Abdul Razak (Susur 5)
80350 Johor Bahru
Johor Darul Takzim
(07)2233377
(07)2238833

Sri Kota Medical Centre
Ophthalmology Department
Jalan Mohet
41000 Klang
Selangor Darul Ehsan
Tel : (03)33733636 Ext : 7206
Fax : (03)33736888

Sunway Medical Centre
No 5, Jln Lagoon Selatan
Bandar Sunway
46150 Petaling Jaya
Selangor Darul Ehsan
Tel : (03)74919191 Ext : 6612/6613

Tan Eye Specialist Centre
Sunway Medical Centre
No 5, Jln Lagoon Selatan
Bandar Sunway
46150 Petaling Jaya
Selangor Darul Ehsan
Tel : (03)74919191 Ext : 1602
Fax : (03)79826025

Tun Hussein Onn National Eye
Hospital
Lorong Utara B
46200 Petaling Jaya
Selangor Darul Ehsan
Tel : (03)79561511
Fax : (03)79576128

Cornea Transplant Services

UNIVERSITY

Hospital Universiti Kebangsaan Malaysia
Ophthalmology Department
Faculty of Medicine
Jalan Yaacob Latif
Bandar Tun Razak, Cheras
56000 Kuala lumpur
Tel : (03)91702497
Fax : (03)91737836

Hospital Universiti Sains Malaysia
Ophthalmology Department
16150 Kubang Kerian
Kelantan Darul Naim
Tel : (09)7664370
Fax : (09)7653370

University of Malaya Medical Centre
Ophthalmology Department
Faculty of Medicine
59100 Kuala Lumpur
Tel : (03) 79502060
Fax : (03) 79535635

Heart and Lung Transplant Services

MOH

Hospital Kuala Lumpur
Institut Perubatan Respiratori
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)40232966
Fax : (03)40218807

Institute Jantung Negara
Cardiothoracic Department
145, Jalan Tun Razak
50400 Kuala Lumpur
Tel : (03)26178200
Fax : (03)26928418

Heart Valve Transplant Services

MOH

Institute Jantung Negara
Cardiovascular Tissue Bank
Department Of Cardiothoracic Surgery
145, Jalan Tun Razak
50400 Kuala Lumpur
Tel : (03)2617 8200
Fax : (03)2692 8418

Kidney Transplant Services

MOH

Hospital Batu Pahat
Renal Transplant Clinic
c/o Haemodialysis Unit
83000 Batu Pahat
Johor Darul Takzim
Tel 1 : (07)4341999 Ext : 149
Tel 2 : (07)4340654
Fax : (07)4322544

Hospital Bintulu
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Nyabau
97000 Bintulu
Sarawak
Tel 1 : (086)255899
Tel 2 : (086)311416
Fax : (086)255866

Hospital Duchess of Kent
Renal Transplant Clinic
c/o Haemodialysis Unit
KM3.2, Jalan Utara
90007 Sandakan
Sabah
Tel 1 : (089)212111 Ext : 5190
Tel 2 : (089)212739
Fax : (089)213607

Hospital Dungun
Renal Transplant Clinic
c/o Haemodialysis Unit
23000 Dungun
Terengganu Darul Iman
Tel : (09)8483333 Ext : 261
Fax : (09)8484160

Hospital Kemaman
Renal Transplant Clinic
c/o Haemodialysis Unit
24000 Kemaman
Terengganu Darul Iman
Tel : (09)8593333 Ext : 2012
Fax : (09)8595512

Hospital Kluang
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Hospital
88000 Kluang
Johor Darul Takzim
Tel 1 : (07)7723333 Ext : 266 / 313
Tel 2 : (07)7723334
Fax : (07)7734498

Hospital Kuala Lumpur (Paed Tx Unit)
Nephrology Clinic (Renal Transplant)
Department of Nephrology
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26921044 Ext : 6021
Fax : (03)26948187

Hospital Kuala Lumpur
Nephrology Clinic (Renal Transplant)
Department of Nephrology
Jalan Pahang
50586 Kuala Lumpur
Tel 1 : (03)26155555 Ext : 5910
Tel 2 : (03)26157561
Fax : (03)26938953

Kidney Transplant Services

MOH

Hospital Labuan
Renal Transplant Clinic
c/o Haemodialysis Unit
87020 Labuan
Sabah
Tel 1 : (087)423919 Ext : 274
Tel 2 : (087)410761
Fax : (087)423928

