



# 2<sup>nd</sup>

## REPORT OF NATIONAL TRANSPLANT REGISTRY 2005



**Editors:**  
**Hooi LS**  
**Lela Yasmin Mansor**

With contributions by:  
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Mohamed Ezani, David Chew SP, Ganesalingam K, Lim CB, Tan SS,  
Goh BL, Hamdan Leman, Suzina Sheikh



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REPORT OF THE  
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## FOREWORD

The first report of the National Transplant Registry was launched on 20 December 2005. We are pleased that the second report of the National Transplant Registry has now been published.

We would like to thank all the 160 source data producers without whom this report would not be possible. We are amazed by the level of cooperation provided by many private hospitals and institutions who have voluntarily reported their transplant data. Please keep up the good work.

Altogether there are seven chapters to cater to the 7 types of transplants for which data is being collected: Blood and Marrow Transplant, Cornea Transplant, Heart /Lung Transplant, Liver Transplant, Renal Transplant, Heart Valve Transplant, Bone and Tissue Transplant. Each organ or tissue system has an expert panel to determine the type of data to be collected, interpret the analyzed data and come out with the report. We wish to thank all individuals and representatives from the various professional societies who sit in these expert panels for their continued and invaluable support.

In this second report an eight chapter has been added to capture data on cadaveric organ and tissue donation. This has been possible with the assistance of the National Transplant Resource Centre, Hospital Kuala Lumpur.

Lastly we wish to record once again our sincere appreciation to the Ministry of Health, Clinical Research Centre, Hospital Kuala Lumpur, our supporters from the pharmaceutical industry and other well wishers for their continued support.

Thank you.

Tan Sri Dato' Dr Yahya Awang  
Chairperson  
NTR

Dato' Dr Zaki Morad  
Co-Chairperson  
NTR

Datin Dr Lela Yasmin  
Mansor  
Co-chairperson  
NTR

## ACKNOWLEDGEMENTS

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

We would especially like to thank the following:

- Our source data providers who are the transplant surgeons, physicians and staff of all organ and tissue transplant centres and transplant follow up centres from the government, university 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
- 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
- And not forgetting our supporters from the industry and other well-wishers:

Roche (M) Sdn Bhd  
Norvartis Corporation (M) Sdn Bhd  
Janssen-Cilag Div., Johnson & Johnson Sdn. Bhd.  
GlaxoSmithKline Pharmaceutical Sdn. Bhd.

## **PARTICIPATING CENTRES**

### **Discipline: Blood and Marrow Transplant**

1. Division of Haematology, Department of Medicine, University of Malaya Medical Centre
2. Haematology Department, Hospital Kuala Lumpur
3. Haematology Department, Subang Jaya Medical Centre
4. Maybank BMT Centre, Hospital Universiti Kebangsaan Malaysia
5. Oncology-Haematology Department, Gleneagles Medical Centre, Penang
6. Oncology-Haematology Department, Lam Wah Ee Hospital
7. Paediatric BMT Unit, Department of Paediatrics, University of Malaya Medical Centre
8. Paediatric BMT Unit, Institute of Paediatrics, Hospital Kuala Lumpur
9. Paediatric BMT Unit, Subang Jaya Medical Centre

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2. Hope Eye Centre, Gleneagles Intan Medical Centre, Kuala Lumpur
3. Klinik Pakar Mata Centre For Sight
4. Ophthalmology Department, 94 Hospital Angkatan Tentera Kem Terendak
5. Ophthalmology Department, Hospital Universiti Kebangsaan Malaysia
6. Ophthalmology Department, Gleneagles Medical Centre, Penang
7. Ophthalmology Department, Hospital Alor Setar
8. Ophthalmology Department, Hospital Batu Pahat
9. Ophthalmology Department, Hospital Bukit Mertajam
10. Ophthalmology Department, Hospital Duchess of Kent, Sandakan
11. Ophthalmology Department, Hospital Ipoh
12. Ophthalmology Department, Hospital Kajang
13. Ophthalmology Department, Hospital Kangar
14. Ophthalmology Department, Hospital Kuala Lipis
15. Ophthalmology Department, Hospital Kuala Lumpur
16. Ophthalmology Department, Hospital Kuala Pilah
17. Ophthalmology Department, Hospital Kuala Terengganu
18. Ophthalmology Department, Hospital Melaka
19. Ophthalmology Department, Hospital Mentakab
20. Ophthalmology Department, Hospital Miri
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26. Ophthalmology Department, Hospital Raja Perempuan Zainab II, Kota Bharu
27. Ophthalmology Department, Hospital Selayang
28. Ophthalmology Department, Hospital Seremban
29. Ophthalmology Department, Hospital Sibul
30. Ophthalmology Department, Hospital Sultan Ismail
31. Ophthalmology Department, Hospital Sultanah Aminah
32. Ophthalmology Department, Hospital Sungai Petani
33. Ophthalmology Department, Hospital Taiping
34. Ophthalmology Department, Hospital Tawau

35. Ophthalmology Department, Hospital Teluk Intan
36. Ophthalmology Department, Hospital Tengku Ampuan Afzan
37. Ophthalmology Department, Hospital Tengku Ampuan Rahimah
38. Ophthalmology Department, Hospital Umum Sarawak
39. Ophthalmology Department, Hospital Universiti Sains Malaysia
40. Ophthalmology Department, Sri Kota Medical Centre
41. Ophthalmology Department, University of Malaya Medical Centre
42. Ophthalmology Unit, Department of Surgery, Universiti Putra Malaysia
43. Optimax Eye Specialist Centre
44. Puteri Specialist Hospital, Johor Bahru
45. Tan Eye Specialist Centre, Sunway Medical Centre
46. Tun Hussein Onn National Eye Hospital, 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. Institute of Paediatrics, Hospital Kuala Lumpur
4. Subang Jaya Medical Centre

**Discipline: Renal Transplant**

1. 96 Hospital Angkatan Tentera Kem Lumut
2. C. S. Loo Kidney & Medical Specialist Centre, Perak Community Specialist Hospital
3. MAA-Medicare Kidney Charity, Cheras
4. National Kidney Foundation Dialysis Centre, Taiping
5. Nephrology Department, Hospital Alor Setar
6. Nephrology Department, Hospital Batu Pahat
7. Nephrology Department, Hospital Bintulu
8. Nephrology Department, Hospital Duchess of Kent
9. Nephrology Department, Hospital Dungun
10. Nephrology Department, Hospital Ipoh
11. Nephrology Department, Hospital Kangar
12. Nephrology Department, Hospital Kemaman
13. Nephrology Department, Hospital Kluang
14. Nephrology Department, Hospital Kuala Lumpur
15. Nephrology Department, Hospital Kuala Terengganu
16. Nephrology Department, Hospital Labuan

17. Nephrology Department, Hospital Melaka
18. Nephrology Department, Hospital Mentakab
19. Nephrology Department, Hospital Miri
20. Nephrology Department, Hospital Pakar Sultanah Fatimah
21. Nephrology Department, Hospital Pontian
22. Nephrology Department, Hospital Pulau Pinang
23. Nephrology Department, Hospital Queen Elizabeth
24. Nephrology Department, Hospital Raja Perempuan Zainab II
25. Nephrology Department, Hospital Segamat
26. Nephrology Department, Hospital Selayang
27. Nephrology Department, Hospital Serdang
28. Nephrology Department, Hospital Seremban
29. Nephrology Department, Hospital Sibul
30. Nephrology Department, Hospital Sultan Ismail Pandan
31. Nephrology Department, Hospital Sultanah Aminah
32. Nephrology Department, Hospital Taiping
33. Nephrology Department, Hospital Tanah Merah
34. Nephrology Department, Hospital Tawau
35. Nephrology Department, Hospital Teluk Intan
36. Nephrology Department, Hospital Temerloh
37. Nephrology Department, Hospital Tengku Ampuan Afzan
38. Nephrology Department, Hospital Tengku Ampuan Rahimah
39. Nephrology Department, Sarawak General Hospital
40. Nephrology Department, UKM Hospital
41. Nephrology Department, University Malaya Medical Centre
42. Nephrology Department, USM Hospital
43. Nephrology Unit, Ampang Puteri Specialist Hospital
44. Nephrology Unit, Assunta Hospital
45. Nephrology Unit, Mahkota Medical Centre
46. Nephrology Unit, Subang Jaya Medical Centre
47. Nephrology Unit, Sunway Medical Centre
48. Normah Medical Specialist Centre
49. Paediatric Renal Transplant Clinic, Hospital Kuala Lumpur
50. Paediatric Ward, Hospital Sultanah Aminah
51. Renal Care, Ipoh Specialist Hospital
52. Renal Dialysis Centre Sdn. Bhd.
53. Renal Transplant Clinic, Damai Medical & Heart Clinic
54. Renal Transplant Clinic, Hospital Lam Wah Ee
55. Renal Transplant Clinic, Pusat Pakar Tawakal
56. Renal Transplant Clinic, Sabah Medical Centre
57. Renal Transplant Clinic, Selangor Medical Centre
58. Renal Transplant Clinic, Sri Kota Medical Centre
59. Renal Transplant Unit, Hospital Pantai Mutiara
60. S.P. Menon Dialysis Centre, Klang
61. Simon Wong Medical & Kidney Clinic, Timberland Medical Centre
62. Smartcare Dialysis Centre, Cheras
63. Smartcare Dialysis Centre, Subang Jaya
64. Tan Medical Renal Clinic
65. The Rotary Haemodialysis Centre
66. Tung Shin Hospital
67. Yayasan Kebajikan SSL Hemodialisis



**Discipline: Bone / Tissue Transplant**

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

## **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 practitioners of transplantation is useful 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).

## **SPONSORS OF THE NTR**

- 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 by the sponsors of the NTR to govern the NTR. Current membership of the Governance Board are as follows:

<b>Name</b>	<b>Representation</b>
Tan Sri Dato' Dr. Yahya Awang <b>Chairperson</b>	Cardiothoracic Consultant, Damansara Specialist Hospital NTR Expert Panel Chairman of Heart / Lung Transplant
Dato' Dr. Zaki Morad Mohd Zaher <b>Co-chair</b>	Head, Department of Nephrology, Hospital Kuala Lumpur NTR Expert Panel Chairman of Renal Transplant
Datin Dr. Fadhilah Zowiyah Lela Yasmin Mansor <b>Co-chair</b>	Chairperson, Registry Subcommittee National Transplant Coordinating Committee Ministry Of Health
Dato' Dr. Tan Kai Chah	Hepatobiliary / Liver Transplant Surgeon, Subang Jaya Medical Centre
Dr. Teng Seng Chong	Medical Development Division, Ministry of Health
Dr. Tan Chwee Choon	Malaysian Society of Transplantation
Dr. Lim Teck Onn	Clinical Research Centre (CRC), Hospital Kuala Lumpur
Dr. Jamaiyah Haniff	Clinical Research Centre (CRC), Hospital Kuala Lumpur
Mr. Rohan Malek	Malaysian Urological Association
Dr. Hooi Lai Seong	Malaysian Society of Nephrology
Mr. Hamdan Leman	Malaysian Society of Thoracic & Cardiovascular Surgeons
Dr. Aizai Azan Abdul Rahim	National Heart Association of Malaysia
Prof. Dr. Abdul Rani Samsudin	Malaysian National Tissue Bank
Dr. Wong Jun Shyan	Ophthalmological Society Of MMA
Tan Sri Datuk Dr. Mohd. Ismail Merican	Malaysian Liver Foundation
Dr. Hamidah Shaban	Malaysian Thoracic Society
Prof. Dr. Zulmi Wan	Malaysian Orthopaedic Association NTR Expert Panel Chairman of Bone and Tissue Transplant
Dr. Gill Satwant Singh	National Kidney Foundation of Malaysia
Dr. Chang Kian Meng	Malaysian Society of Haematology
Dr. Kelvin Lim Lye Hock	Malaysian Association of Oral & Maxillofacial Surgeons
Dr. R T Arasu	Malaysian Dental Association
Dr. Alan Teh Kee Hean	NTR Expert Panel Co-chair of Blood and Marrow Transplant (Adult)
Prof. Dr. Chan Lee Lee	NTR Expert Panel Co-chair of Blood and Marrow Transplant (Paediatric)
Dato' Dr. Zakaria Zahari	NTR Expert Panel Chairman of Liver Transplant
Dr. Shamala Retnasabapathy	NTR Expert Panel Chairman of Cornea Transplant
Dr. Goh Bak Leong	NTR Expert Panel Co-chair of Renal Transplant
Mr. Mohamed Ezani Hj Md. Taib	NTR Expert Panel Co-chair of Heart / Lung Transplant

## EXPERT PANEL

NTR has established seven groups of expert panel comprising members of the medical profession and allied health with expert knowledge in the 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
2. To undertake quality control of the reported data
3. To undertake literature review in 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 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: Blood and Marrow Transplant**

<b>Co-Chair (Adult)</b>	Dr. Alan Teh Kee Hean
<b>Co-Chair (Paeds)</b>	Prof. Dr. Chan Lee Lee
<b>Member</b>	Prof. Dr. Cheong Soon Keng
	Dr. Chang Kian Meng
	Dr. Gan Gin Gin @ Gan Shiaw Sze
	Dr. Hishamshah Mohd Ibrahim
	Dr. Jameela Sathar
	Prof. Dr. Lin Hai Peng
	Dr. Mahfuzah Mohamed
	Dr. Ng Soo Chin
	Dr. S Visalachy Purushothaman
	Dr. Vijaya Sangkar

### **Discipline: Cornea Transplant**

<b>Chairman</b>	Dr. Shamala Retnasabapathy
<b>Co-Chair</b>	Dr. Choong Yean Yaw
<b>Member</b>	Dato' Dr. Veera Ramani
	Dr. Jonathan Choon Siew Cheong
	Dr. Chuah Kay Leong
	Dr. Michael Law Sie Haur
	Dr. Mariam Ismail
	Assoc. Prof. Dr. S C Reddy

	Dr. Sahimi Sulaiman
	Dr. U. Thiageswari

**Discipline: Heart and Lung Transplant**

<b>Chairman</b>	Tan Sri Dato' Dr. Yahya Awang
<b>Co-Chair</b>	Mr. Mohamed Ezani Hj Md.Taib
<b>Member</b>	Datin Dr. Aziah Ahmad Mahayiddin
	Dr. Ashari Yunus
	Dr. Aizai Azan Abdul Rahim
	Dato' Dr. David Chew Soon Ping
	Dr. Hamidah Shaban

**Discipline: Liver Transplant**

<b>Chairman</b>	Dato' Dr. Zakaria Zahari
<b>Member</b>	Dr. Ganesalingam A/L Kanagasabai
	Dr. Goon Hong Kooi
	Dr. Lim Chooi Bee
	Assoc. Prof. Dr. Lee Way Seah
	Dr. Sushila Sivasubramaniam
	Dr. Tan Soek Siam
	Dr. S Thavaranjitham

**Discipline: Renal Transplant**

<b>Chairman</b>	Dato' Dr. Zaki Morad Mohd Zaher
<b>Co-Chair</b>	Dr. Goh Bak Leong
<b>Member</b>	Dr. Fan Kin Sing
	Dr. Lily Mushahar
	Mr. Rohan Malek
	Dr. S Prasad Menon
	Prof. Dr. Tan Si Yen

**Discipline: Heart Valve Transplant**

<b>Chairman</b>	Mr. Mohamed Ezani Hj Md.Taib
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**Discipline: Bone / Tissue Transplant**

<b>Chairman</b>	Prof. Dr. Zulmi Wan
<b>Member</b>	Prof. Dr. Abdul Rani Samsudin
	Dr. Badrul Shah Badaruddin
	Dato' Dr. Hasim Mohamad
	Dr. Norimah Yusof
	Dr. Robert Penafort

## **STAFF OF NATIONAL TRANSPLANT REGISTRY**

Clinical Registry Coordinator      Ms. Leong Wei Chee

## **SUPPORTING STAFF FROM THE CLINICAL RESEARCH CENTRE**

The Clinical Research Centre (CRC) of the Ministry of Health provides technical support for the National Transplant Registry. The clinical epidemiologists provide methodological and epidemiological input while the database is supported on CRC's IT infrastructure.

Clinical Epidemiologist	Dr. Jamaiyah Haniff
Clinical Epidemiologist	Dr. Anita Das
Information & Communication Technology (ICT) Manager	Ms. Celine Tsai Pao Chien
Network Administrator	Mr. Kevin Ng Hong Heng
Assistant Network Administrator	Mr. Adlan Ab. Rahman
Database Administrator	Ms. Lim Jie Ying
Programmer	Mr. Sebastian Thoo / Mr. John Chong
Desktop publisher	Ms. Azizah Alimat

## **BIostatistical CONSULTANTS**

Consultant Biostatistician	Dr. Sharon Chen Won Sun
Biostatistician	Mr. Tan Wei Hao
Biostatistician	Ms. Suziah binti Simat

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## INTRODUCTION

The national transplant registry (NTR) was planned and set up in November 2003. The parties involved in the setting up of the NTR are the Clinical Research Centre (CRC), Medical Development Division, Ministry of Health and the Malaysian Society of Transplantation. Due to policy changes, the running of the NTR has been transferred to the Malaysian Society of Transplantation since December 2005. The Transplant Registry Unit of the CRC continues to provide the expertise for statistical analysis and IT support. The NTR is currently staffed by a full time Clinical Research Coordinator Ms Leong Wei Chee. I wish to take this opportunity to record our sincere appreciation and thanks to Ms Woo Li Fong who has resigned as Clinical Registry Manager to work overseas. Ms Woo had played an important role in getting the cooperation and support of all our source data producers (SDPs). The SDPs are individual doctors or transplant units who voluntarily report data on their transplant activities.

Transplant registry databases are important as they can be used to describe and monitor trends in transplantation. They can play a critical role in assessing transplantation, help identify factors that influence outcome and help evaluate late transplant complications.

The government, scientific community, pharmaceutical industry and public can have access to the NTR data as the reports once published remains in the public domain and can be downloaded from the internet. The government and policy makers can use this data to address issues related to funding and reimbursement policy, legislative and regulatory policy, performance standards and quality control. The scientific community and the public can use this data for research, policy analysis and evaluation of organ allocation policies. Patients and families can use the data to evaluate their transplant options. Therefore the valuable information provided justifies the investment put into transplant registries.

In fact at the 57<sup>th</sup> World Health Assembly organised by WHO in Geneva in May 2004, the Issue of Human Organ and Tissue Transplantation was addressed. One of the resolutions passed included requesting among other things for the Director General of Health of member countries to collect and examine data on practices, safety, quality, efficacy and epidemiology of organ and tissue transplantation. The aim is to foster global collection of data on donation and transplantation of all organs and tissues. With the setting up of the NTR and the publication of the second report we are surely moving in the right direction in this respect.

In this second report of the National Transplant Registry, there are no major surprises. New information and updates have been added to the first report. You may notice some discrepancies in the numbers of patients transplanted in the various years listed if you were to compare this second report with the first report. These discrepancies are unavoidable to some extent as transplants done in a particular year may only be reported in later years as data gets updated.

Transplantation activity in this country however remains relatively low. In 2005 the transplants that were done in Malaysia included:

- 192 corneal transplants
- 145 blood and bone marrow transplants
- 46 kidney transplants
- 5 liver transplants
- 1 heart and 1 lung transplant



The majority of the corneas were from USA (71%) and Sri Lanka (17%). Only 12% of corneas were obtained from local donors. Similarly an additional 109 kidney failure patients went overseas for commercial transplants. These commercial transplants done overseas make up 70% of new renal transplant recipients. Even if we take these into account, the kidney transplant rate in Malaysia is low at about 6 per million population per year. In contrast, the intake of new dialysis patients was 101 per million population in 2005. This means that that less than 6% of end stage kidneys failure get transplanted – the vast majority having to accept live long dialysis therapy as their only option. In 2005, our cadaver organ donation rate remains very low at 0.53 per million population.

We hope all that all parties concerned will work harder to find ways to increase the level of transplant activity in this country. We all share the same desire to improve the plight of many Malaysians who are in dire need of life saving organ transplants or tissue transplants that will improve the quality of lives.

This low level of transplant activity may also have an impact on the long-term viability of the National Transplant Registry. However in the near term we are confident that the NTR will continue to develop and progress. We are fortunate that the founding members of the NTR including Tan Sri Dato' Dr. Yahya Awang, Dato' Dr. Zaki Morad Mohd. Zaher, Datin Dr. Lela Yasmin Mansor and Dr. Lim Teck Onn remain enthusiastic and committed. It is also hoped that Dr. Hooi Lai Seong who has contributed much of her free time doing the tedious work of editing this report will continue as editor for future reports. The NTR continues to depend on financial support from the Ministry of Health, the pharmaceutical industry and other well-wishers. It is hoped that all concerned will realize the benefits of having a national transplant registry and continue to contribute to its success and development.

Thank you.

Tan Chwee Choon  
On behalf of the Executive Committee  
Malaysian Society of Transplantation

## **REPORT SUMMARY**

### **1. BLOOD AND MARROW TRANSPLANTATION**

There was a total of 1048 haematopoietic stem cell transplantations reported to the Registry between 1987 and 2005; of which 699 recipients were alive at the end of 2005.

The majority of all transplants (72%) 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.

There were 145 new transplantations done in the 9 transplant units in Malaysia in 2005.

Mean age of new transplant patients in 2005 was  $26 \pm 16$  years; 48% were male, 46% Chinese. Autologous transplants accounted for 39%. Seventy-nine percent of the transplant sources were from peripheral blood stem cells and 94% were from HLA identical donors.

In 2005, 36 patients died. Underlying disease, infection and GVHD were the commonest causes of death accounting for 39%, 25% and 17% respectively.

### **2. CORNEAL TRANSPLANTATION**

There were 46 centres which agreed to provide cornea transplantation data.

One hundred and ninety-two new cornea transplantations were reported in Malaysia in 2005. Mean age of new transplant recipients in 2005 was  $46 \pm 21$  years. Of these, 59% were male, 32% of recipients were Malay, 38% Chinese, 21% Indian and 9% other races.

The primary diagnoses for cornea transplantation recipients in 2005 were cornea perforation (19%), keratoconus (18%), pseudophakic bullous keratopathy (18%), microbial keratitis (17%), cornea scars (10%), other (non-pseudophakic) bullous keratopathy (7%), and failed previous cornea grafts (7%).

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

In 2005, 71% of donated corneas were from the USA, 17% from Sri Lanka and 12% from local sources. The mean age of the donors was  $57 \pm 14$  years.

The commonest cornea transplantation surgery performed was penetrating keratoplasty (90%) i.e. transplantation of a full thickness cornea tissue. Eighty-two percent (150/184) of recipients from 2004 had follow-up data at one year. Overall graft survival was 80% at one year.

### **3. HEART TRANSPLANTATION**

There were a total of 16 heart transplantations reported to the Registry between 1997 and 2005.

There were only 1 heart transplant and 1 lung transplant performed in 2005. The lung transplant was a single lung transplant. 7 heart grafts were functioning at the end of 2005 and all were followed up in Institut Jantung Negara.

Two thirds of the recipients were males and over half were Indians. The mean age of recipients was  $36 \pm 16$  years. Ischaemic cardiomyopathy was the commonest primary diagnosis (8/15) followed by dilated cardiomyopathy (6/15).

Five recipients died in hospital following transplantation; four patients succumbed to late deaths after their heart transplant.

The transplant patient survival rate was 60% and 40% at 1 year and 3 years respectively.

### **4. LIVER TRANSPLANTATION**

There were a total of 80 liver transplantations reported to the Registry between 1993 and 2005; 45 grafts were functioning at the end of 2005.

There were 5 new liver transplantations done in Malaysia in 2005.

There were 4 centres of follow-up for liver transplant recipients in 2005.

Mean age of all transplant patients was  $7 \pm 13$  years (range 3 months to 74 years); 55% were male, 51% Chinese, 76% were for biliary atresia. A majority was living donor liver transplantations (84%).

At the time of transplantation the main immunosuppressive drugs used were tacrolimus (76%) and steroids (55%).

Transplant patient survival rate for the cohort 1993 to 1998 was 71% at 1 year; survival rate for the cohort 1999 to 2005 was 66% at 1 year.

### **5. RENAL TRANSPLANTATION**

There were 67 centres of follow-up for renal transplant recipients in 2005. Incident rates for renal transplantation were static, from 7 per million population in 1996 to 6 per million in 2005. There were 155 new renal transplants in 2005.

The number of functioning renal transplants has increased steadily from 1023 in 1996 to 1681. The transplant prevalence rate was 69 per million population in 2005.

In 2005, the mean age for new transplant recipients was  $38 \pm 14$  years, 70% were male and 19% had diabetes at the time of transplantation.

Ninety-nine percent of prevalent renal transplant recipients were on prednisolone, 78% cyclosporine, 14% tacrolimus, 44% mycophenolate mofetil and 39% azathioprine.

In 2005, 38 (2%) of prevalent transplant recipients died and 15 (1%) lost their grafts. Infection and cardiovascular disease were the commonest causes of death accounting for 42% and 11% respectively. Death at home was the third commonest cause at 11%. Renal allograft rejection accounted for 78% of graft loss.

The overall transplant patient survival rate from 1993 to 2005 was 95%, 92%, 89% and 81% at 1 year, 3 years, 5 years and 10 years respectively, while the overall graft survival rate was 92%, 85%, 79% and 63% respectively.

## **6. HEART VALVE TRANSPLANTATION**

There were a total of 163 heart valve homografts reported to the Registry between 1996 and 2005; 144 grafts were functioning at the end of 2005. Eighty-two were aortic and 81 were pulmonary valves.

Mean age of all heart valve transplant patients was  $11 \pm 11$  years (range 3 months to 70 years); 50% were male, 61% Malay.

## **7. BONE AND TISSUE TRANSPLANTATION**

In 2005, 131 bone allografts and 64 amniotic membranes were supplied by National Tissue Bank, USM.

Twenty-one hospitals used the bone grafts and 16 centres used the amniotic membranes.

## **8. CADAVERIC ORGAN AND TISSUE DONATION**

There were 13 donors in 2005 of which 5 were brain dead multi-organ and tissue donors and 8 were post cardiac death tissue donors. The rate is 0.53 donations per million population. The first lung donor for lung transplantation occurred in December 2005.

The mean age of the donors was  $46.4 \pm 24.8$  years. The youngest was a Malay three year old child who donated liver, kidneys, heart valves and eyes, the oldest was an 81 year old eye donor. All the donors were Malaysians, of whom 7 were Indians, 5 Chinese and 1 Malay. Seven donors were from Selangor. There were more male donors than female (62% versus 38 %).

Three donors carried the donor pledge card. Nine of the donors died from medical causes, 3 died from road accidents and one homicide. Seven procurements took place in the bigger government hospitals, 5 from private hospitals, 1 from a University Hospital.

## CHAPTER 1

### BLOOD AND MARROW TRANSPLANTATION

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## **1.0 INTRODUCTION**

This is the second report on Blood and Marrow Transplant activity recorded by the Blood and Marrow Transplant Registry under the umbrella of the National Transplant Registry.

The registry continues to be of vital importance as it would serve the following purposes:

1. provide an accurate record of the number of haematopoietic stem cell transplantations performed in the country
2. reflect the changing trends in patient numbers, indications for transplant, mode of transplants and centres involved
3. report on the outcome of haematopoietic stem cell transplantation which would allow national and international comparisons
4. provide data which could guide future needs and directions in the field of haematopoietic stem cell transplantation



**1.1 STOCK AND FLOW**

At the time of the second report, a cumulative total of 1048 transplants have been performed by the 9 stem cell transplant centres in the country. The number of transplants recorded in 2005, 145, is an increase over the previous year's total of 139.

Table 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2005

Year	87	88	89	90	91	92	93	94	95
New transplant patients	8	6	22	5	12	21	19	25	30
Deaths	1	1	6	6	1	2	9	5	16
Lost to follow up	0	0	0	0	0	0	0	0	0
Alive at 31 <sup>st</sup> December	7	12	28	27	38	57	67	87	101

Year	96	97	98	99	00	01*	02	03	04	05
New transplant patients	28	33	49	62	94	108	114	128	139	145
Deaths	11	15	17	15	31	47	30	50	43	39
Lost to follow up	0	0	0	0	0	0	0	0	0	0
Alive at 31 <sup>st</sup> December	118	136	168	215	278	338	422	500	596	699**

\*1 patient in year transplant 2001 with no death date

\*\*2 patients with missing outcome status and 1 patient with unknown outcome status

\*Out of 1048 patients who were transplanted, there were 40 patients with early death before day 30 of transplant