Hospital Likas
Renal Transplant Clinic
c/o Haemodialysis Unit
88996 Kota Kinabalu
Sabah
Tel : (088)522600 Ext : 723 / 714
Fax : (088)438512

Hospital Melaka
Renal Transplant Clinic
c/o Haemodialysis Unit
Tingkat Bawah, Blok D
Jalan Pringgit
70060 Melaka
Tel 1 : (06)2822344
Tel 2 : (06)2707648
Fax : (06)2837500

Hospital Mersing
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Ismail
86800 Mersing
Johor Darul Takzim
Tel 1 : (07)7993333 Ext : 126
Tel 2 : (07)7991415
Fax : (07)7994200

Hospital Miri
Renal Transplant Clinic
c/o Haemodialysis Unit
98000 Miri
Sarawak
Tel : (085)420033 Ext : 251
Fax : (085)416514

Hospital Pakar Sultanah Fatimah
Renal Transplant Clinic
c/o Haemodialysis Unit
84000 Muar
Johor Darul Takzim
Tel : (06)9521901 Ext : 116
Fax : (06)9526003

Hospital Pontian
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Alfagoff
82000 Pontian
Johor Darul Takzim
Tel 1 : (07)6873333 Ext : 202
Tel 2 : (07)6874533
Fax : (07)6874533

Hospital Pulau Pinang
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Residensi
10990 Georgetown
Pulau Pinang
Tel : (04)2225333 Ext : 397
Fax : (04)2281737

Kidney Transplant Services

MOH

Hospital Queen Elizabeth
Renal Transplant Clinic
c/o CADP Unit
88586 Kota Kinabalu
Sabah
Tel : (088)218166 Ext : 284
Fax : (088)211999

Hospital Raja Perempuan Zainab II
Renal Transplant Clinic
c/o Haemodialysis Unit
15590 Kota Bharu
Kelantan Darul Naim
Tel 1 : (09)7485533
Tel 2 : (09)7502801
Fax : (09)7486951

Hospital Raja Permaisuri Bainun
Nephrology Clinic
Jalan Hospital
30990 Ipoh
Perak Darul Ridzuan
Tel : (05)5222372
Fax : (05)2531541

Hospital Segamat
Renal Transplant Clinic
c/o Haemodialysis Unit
83500 Segamat
Johor Darul Takzim
Tel 1 : (07)9433333 Ext : 147
Tel 2 : (07)9433334
Fax : (07)9434641

Hospital Selayang
Renal Transplant Clinic
c/o Ward 7B
Lebuhraya Selayang-Kepong
68100 Batu Caves
Selangor Darul Ehsan
Tel 1 : (03)61203233 Ext : 7007/7011
Tel 2 : (03)61380409
Fax : (03)61377097

Hospital Serdang
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Puchong
43000 Kajang
Selangor Darul Ehsan
Tel 1 : (03)89475555 Ext : 1256
Tel 2 : (03)89475282
Fax : (03)89455317

Hospital Sibu
Renal Transplant Clinic
c/o Haemodialysis Unit
96000 Sibu
Sarawak
Tel : (084)343333 Ext : 2102
Fax : (084)337354

Hospital Sultan Haji Ahmad Shah
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Maran
28000 Temerloh
Pahang Darul Makmur
Tel : (09)2955333 Ext : 1570

Kidney Transplant Services

MOH

Hospital Sultan Ismail Pandan
Renal Transplant Clinic (Paed)
c/o Paediatrics Ward (Wad 8C & D)
Jalan Persiaran Mutiara Emas Utama
Taman Mount Austin
81100 Johor Bahru
Johor Darul Takzim
Tel : (07)3565000 Ext : 2013/8306
Fax : (07)3565088

Hospital Sultan Ismail Pandan
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Persiaran Mutiara Emas Utama
Taman Mount Austin
81100 Johor Bahru
Johor Darul Takzim
Tel : (07)3565000 Ext : 3508/3509
Fax : (07)3565034

Hospital Sultanah Aminah
Renal Transplant Clinic
c/o Haemodialysis Unit
80590 Johor Bahru
Johor Darul Takzim
Tel : (07)2231666 Ext : 2055
Fax : (07)2242694

Hospital Sultanah Bahiyah
Renal Transplant Clinic
c/o Haemodialysis Unit
06550 Alor Setar
Kedah Darul Aman
Tel : (04)7303333 Ext : 201/202
Fax : (04)7341737

Hospital Sultanah Nur Zahirah
Renal Transplant Clinic
c/o Haemodialysis Unit
20400 Kuala Terengganu
Terengganu Darul Iman
Tel : (09)6212121 Ext : 2054
Fax : (09)6221820