Figure 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2005

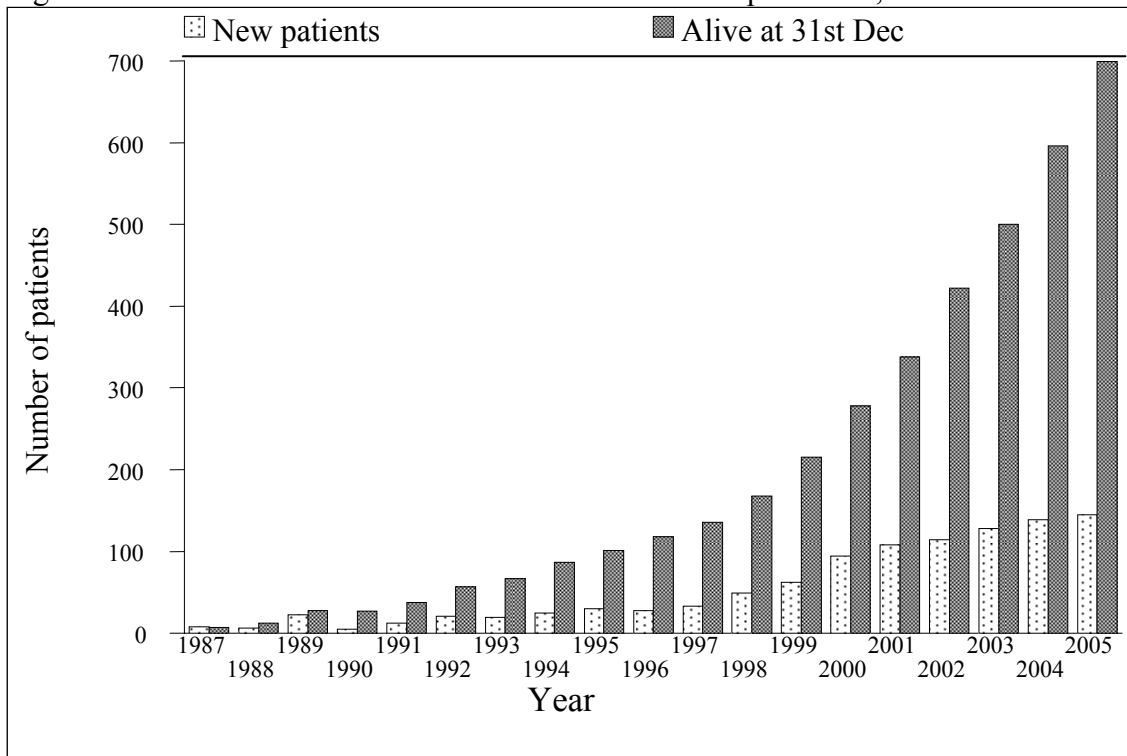
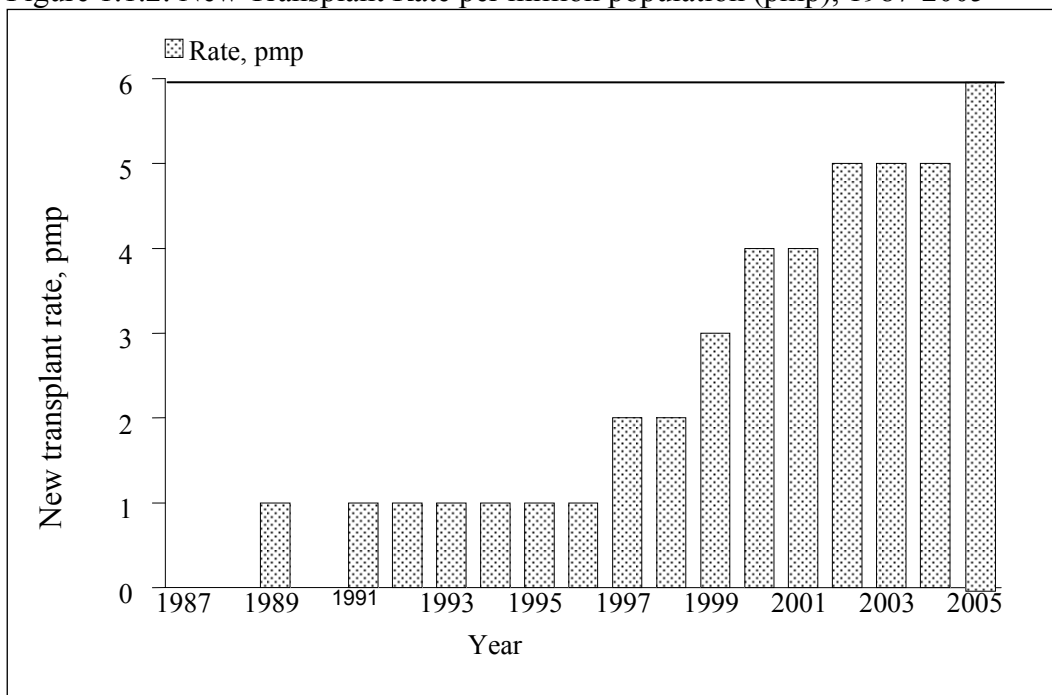


Table 1.1.2: New Transplant Rate per million population (pmp), 1987-2005

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995
New transplant patients	8	6	22	5	12	21	19	25	30
New transplant rate pmp	0	0	1	0	1	1	1	1	1

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New transplant patients	28	33	49	62	94	107	114	128	139	145
New transplant rate pmp	1	2	2	3	4	4	5	5	5	6

Figure 1.1.2: New Transplant Rate per million population (pmp), 1987-2005



The number of transplant centres in the country remains unchanged from the previous year (i.e. 9).

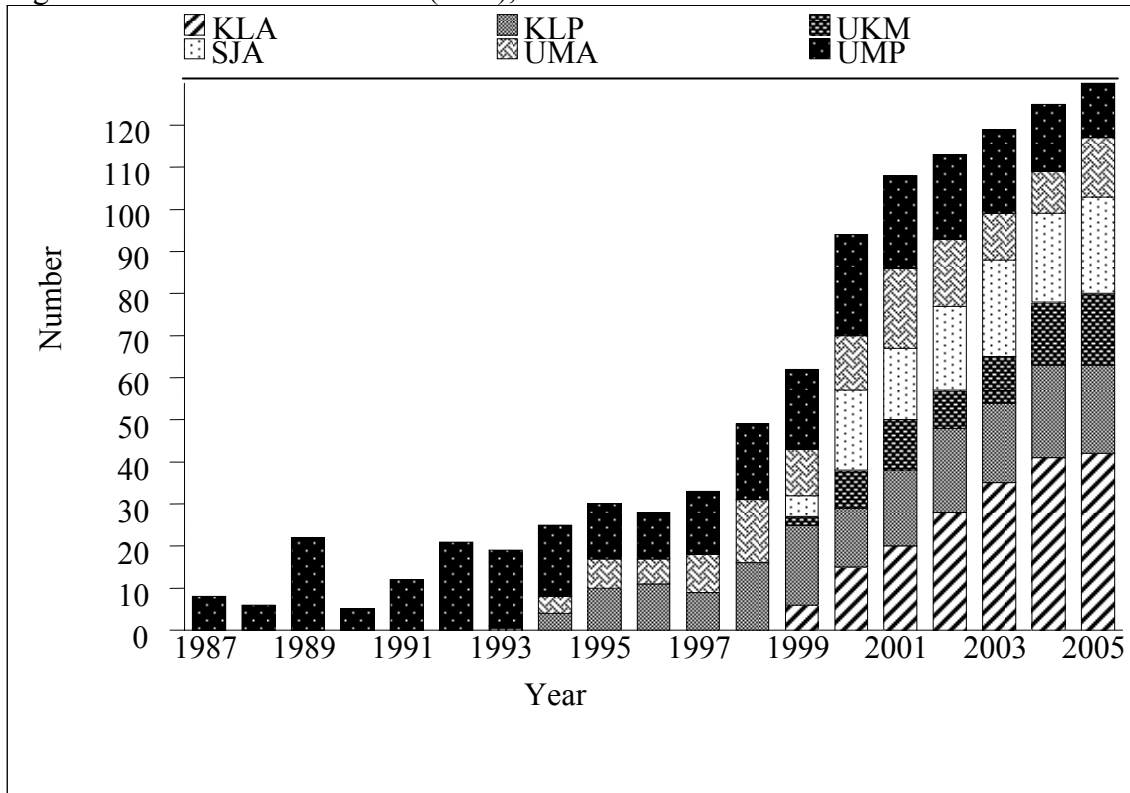
Table 1.1.3: Centre distribution (SDP), 1987-2005

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	0	0	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	22	100	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
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	11	39	9	27	16	33	19	31	14	15
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	31	11	18	13	14
UMP	17	68	13	43	11	39	15	45	18	37	19	31	24	26
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
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

Year	2001		2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	20	19	28	25	35	27	41	29	42	29	187	18
KLP	18	17	20	18	19	15	22	16	21	14	183	17
UKM	12	11	9	8	11	9	15	11	17	12	75	7
SJA	17	16	20	18	23	18	21	15	23	16	128	12
UMA	19	18	16	14	11	9	10	7	14	10	136	13
UMP	22	20	20	18	20	16	16	12	13	9	300	29
GMC	0	0	0	0	0	0	2	1	2	1	4	0
LWE	0	0	0	0	0	0	6	4	1	1	7	1
SJP	0	0	1	1	9	7	6	4	12	8	28	3
TOTAL	108	100	114	100	128	100	139	100	145	100	1048	100

Figure 1.1.3: Centre distribution (SDP), 1987-2005



KLA	HKL, Adult
KLP	HKL, Paediatric
UMA	UMMC, Adult
UMP	UMMC, Paediatric
SJA	SJMC, Adult
UKM	Hospital UKM

**1.2 RECIPIENTS' CHARACTERISTICS**

There is a slight female preponderance (48% males, 52% females) (Table 1.2.1). The largest ethnic group of transplant recipients is Chinese followed by Malays and Indians (Table 1.2.2). The young median age reflects the paediatric bias in the registry as transplants first started in paediatric patients and the adult centres started later, in 1993 (Table 1.2.3). However there is an adult preponderance in recent years.

The majority of transplants (about two-thirds) are for malignant disorders and most of these are haematological malignancies like leukaemia and lymphoma (Table 1.2.4). The bulk of non-malignant disorders requiring transplants are thalassaemia and aplastic anaemia.

Table 1.2.1: Gender distribution, 1987-2005

Year	1987		1988		1989		1990		1991		1992		1993		1994	
	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	
	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		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Male	71	55	83	60	69	48	593	57
Female	57	45	56	40	76	52	455	43
TOTAL	128	100	139	100	145	100	1048	100

Figure 1.2.1: Gender distribution, 1987-2005

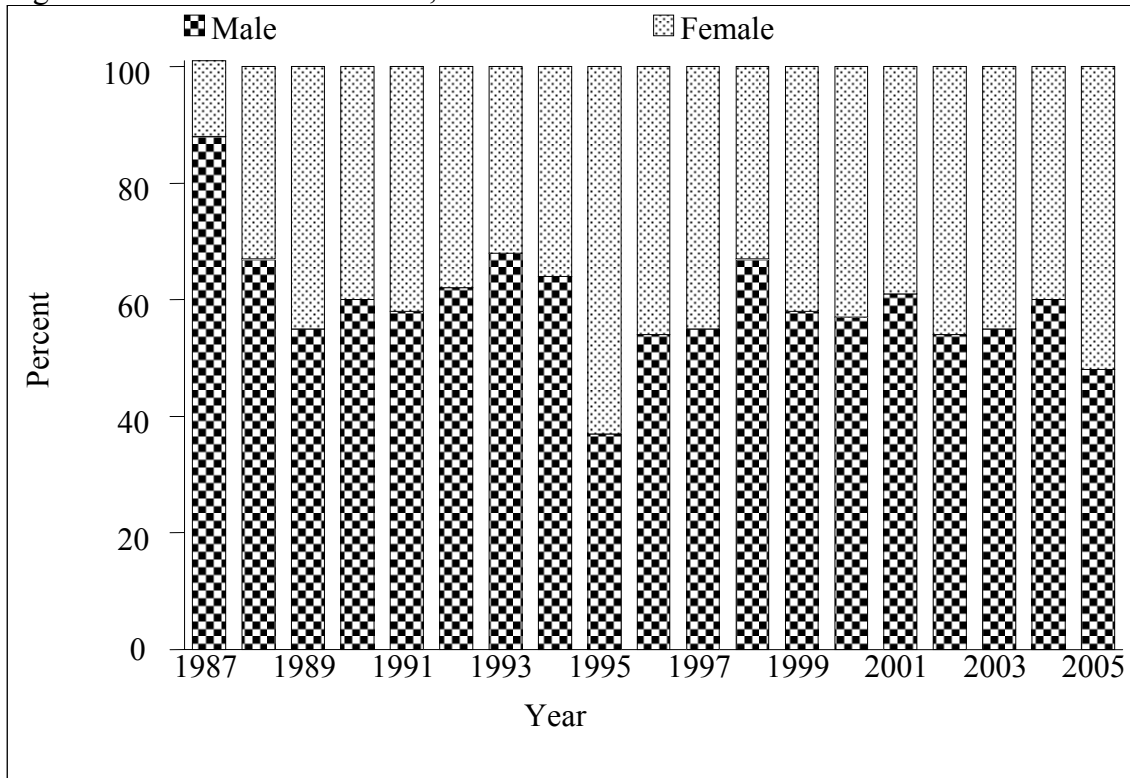


Table 1.2.2: Ethnic group distribution, 1987-2005

Year	1987		1988		1989		1990		1991		1992		1993	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Race														
Malay	2	25	4	67	13	59	2	40	4	33	4	19	3	16
Chinese	5	63	2	33	8	36	3	60	7	58	10	48	10	53
Indian	1	13	0	0	0	0	0	0	1	8	4	19	1	5
Bumiputra Sabah	0	0	0	0	1	5	0	0	0	0	2	10	3	16
Bumiputra Sarawak	0	0	0	0	0	0	0	0	0	0	0	0	2	11
Others	0	0	0	0	0	0	0	0	0	0	1	5	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.	%
Race														
Malay	9	36	7	23	8	29	9	27	20	41	31	50	33	35
Chinese	12	48	14	47	11	39	20	61	24	49	26	42	48	51
Indian	0	0	3	10	6	21	0	0	4	8	4	6	7	7
Bumiputra Sabah	4	16	1	3	0	0	1	3	0	0	0	0	3	3
Bumiputra Sarawak	0	0	0	0	3	11	0	0	0	0	0	0	0	0
Others	0	0	5	17	0	0	3	9	1	2	1	2	3	3
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

Year	2001		2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Race												
Malay	47	44	37	32	46	36	51	37	53	37	383	37
Chinese	48	44	65	57	65	51	63	45	67	46	508	48
Indian	8	7	8	7	6	5	9	6	13	9	75	7
Bumiputra Sabah	1	1	1	1	4	3	8	6	5	3	34	3
Bumiputra Sarawak	1	1	1	1	4	3	7	5	5	3	23	2
Others	3	3	2	2	3	2	1	1	2	1	25	2
TOTAL	108	100	114	100	128	100	139	100	145	100	1048	100

Figure 1.2.2: Ethnic group distribution, 1987-2005

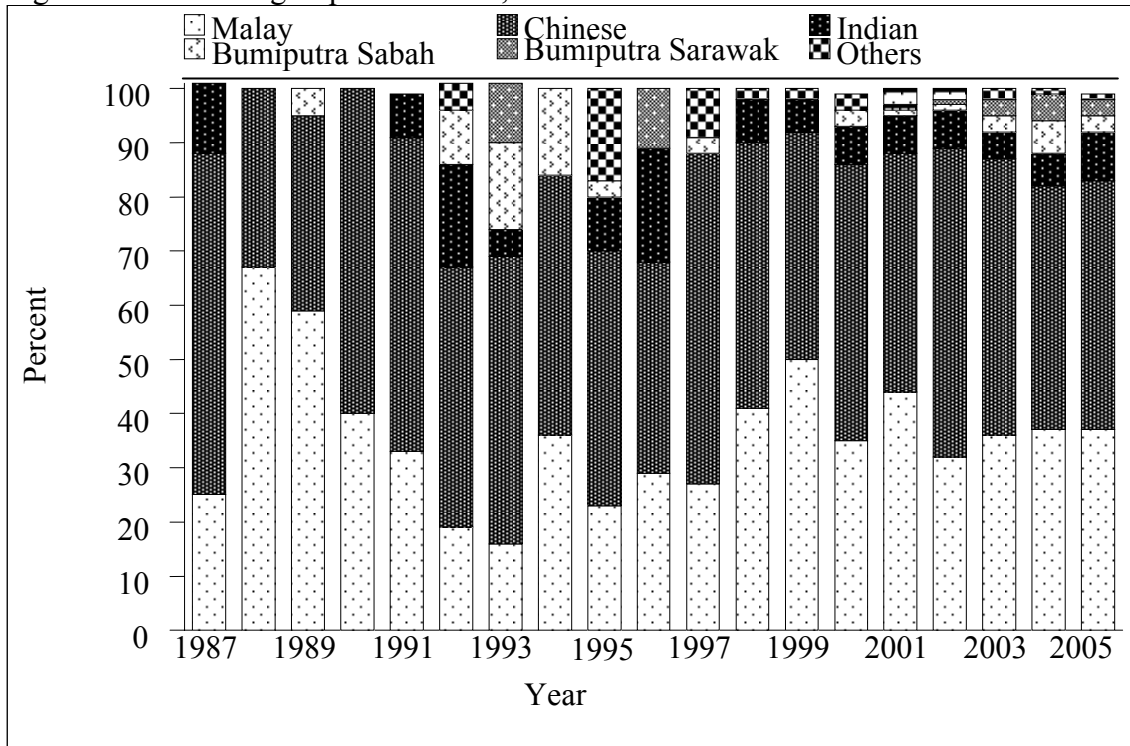




Table 1.2.3: Age distribution, 1987-2005

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

Year	1994		1995		1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	11	44	12	40	13	46	19	58	21	43	28	45	27	29
10-19	11	44	13	43	12	43	8	24	16	33	15	24	27	29
20-39	3	12	4	13	3	11	5	15	12	24	12	19	19	20
40-59	0	0	1	3	0	0	1	3	0	0	7	11	20	21
>=60	0	0	0	0	0	0	0	0	0	0	0	0	1	1
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100
Mean	11		13		11		12		13		17		23	
SD	7		9		9		12		10		15		17	
Median	11		11		11		6		10		11		18	
Minimum	1		3		1		1		5 months		1		1	
Maximum	29		41		37		45		39		57		61	

Year	2001		2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	23	21	30	26	42	33	26	19	29	20	345	33
10-19	28	26	25	22	18	14	41	29	30	21	273	26
20-39	40	37	36	32	47	37	52	37	50	34	283	27
40-59	16	15	23	20	21	16	18	13	35	24	142	14
>=60	1	1	0	0	0	0	2	1	1	1	5	0
TOTAL	108	100	114	100	128	100	139	100	145	100	1048	100
Mean	23		23		22		23		26		19	
SD	16		16		15		15		16		15	
Median	22		22		23		20		25		14	
Minimum	1 month		1		5 months		1		1		1 month	
Maximum	64		55		52		70		66		70	

\*Age=date of transplant – date of birth

Figure 1.2.3: Age distribution, 1987-2005

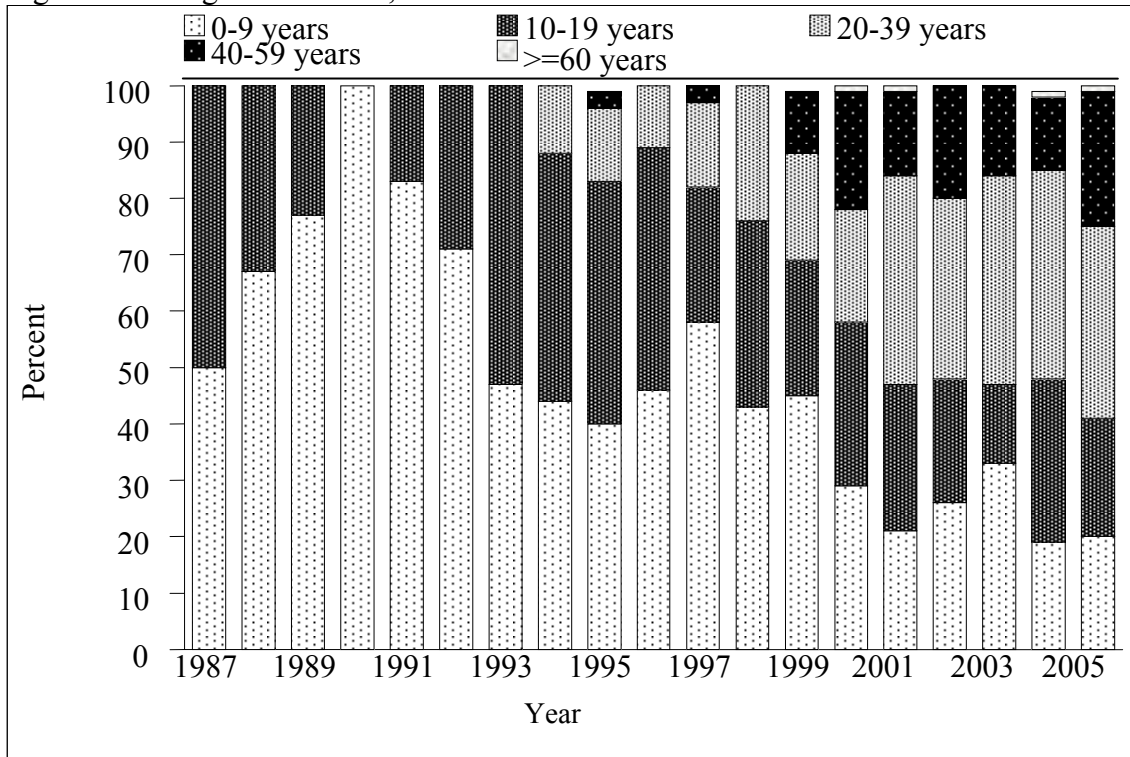


Table 1.2.4: Primary Diagnosis, 1987-2005

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

Year	1994		1995		1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Diagnosis	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	8	32	10	33	13	46	37	39	11	33	23	47	28	45
Chronic leukaemia	4	16	5	17	5	18	13	14	6	18	7	14	7	11
Hypoplastic anaemia	5	20	8	27	4	14	11	12	5	15	4	8	5	8
Erythrocytic disorders	0	0	0	0	1	4	0	0	0	0	0	0	0	0
Lymphoma	0	0	0	0	0	0	19	20	2	6	5	10	6	10
Solid tumors	1	4	1	3	0	0	2	2	1	3	2	4	5	8
Myelodysplasia	2	8	0	0	0	0	1	1	0	0	1	2	0	0
Haemoglobinopathy	5	20	5	17	5	18	7	7	6	18	2	4	4	6
Multiple myeloma	0	0	0	0	0	0	1	1	0	0	0	0	3	5
Others	0	0	1	3	0	0	3	3	2	6	5	10	4	6
TOTAL	25	100	30	100	28	100	94	100	33	100	49	100	62	100

Year	2001		2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Diagnosis	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	48	44	48	42	42	33	46	33	53	37	397	38
Chronic leukaemia	18	17	19	17	19	15	22	16	13	9	147	14
Hypoplastic anaemia	7	6	4	4	5	4	12	9	5	3	94	9
Erythrocytic disorders	0	0	1	1	2	2	0	0	0	0	8	1
Lymphoma	23	21	20	18	28	22	35	25	33	23	171	16
Solid tumors	0	0	3	3	2	2	0	0	2	1	23	2
Myelodysplasia	4	4	4	4	3	2	6	4	4	3	26	2
Haemoglobinopathy	4	4	8	7	17	13	9	6	16	11	109	10
Multiple myeloma	1	1	4	4	4	3	3	2	8	6	24	2
Others	3	3	3	3	6	5	6	4	11	8	49	5
TOTAL	108	100	114	100	128	100	139	100	145	100	1048	100

Diagnosis list in the web-application

#	Diagnosis	Categorise as:
1	Acute leukaemia, unclassified	Acute leukemia
2	Acute undifferentiated leukaemia	
3	ALL	
4	AML denovo	
5	AML post-chemotherapy	
6	AML post-MDS	
7	Chronic lymphocytic leukaemia	Chronic leukemia
8	Chronic myeloid leukaemia	
9	Aplastic anaemia	Hypoplastic anemia
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	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 NET	
28	Juvenile Myelomonocytic leukaemia	Myelodysplasia
29	Myelodysplastic 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**

Allogeneic transplants still form the majority of transplants, mostly being sibling related transplants. Autologous transplants are increasing and the number of such transplants has exceeded 50 in 2005.

The increasing use of non-myeloablative transplants has enabled older patients to access allogeneic stem cell transplantation, and the upper age limit for such transplants has been steadily increasing.

The number of unrelated donor transplantation is also showing a slow increase.

Table 1.3.1: Graft number, 1987-2005

Year	1987		1988		1989		1990		1991		1992		1993	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	8	100	6	100	19	86	4	80	9	75	19	90	18	95
2	0	0	0	0	2	9	1	20	3	25	2	10	1	5
3	0	0	0	0	1	5	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.	%
1	24	96	29	97	28	100	31	94	48	98	61	98	91	97
2	1	4	1	3	0	0	1	3	1	2	1	2	3	3
3	0	0	0	0	0	0	1	3	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		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	103	95	113	99	125	98	134	98	114	98	984	97
2	5	5	1	1	3	2	3	2	2	2	31	3
3	0	0	0	0	0	0	0	0	0	0	2	0
TOTAL	108	100	114	100	128	100	137	100	116	100	1017	100

Figure 1.3.1: Graft number, 1987-2005

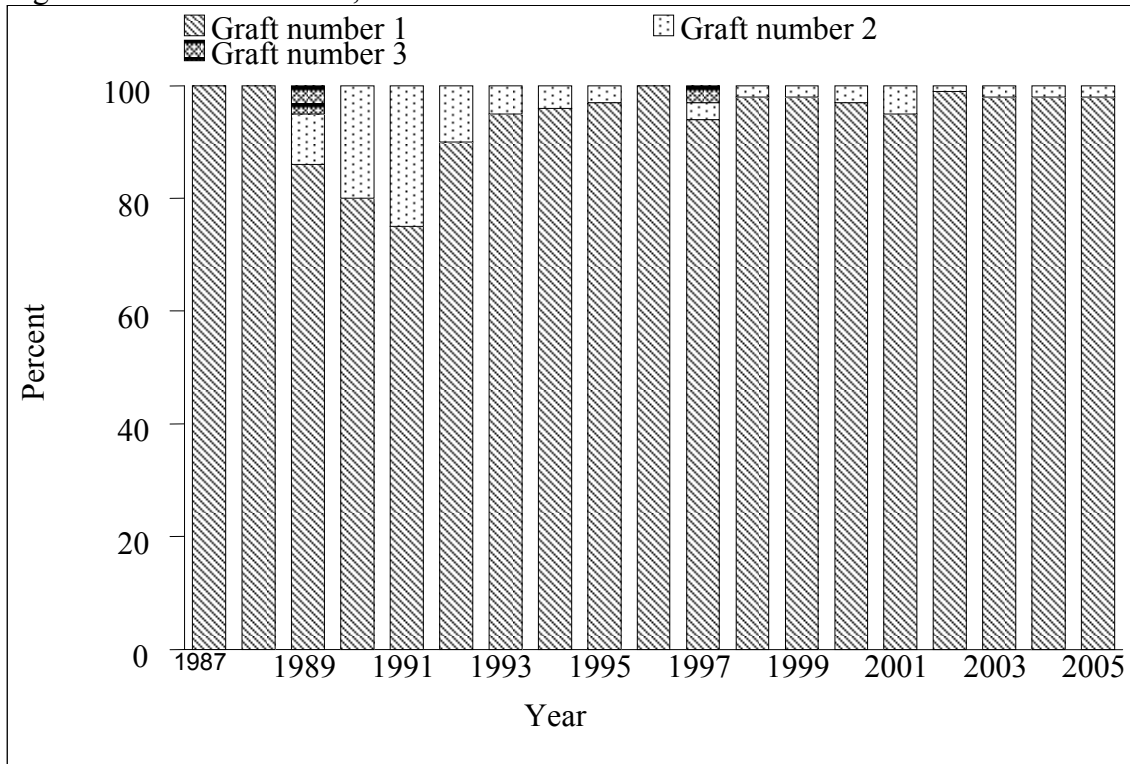


Table 1.3.2: Type of transplant, 1987-2005

Year	1987		1988		1989		1990		1991		1992	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	8	100	6	100	21	95	5	100	12	100	20	95
Autologous	0	0	0	0	1	5	0	0	0	0	1	5
TOTAL	8	100	6	100	22	100	5	100	12	100	21	100

Year	1993		1994		1995		1996		1997		1998		1999	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	18	95	24	96	29	97	26	93	27	82	32	65	44	71
Autologous	1	5	1	4	1	3	2	7	6	18	17	35	18	29
TOTAL	19	100	25	100	30	100	28	100	33	100	49	100	62	100

Year	2000		2001		2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	56	60	75	69	75	66	84	66	90	65	88	61	740	71
Autologous	38	40	33	31	39	34	44	34	49	35	56	39	307	29
TOTAL	94	100	108	100	114	100	128	100	139	100	144	100	1047	100

\*6 patients with syngeneic type of transplant

Figure 1.3.2: Type of transplant, 1987-2005

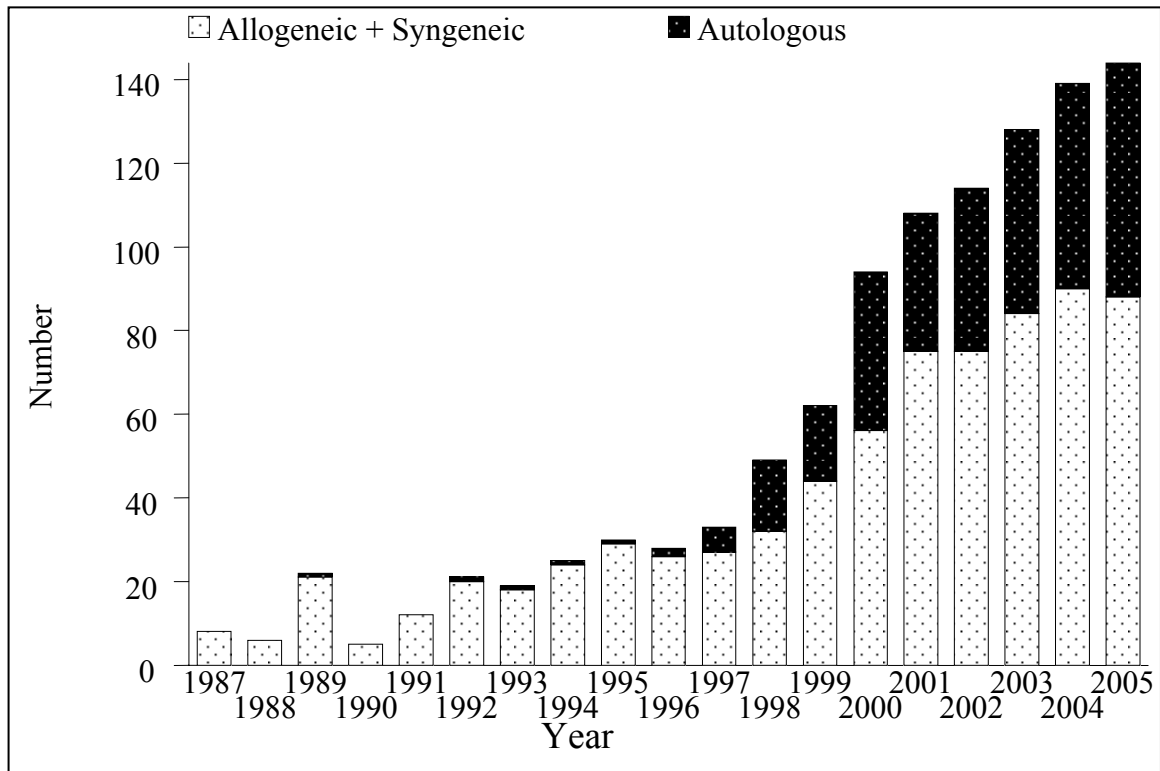


Table 1.3.3: Type of transplant by Centre, 1987-2005

Type of transplant	Allogeneic + Syngeneic		Autologous		TOTAL	
	No.	%	No.	%	No.	%
Centre						
KLA	96	13	91	30	187	18
KLP	155	21	28	9	183	17
UKM	45	6	30	10	75	7
SJA	45	6	83	27	128	12
UMA	95	13	41	13	136	13
UMP	272	37	27	9	299	29
GMC	1	0	3	1	4	0
LWE	7	1	0	0	7	1
SJP	24	3	4	1	28	3
TOTAL	740	100	307	100	1047	100