Hospital Taiping
Renal Transplant Clinic
c/o Haemodialysis unit
Jalan Taming Sari
34000 Taiping
Perak Darul Ridzuan
Tel 1 : (05)8083333 Ext : 8173
Tel 2 : (05)8408173
Fax : (05)8053121

Hospital Tawau
Renal Transplant Clinic
c/o Haemodialysis Unit
91007 Tawau
Sabah
Tel 1 : (089)773183
Tel 2 : (089)773533
Fax : (089)778626

Hospital Tengku Ampuan Afzan
Renal Transplant Clinic
c/o Haemodialysis Unit
25100 Kuantan
Pahang Darul Makmur
Tel : (09)5133333 Ext : 2340
Fax : (09)5164272

Kidney Transplant Services

MOH

Hospital Tengku Ampuan Rahimah
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Langat
41200 Klang
Selangor Darul Ehsan
Tel 1 : (03)33723333 Ext : 1411/1256
Tel 2 : (03)33757200
Fax : (03)33729089

Hospital Tuanku Ja'afar
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Rasah
70300 Seremban
Negeri Sembilan Darul Khusus
Tel 1 : (06)7684000 Ext : 4125
Tel 2 : (06)7604743
Fax : (06)7684711

Hospital Umum Sarawak
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Tun Ahmad Zaidi Adruce
93590 Kuching
Sarawak
Tel 1 : (082)276757
Tel 2 : (082)276528
Fax : (082)276734

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Assunta Hospital
Kidney Unit
Jalan Templer
46990 Petaling Jaya
Selangor Darul Ehsan
Tel 1 : (03)77823433 Ext : 254
Tel 2 : (03)76216696
Fax : (03)77814933

C. S. Loo Kidney & Medical Specialist Centre
Perak Community Specialist Hospital
227, Jalan Kampar
30250 Ipoh
Perak Darul Ridzuan
Tel 1 : (05)2458918
Tel 2 : (05)2545594
Fax : (05)2554288

Damai Medical & Heart Clinic
Renal Transplant Clinic
c/o Haemodialysis Centre
49-N, Jalan Ong Kim Wee
75300 Melaka
Melaka
Tel 1 : (06)2841204 Ext : 210/211
Tel 2 : (06)2844805
Fax : (06)2844805

Fan Medical Renal Clinic
Gleneagles Intan Medical Centre
Suite 7.01, 7th Floor
Medical Office Building
282, Jalan Ampang
50450 Kuala Lumpur
Tel : (03)42578822
Fax : (03)42523823

Kidney Transplant Services

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Klinik Dr Choo & Liew
9-0, Lorong Lintas Plaza 1
Lintas Plaza, Jalan Lintas
88380 Kota Kinabalu
Sabah
Tel : (088)238292
Fax : (088)237292

KPJ Ampang Puteri Specialist Hospital
Renal Transplant Clinic
Suite 1-7, First Floor
No.1, Jalan Mamanda 9
Tmn Dato'Ahmad Razali
68000 Ampang
Selangor Darul Ehsan
Tel : (03)42722500 Ext : 1250
Fax : (03)42702443

KPJ Selangor Specialist Hospital
Renal Transplant Clinic
c/o Haemodialysis Unit
Lot 1, Jalan Singa 20/1, Seksyen 20
40300 Shah Alam
Selangor Darul Ehsan
Tel : (03)55431111 Ext : 4533
Fax : (03)55431722

Normah Medical Specialist Centre
Renal Transplant Clinic
c/o Haemodialysis Centre
P.O. Box 3298
93764 Kuching
Sarawak
Tel 1 : (082)440055 Ext : 260
Tel 2 : (082)443785
Fax : (082)443787

Pantai Hospital Penang
Renal Transplant Clinic
c/o Haemodialysis Centre
No. 82, Jalan Tengah, Bayan Baru
11900 Bayan Lepas
Pulau Pinang
Tel : (04)6433888 Ext : 155
Fax : (04)6432888

Prince Court Medical Centre
Renal Transplant Clinic
c/o Renal Dialysis Unit
Level 3
39, Jalan Kia Peng
50450 Kuala Lumpur
Wilayah Persekutuan
Tel : (03)21600147 Ext : 2977
Fax : (03)31600930