Figure 1.3.3: Type of transplant by Centre, 1987-2005

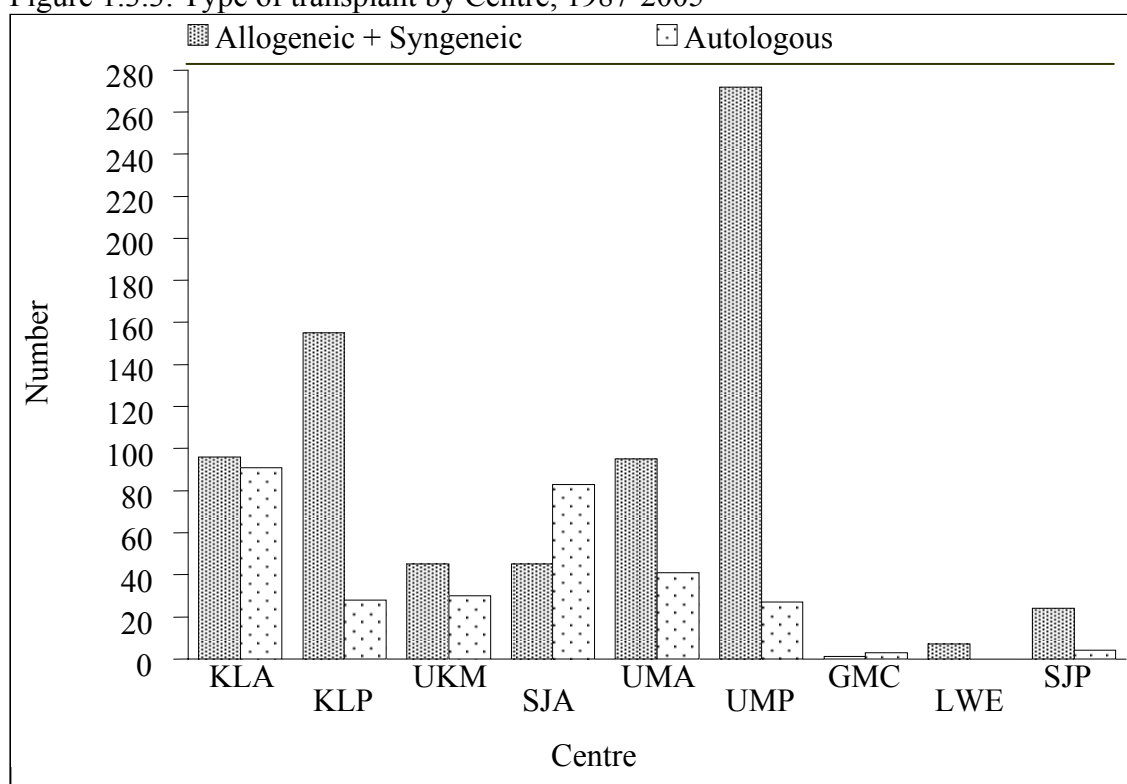




Table 1.3.4: Transplant source, 1987-2005

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	8	100	6	100	22	100	5	100	12	100
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
TOTAL	8	100	6	100	22	100	5	100	12	100

Year	1992		1993		1994		1995		1996	
	No.	%	No.	%	No.	%	No.	%	No.	%
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	21	100	19	100	25	100	30	100	28	100
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
TOTAL	21	100	19	100	25	100	30	100	28	100

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

Year	2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	31	27	44	34	30	22	23	16	451	43
PBSC / Marrow + PBSC	79	69	79	62	100	72	115	79	557	53
Cord blood / Marrow + cord	4	4	5	4	9	6	7	5	40	4
TOTAL	114	100	128	100	139	100	145	100	1048	100

Figure 1.3.4: Transplant source, 1987-2005

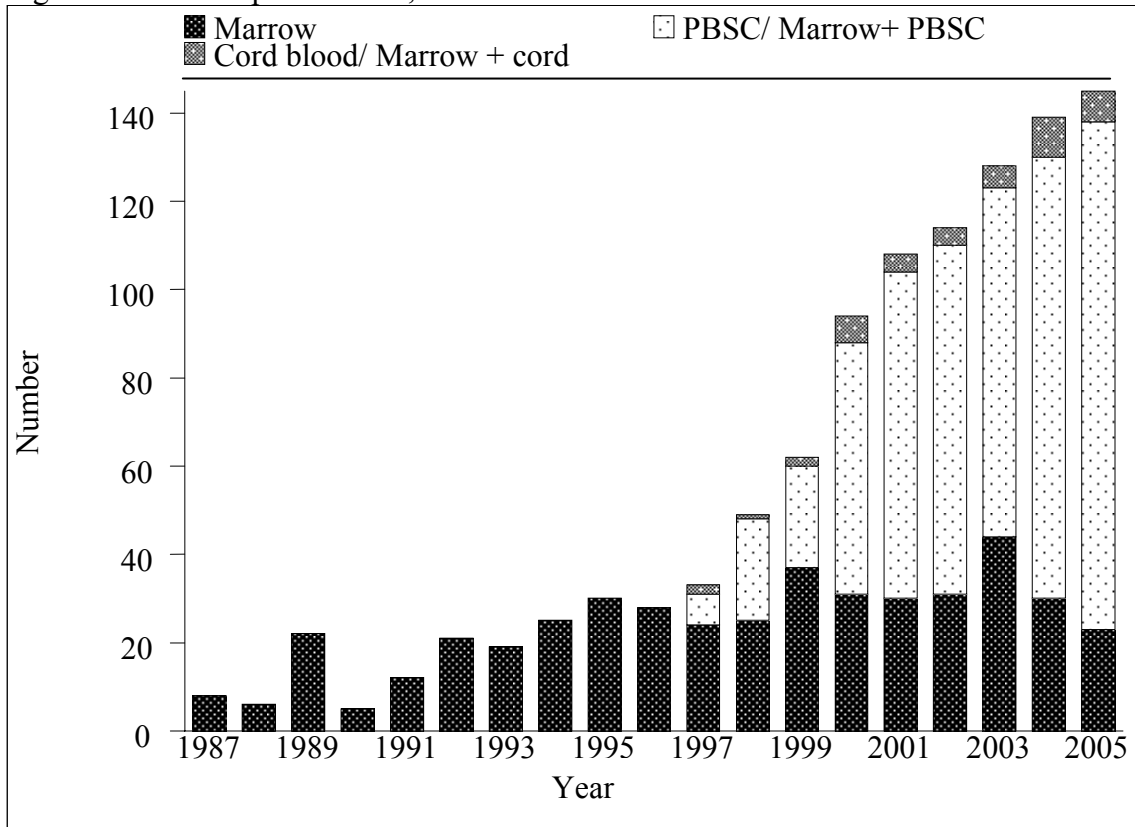


Table 1.3.5: HLA Match, 1987-2005

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
HLA Match	8	100	6	100	21	100	5	100	12	100
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	
	No.	%	No.	%	No.	%	No.	%	No.	%
HLA Match	20	100	23	96	29	100	26	100	18	100
Identical	20	100	23	96	29	100	26	100	18	100
1 AG	0	0	1	4	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	20	100	24	100	29	100	26	100	18	100

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

Year	2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
HLA Match	70	93	79	94	83	92	78	94	695	95
Identical	70	93	79	94	83	92	78	94	695	95
1 AG	3	4	3	4	3	3	4	5	23	3
2 AG	2	3	2	2	4	4	1	1	16	2
>=3 AG Disparate	0	0	0	0	0	0	0	0	1	0
TOTAL	75	100	84	100	90	100	83	100	735	100

\*excluding autologous

Table 1.3.6: Allogeneic Donor Relationship, 1987-2005

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic Donor Relationship										
Sibling	8	100	6	100	21	100	5	100	11	92
Unrelated	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	
	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic Donor Relationship										
Sibling	20	100	18	100	22	92	29	100	26	100
Unrelated	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	
	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic Donor Relationship										
Sibling	26	96	32	100	72	96	44	100	55	98
Unrelated	1	4	0	0	3	4	0	0	1	2
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	27	100	32	100	75	100	44	100	56	100

Year	2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic Donor Relationship										
Sibling	71	95	81	96	81	90	79	91	707	96
Unrelated	4	5	3	4	9	10	8	9	29	4
Others	0	0	0	0	0	0	0	0	3	0
TOTAL	75	100	84	100	90	100	87	100	739	100

\*excluding autologous, including syngeneic

**1.4 TRANSPLANT OUTCOMES**

The major cause of death is relapse/underlying disease with sepsis being the second commonest cause of death (Table 1.4.1).

Table 1.4.1: Cause of Death, 1987-2005

Year	1987		1988		1989		1990		1991	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cause of death										
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	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cause of death										
Sepsis	1	50	2	22	1	20	4	25	6	55
GVHD	0	0	0	0	0	0	4	25	0	0
Underlying disease	0	0	6	67	3	60	2	13	3	27
Haemorrhage	0	0	1	11	0	0	2	13	1	9
VOD	0	0	0	0	0	0	1	6	1	9
Organ Failure	1	50	0	0	1	20	2	13	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	16	100	11	100

Year	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cause of death										
Sepsis	5	33	1	6	4	9	6	40	2	6
GVHD	0	0	2	12	4	9	1	7	2	6
Underlying disease	9	60	11	65	33	70	7	47	22	71
Haemorrhage	0	0	1	6	2	4	0	0	3	10
VOD	0	0	1	6	2	4	0	0	1	3
Organ Failure	1	7	0	0	0	0	1	7	0	0
Interstitial pneumonitis	0	0	1	6	2	4	0	0	1	3
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	15	100	17	100	47	100	15	100	31	100

Year	2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cause of death										
Sepsis	4	13	14	28	10	23	9	25	71	21
GVHD	3	10	5	10	9	21	6	17	37	11
Underlying disease	19	63	27	54	21	49	14	39	188	55
Haemorrhage	0	0	0	0	2	5	2	6	15	4
VOD	0	0	0	0	0	0	0	0	6	2
Organ Failure	3	10	2	4	0	0	1	3	12	4
Interstitial pneumonitis	0	0	1	2	0	0	2	6	7	2
Secondary malignancy	0	0	0	0	0	0	0	0	1	0
Others	0	0	0	0	0	0	1	3	1	0
Unknown	1	3	1	2	1	2	1	3	4	1
TOTAL	30	100	50	100	43	100	36*	100	342	100

\*3 patients with missing cause of death reported

In the 2005 report there is inclusion of additional survival estimates. Besides overall survival there is also survival by age, transplant type and key disease entities (leukaemia, lymphoma, aplastic anemia and thalassaemia).

Figure 1.4.1: Patient survival by year of transplant, 1987-2005

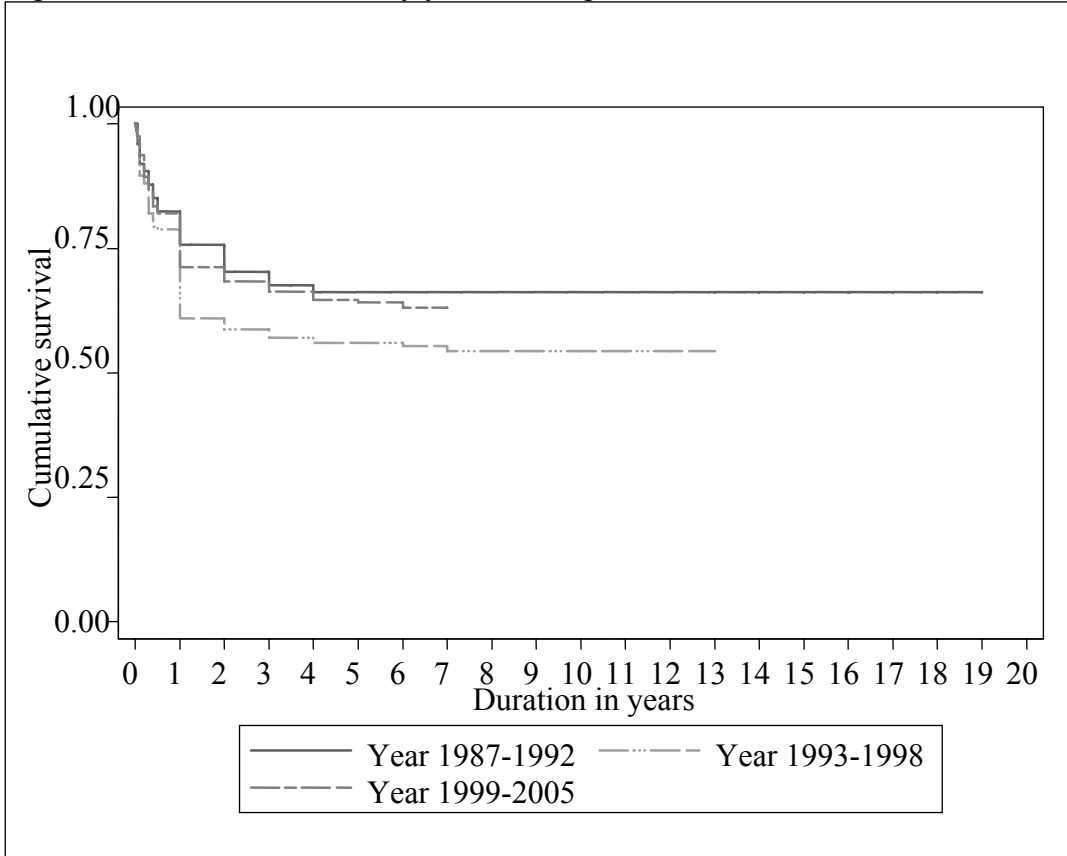


Figure 1.4.2: Patient survival by gender, 1987-2005

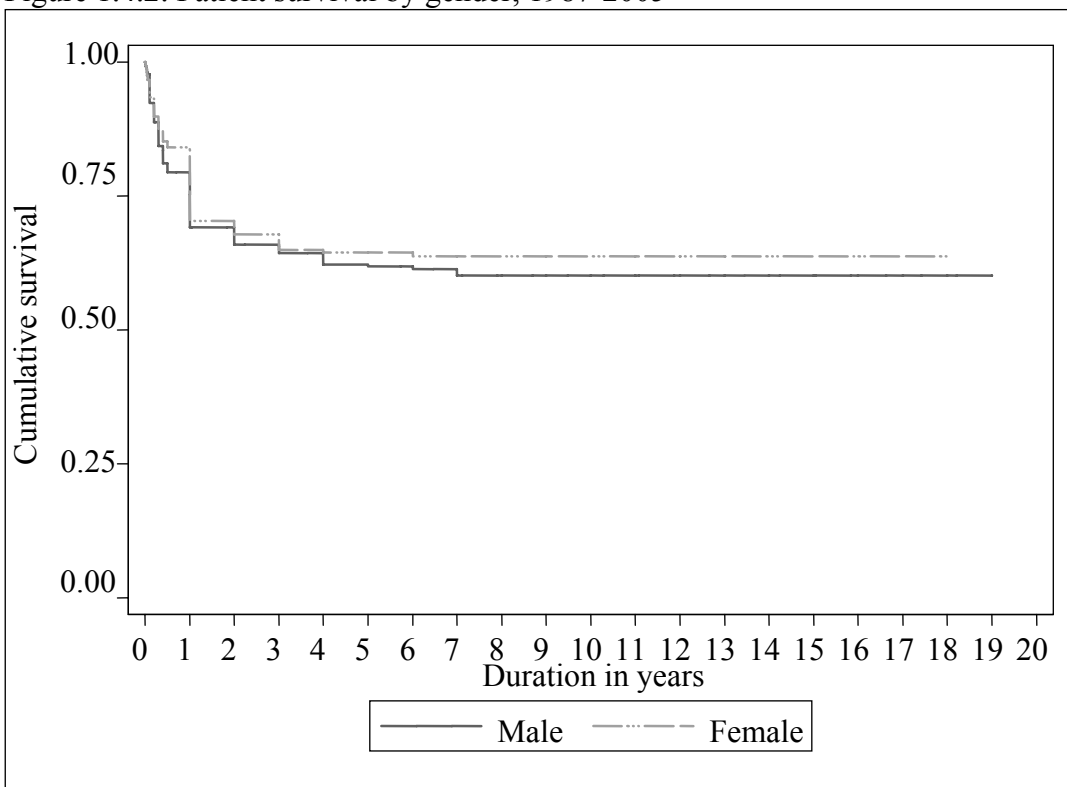


Figure 1.4.3: Patient survival by age group, 1987-2005

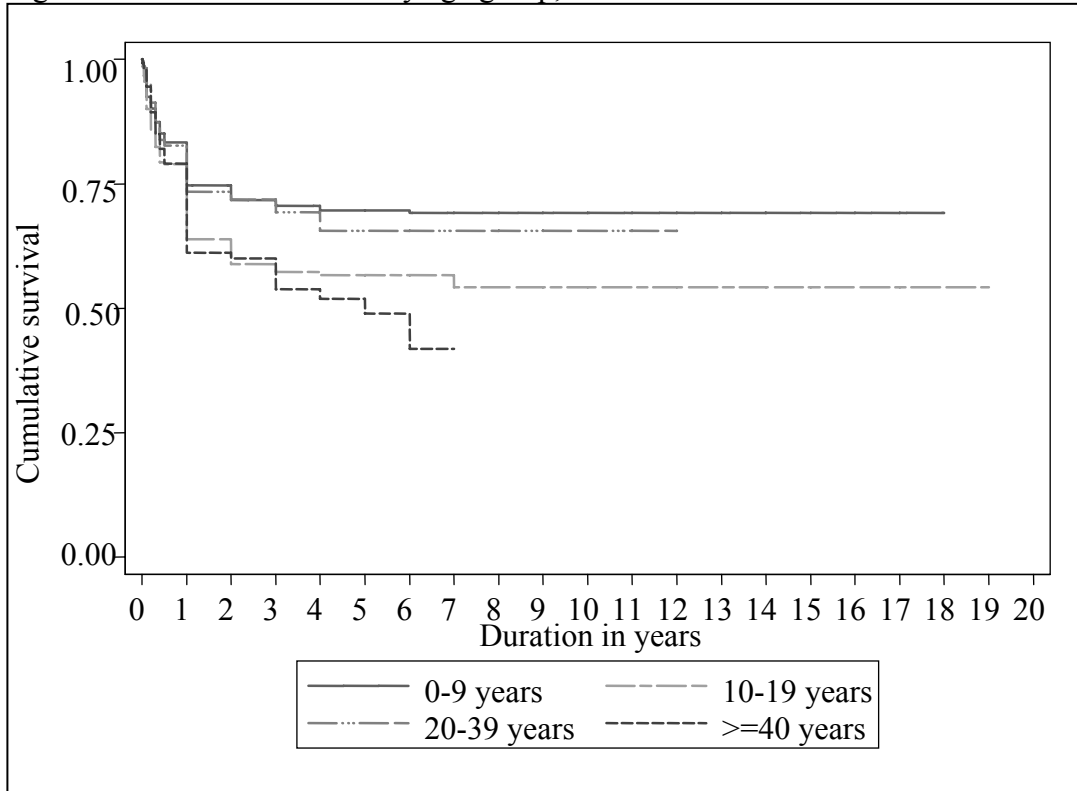
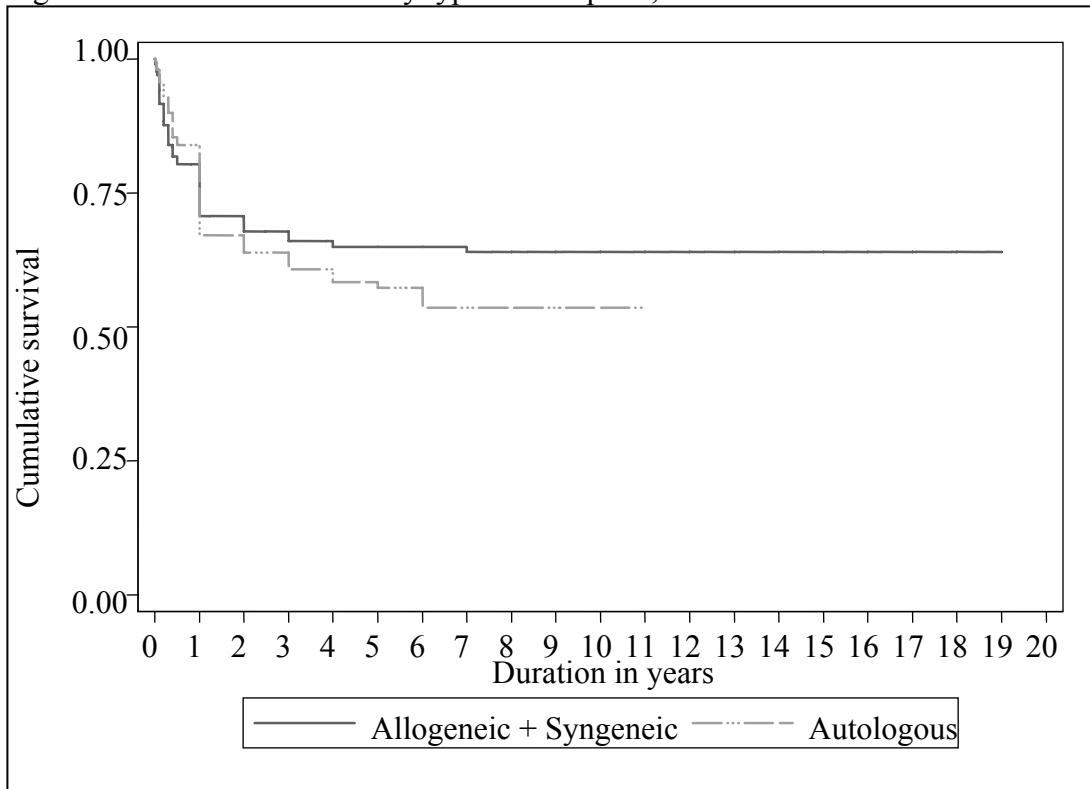


Figure 1.4.4: Patient survival by type of transplant, 1987-2005



### 1.5 DISEASE-FREE SURVIVAL

Figure 1.5.1: Disease-free survival for Acute Myeloid Leukaemia, 1987-2005  
(Allogeneic vs. Autologous)

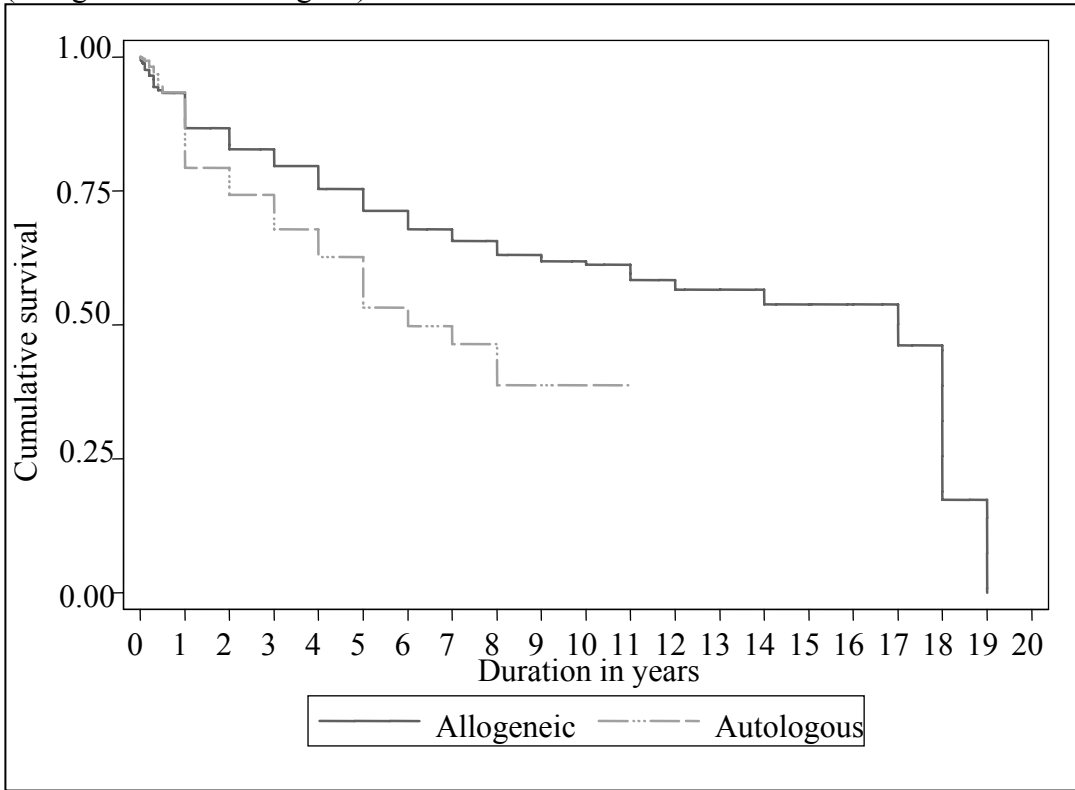


Figure 1.5.2: Disease-free survival for Acute Lymphoblastic Leukaemia, 1987-2005  
(Allogeneic)

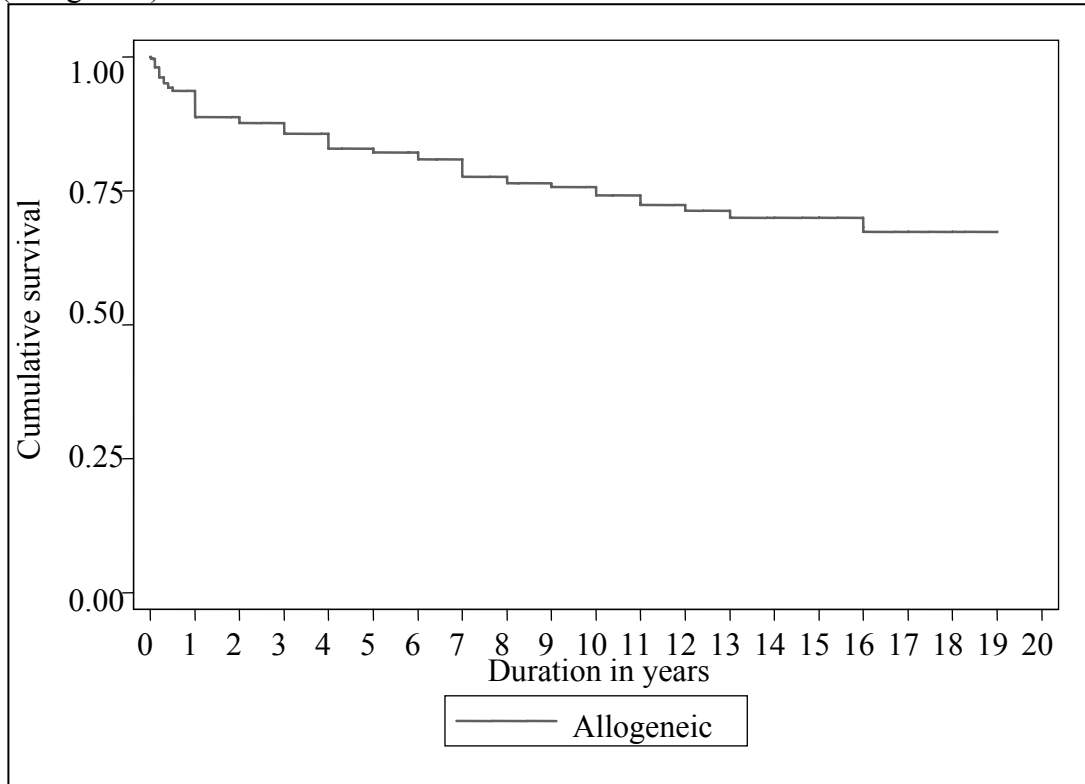




Figure 1.5.3: Disease-free survival for Thalassemia, 1987-2005 (Allogeneic)

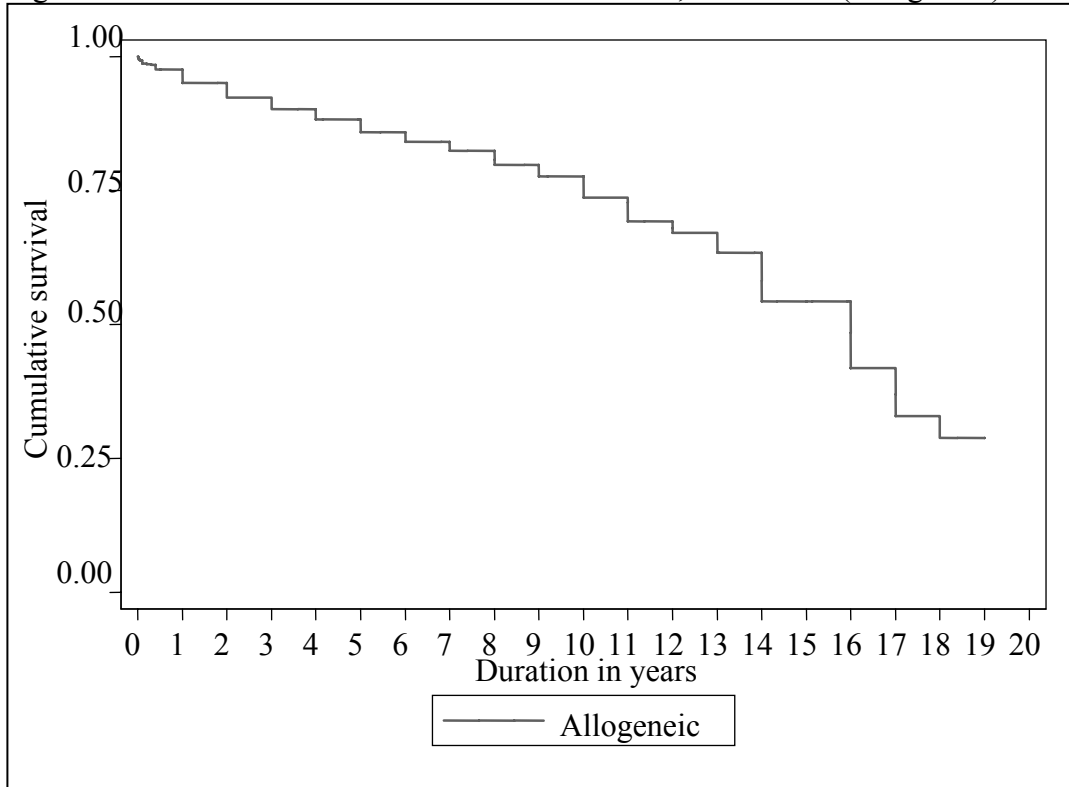


Figure 1.5.4: Disease-free survival for Non-Hodgkin’s Lymphoma, 1987-2005 (Allogeneic vs. Autologous)