Renal Care, Ipoh Specialist Hospital
Renal Transplant Clinic
c/o Renal Care
Ipoh Specialist Hospital
26, Jalan Raja Dihilir (Tambun)
30350 Ipoh
Perak Darul Ridzuan
Tel 1 : (05)2418777 Ext : 275/276
Tel 2 : (05)2413128
Fax : (05)2541388

Sabah Medical Centre
Renal Transplant Clinic
c/o Haemodialysis Centre
Kingfisher Park, Kuala Inanam
88840 Kota Kinabalu
Sabah
Tel : (088)424333
Fax : (088)272622

Kidney Transplant Services

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Sime Darby Medical Centre Subang Jaya
Renal Transplant Clinic
c/o Clinic Dr Prasad
1, Jalan SS 12/1A
47500 Subang Jaya
Selangor Darul Ehsan
Tel : (03)56301212 Ext : 469
Fax : (03)56396188

Simon Wong Medical & Kidney Clinic
Timberland Medical Centre
Lot 5160, Ground Floor
Lorong 2, 2 1/2 miles Rock Road
93250 Kuching
Sarawak
Tel 1 : (082)241242
Tel 2 : (082)234466
Fax : (082)254242

Smartcare Dialysis Centre, Subang Jaya
Klinik Pakar Dialisis
52G, Jalan USJ 10/1B
47620 Subang Jaya
Selangor Darul Ehsan
Tel : (03)56337618
Fax : (03)56330618

Sri Kota Medical Centre
Renal Transplant Clinic
c/o Haemodialysis Centre
Jalan Mohet
41000 Klang
Selangor Darul Ehsan
Tel : (03)33733636 Ext : 7106
Fax : (03)33736888

Sunway Medical Centre
Renal Transplant Clinic
c/o Haemodialysis Unit
Suite A1-28, First Floor
No 5, Jln Lagoon Selatan
Bandar Sunway
46150 Petaling Jaya
Selangor Darul Ehsan
Tel 1 : (03)74919191 Ext : 7784
Tel 2 : (03)74911135
Fax : (03)74918181

Tan Medical Renal Clinic
Healthcare Dialysis Centre
No. 41, Tingkat 1
Jalan 6/31
46300 Petaling Jaya
Selangor Darul Ehsan
Tel : (03)77836423
Fax : (03)77836422

Wee Kidney & Medical Specialist Clinic
Suite 303A, 3rd Floor
Mahkota Medical Centre
No.3, Mahkota Melaka, Jalan Merdeka
75000 Melaka
Melaka
Tel 1 : (06)2818222 Ext : 3309
Tel 2 : (06)2813333
Fax : (06)2810560

Kidney Transplant Services

UNIVERSITY

Pusat Perubatan Universiti Kebangsaan Malaysia
Renal Transplant Clinic (Medical 3)
Jalan Tenteram
Bandar Tun Razak, Cheras
56300 Kuala lumpur
Wilayah Persekutuan
Tel 1 : (03)91455555 Ext : 7318
Tel 2 : (03)91703831
Fax : (03)91735316

Universiti Sains Malaysia Hospital
Renal Transplant Clinic
c/o Haemodialysis Unit
16150 Kubang Kerian
Kelantan Darul Naim
Tel 1 : (09)7673328
Tel 2 : (09)7673329
Fax : (09)7652198

University of Malaya Medical Centre
Renal Transplant Clinic
c/o Ward 8TE Dialysis Unit
Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan
Tel 1 : (03)79494422 Ext : 2282/3093
Tel 2 : (03)79492282
Fax : (03)79568822

Liver Transplant Services

MOH

Hospital Kuala Lumpur
Institute Paediatric
Jalan Pahang
50586 Kuala Lumpur
Tel : (03)26906211
Fax : (03)26913815

Hospital Selayang
Department of Hepatobiliary
Lebuhraya Selayang-Kepong
68100 Batu Caves
Selangor Darul Ehsan
Tel : (03)61203233 Ext : 3314
Fax : (03)61207564

Hospital Selayang
Paediatric Hepatology Unit
Lebuhraya Selayang-Kepong
68100 Batu Caves
Selangor Darul Ehsan
Tel : (03)61203233
Fax : (03)61207564

PRIVATE

Sime Darby Medical Centre Subang Jaya
1, Jalan SS 12/1A
47500 Subang Jaya
Selangor Darul Ehsan
Tel : (03)56306193
Fax : (03)56306209

UNIVERSITY

University of Malaya Medical Centre
Department of Paediatrics
Jalan Universiti
59100 Kuala Lumpur
Tel : (03)79492065
Fax : (03)79556114