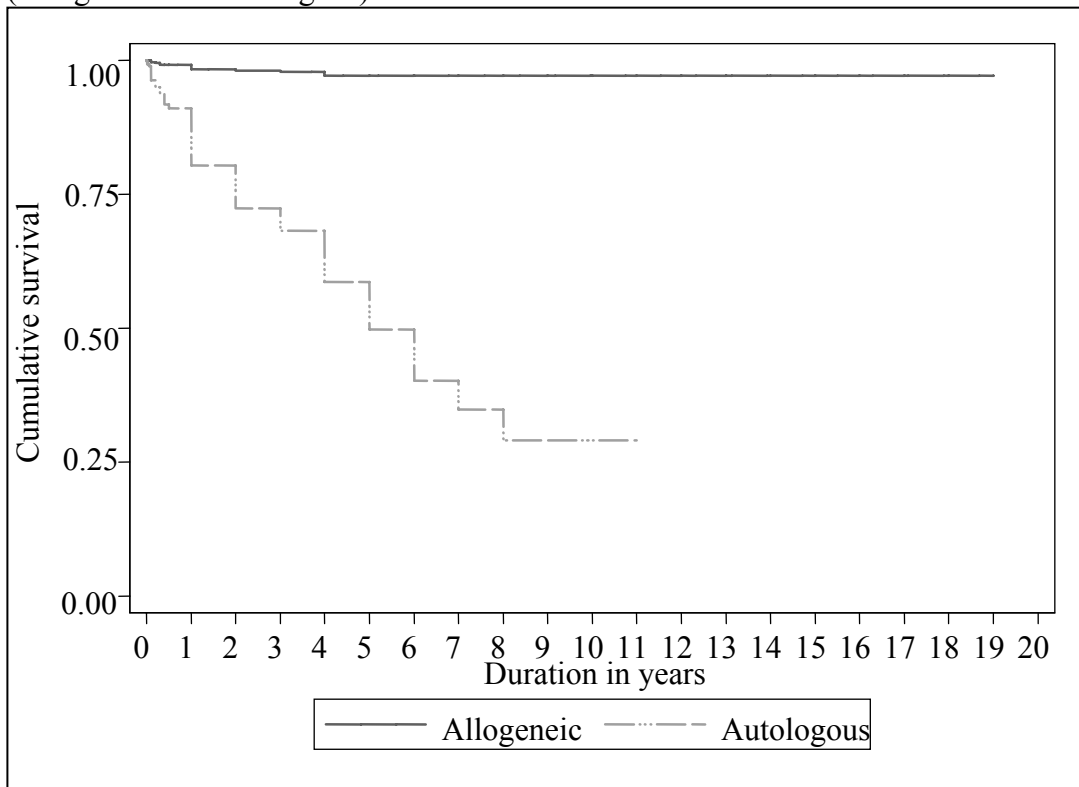


Figure 1.5.5: Disease-free survival for Hodgkin's Disease, 1987-2005 (Autologous)

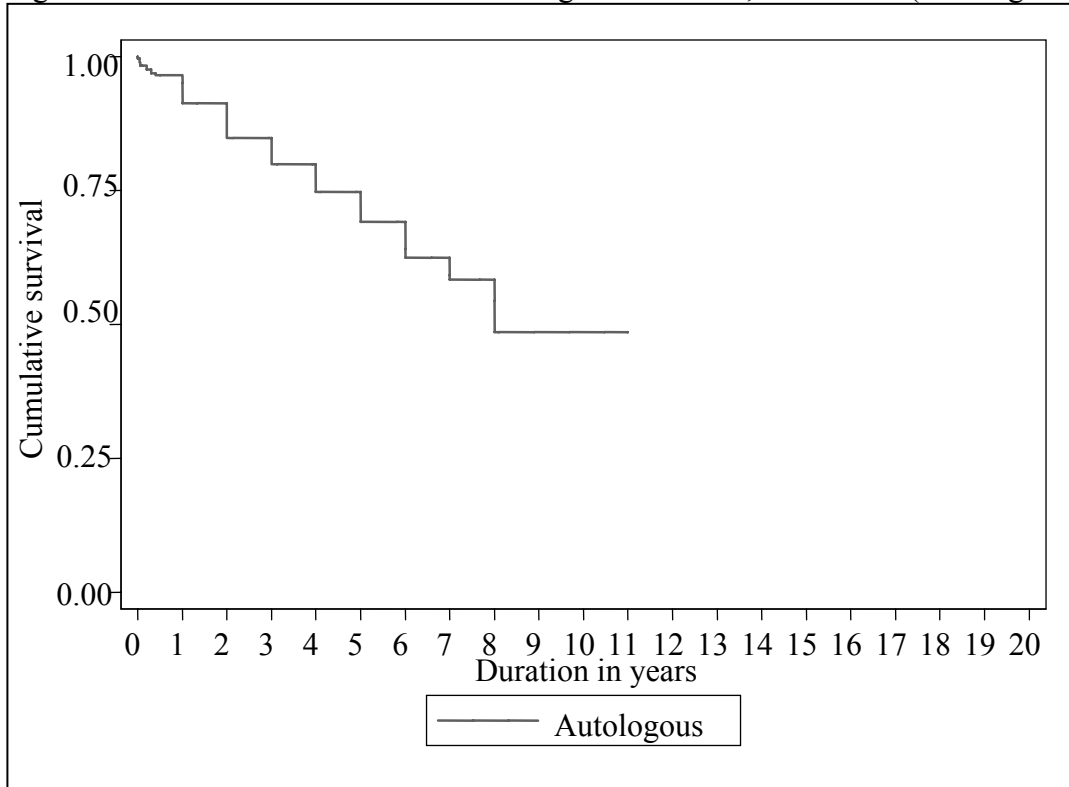


Figure 1.5.6: Disease-free survival for Chronic Myeloid Leukaemia, 1987-2005 (Allogeneic)

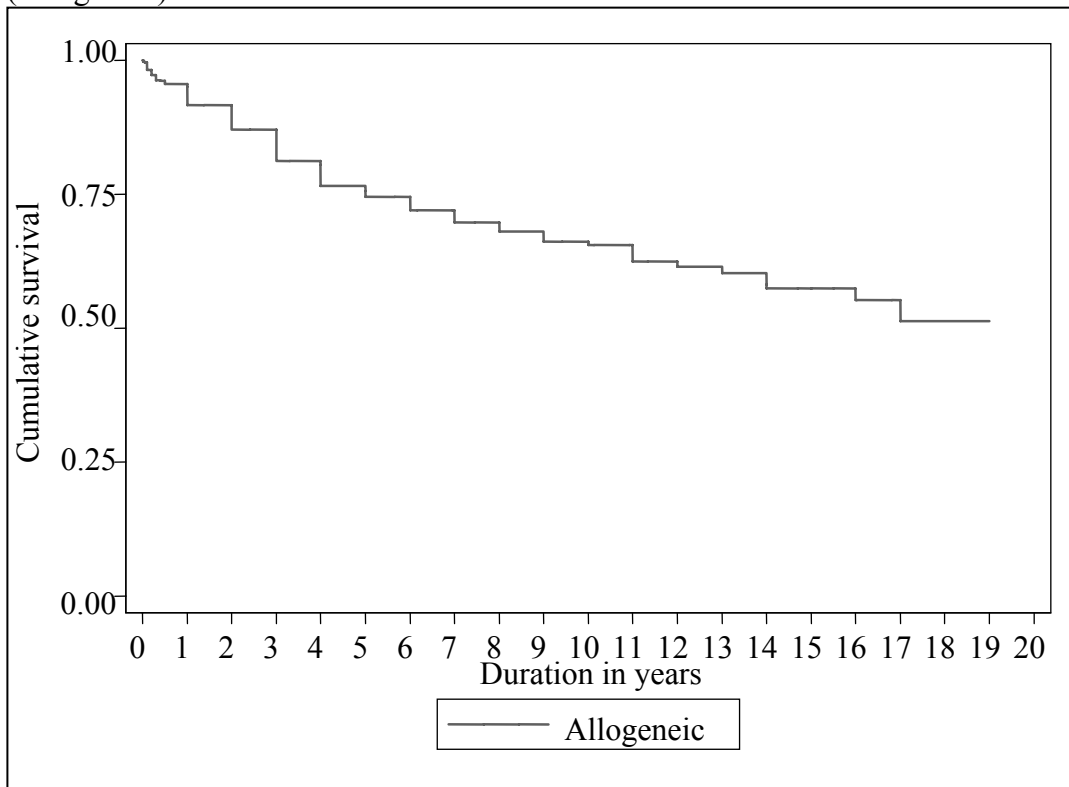


Figure 1.5.7: Disease-free survival for Aplastic Anaemia, 1987-2005 (Allogeneic)

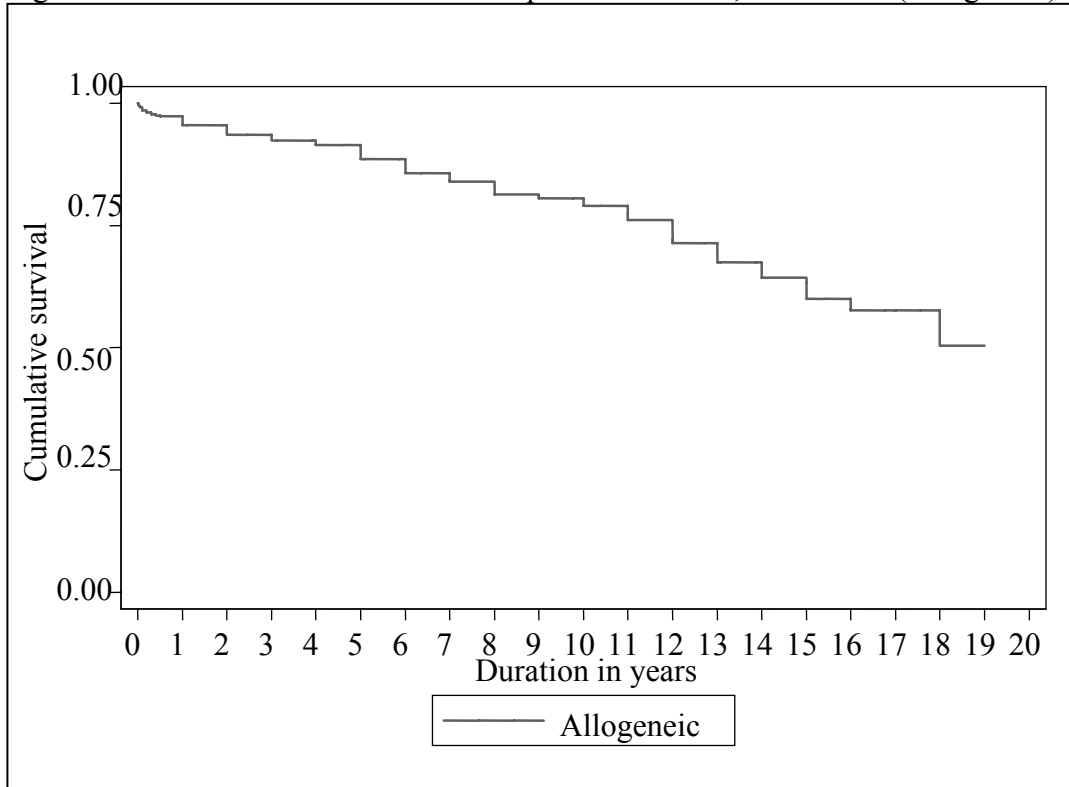
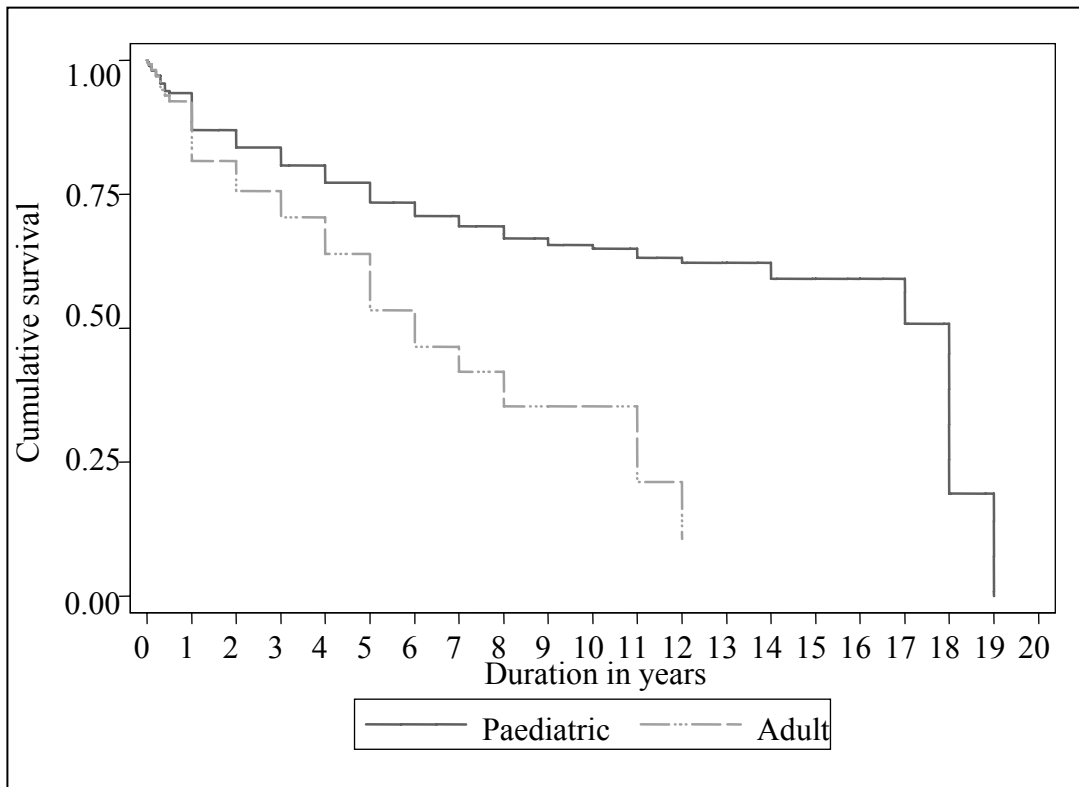
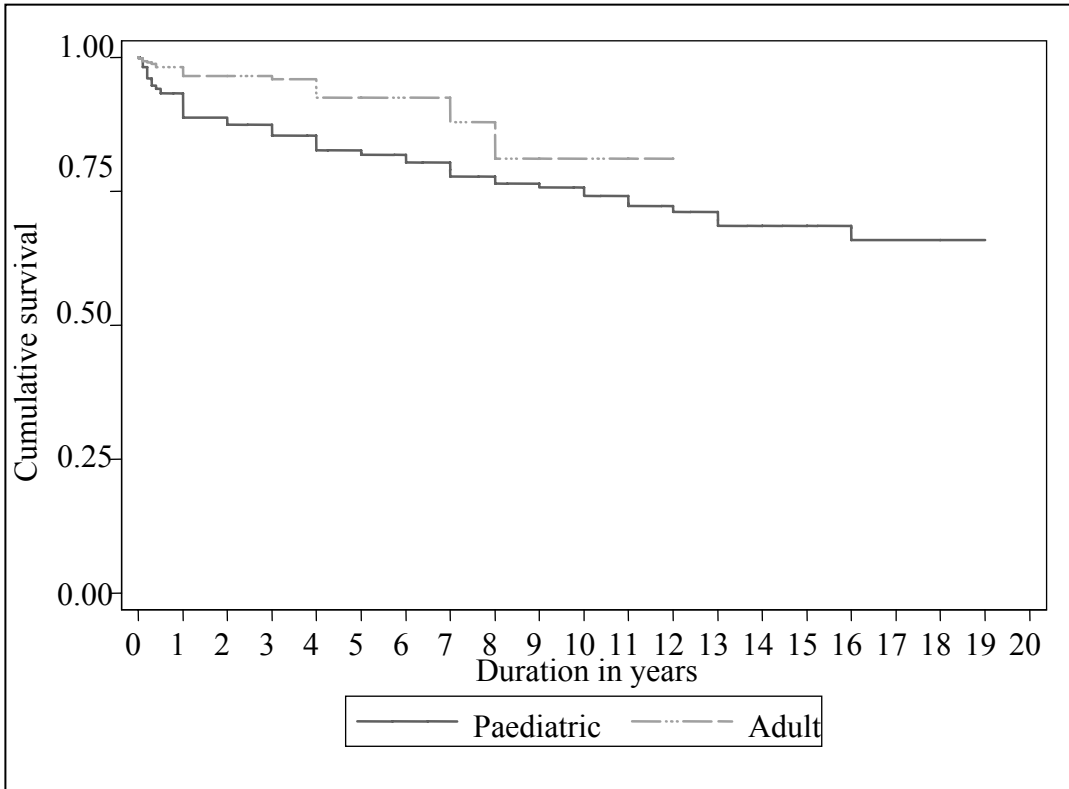


Figure 1.5.8: Disease-free survival by age group for Acute Myeloid Leukaemia, 1987-2005



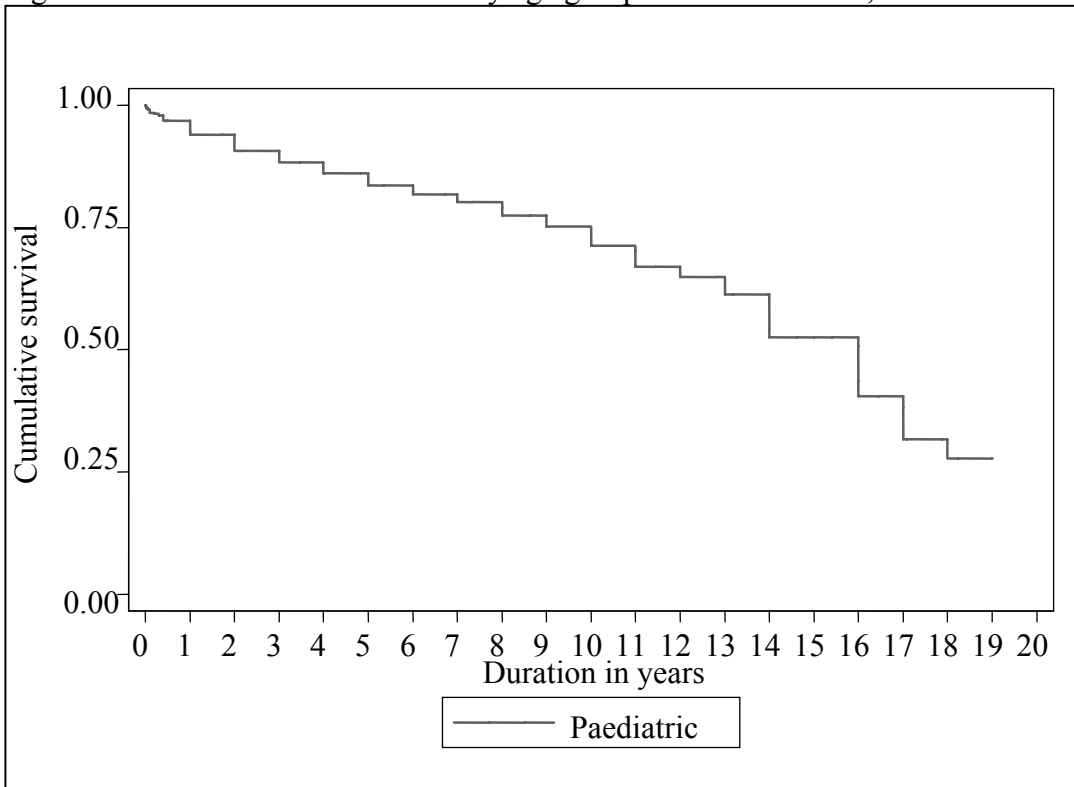
Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.9: Disease-free survival by age group for Acute Lymphoblastic Leukaemia, 1987-2005



Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

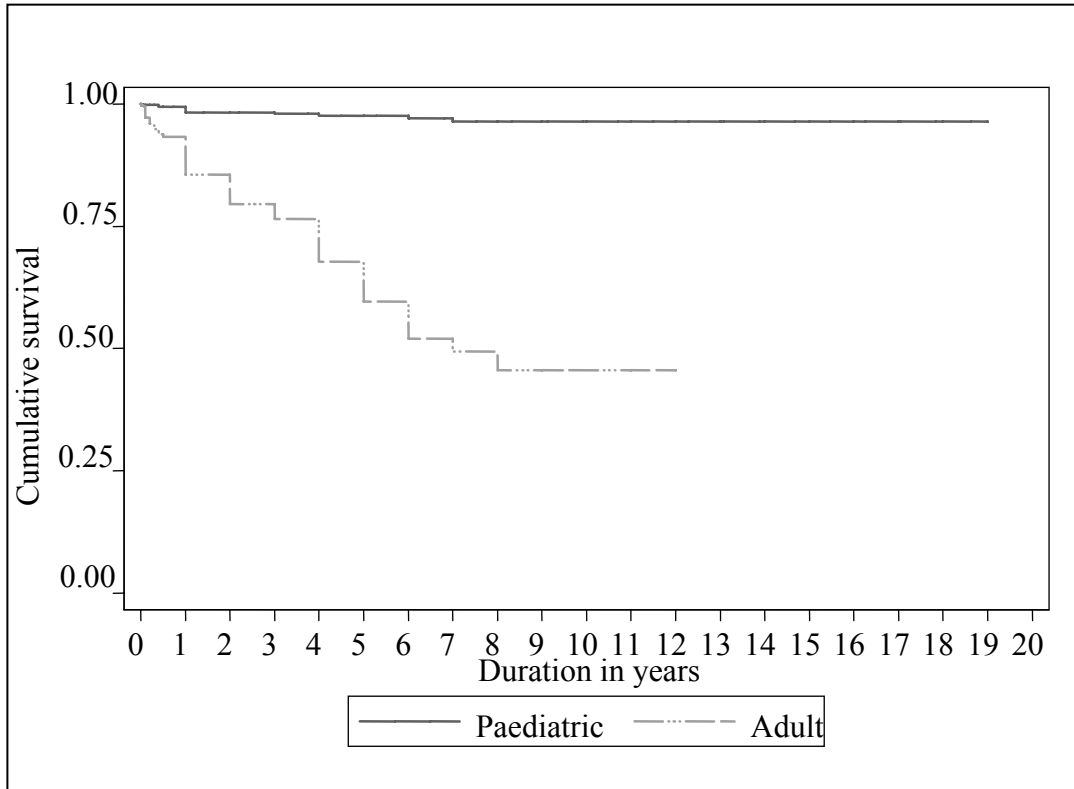
Figure 1.5.10: Disease-free survival by age group for Thalassaemia, 1987-2005



\* No adult cases reported for Thalassaemia.

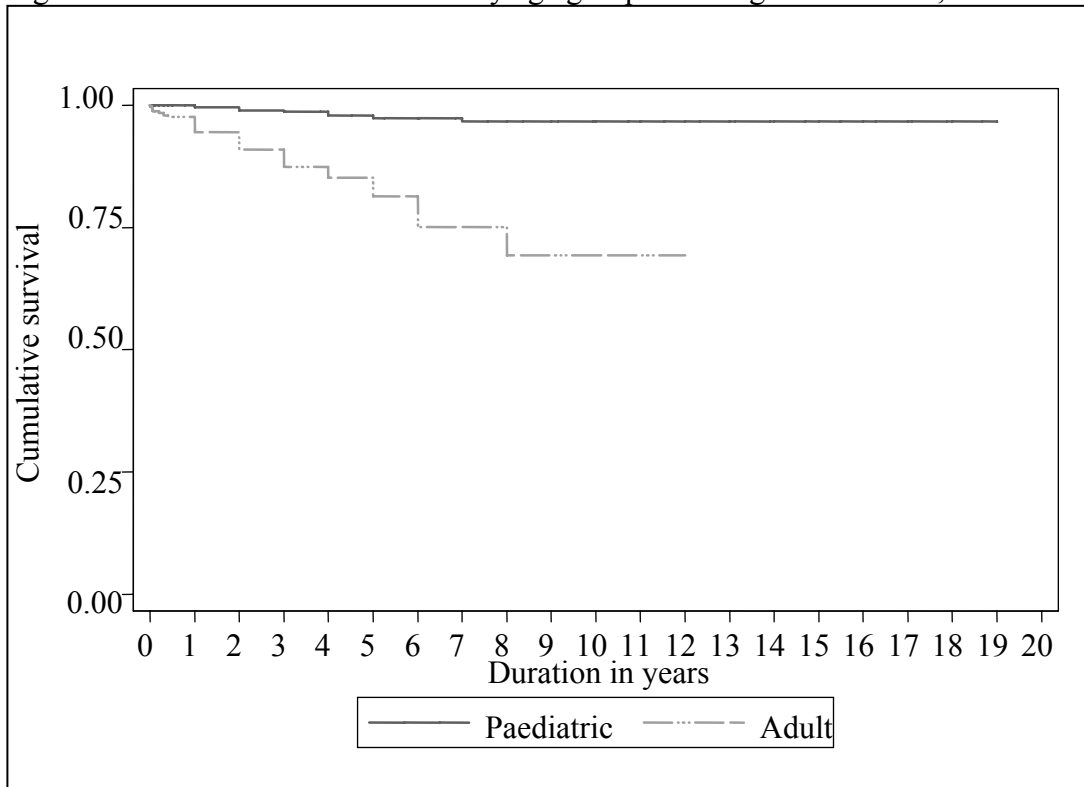
Paediatric is defined as age  $\leq 18$  years and adult age  $> 18$  years

Figure 1.5.11: Disease-free survival by age group for Non-Hodgkin’s Lymphoma, 1987-2005



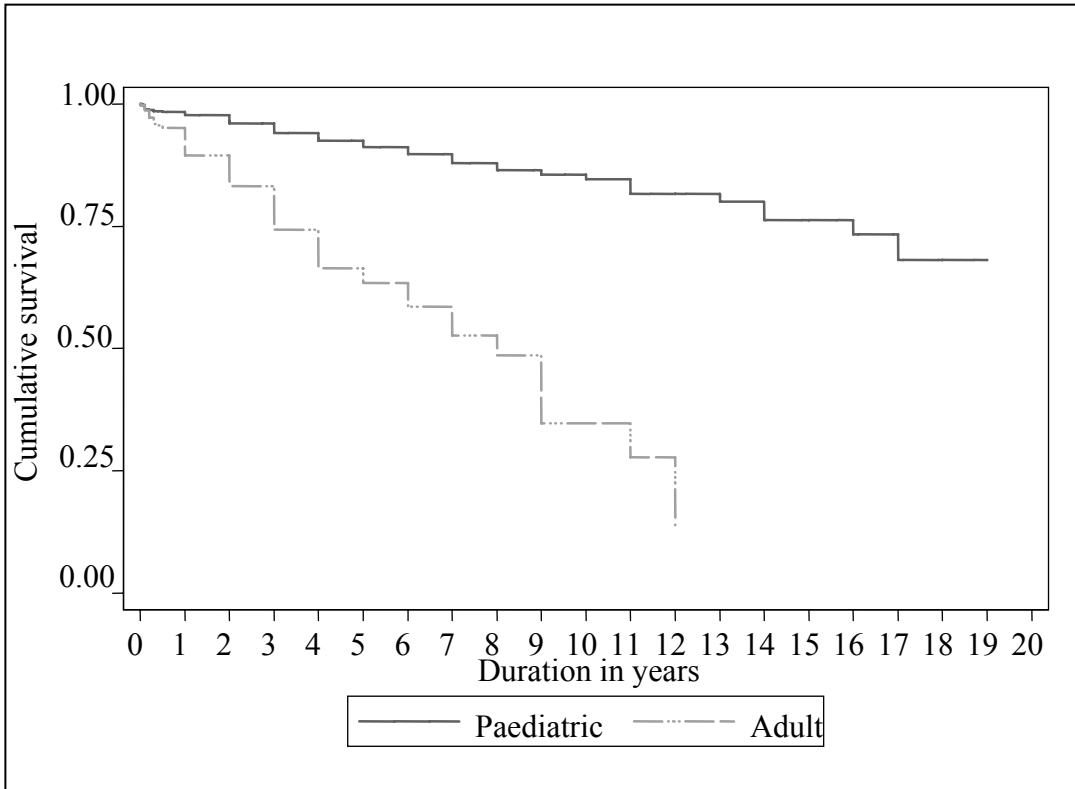
Paediatric is defined as age ≤18 years and adult age >18 years

Figure 1.5.12: Disease-free survival by age group for Hodgkin’s Disease, 1987-2005



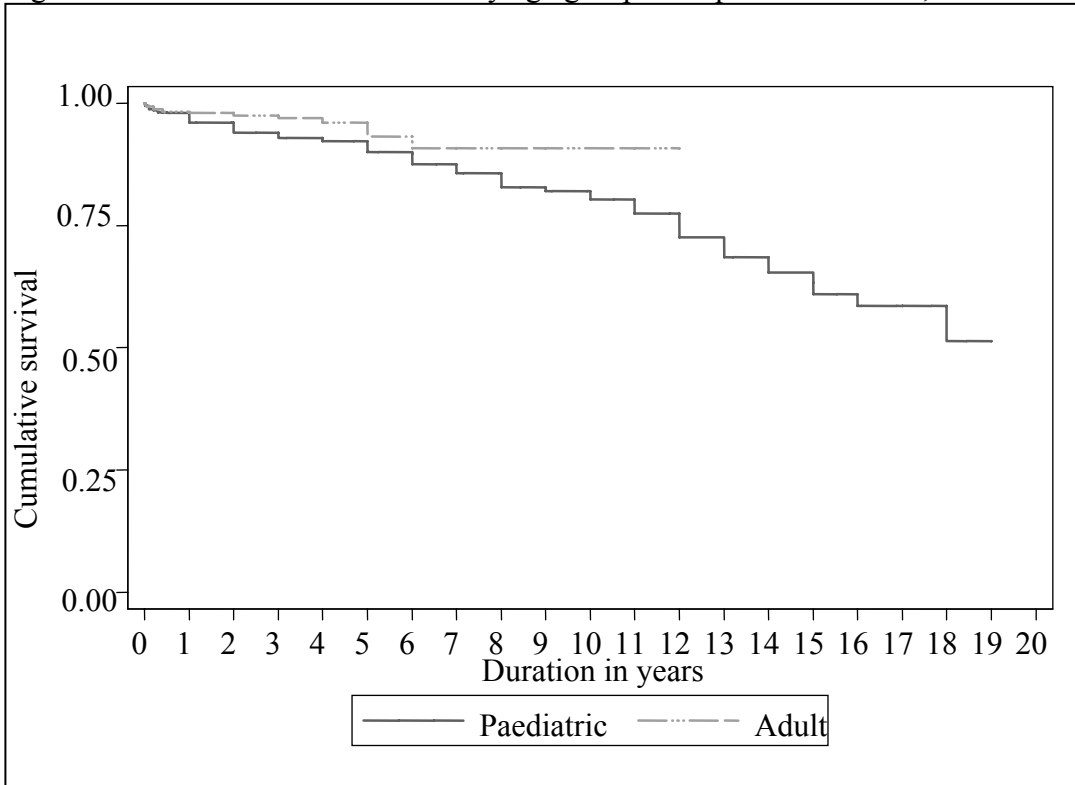
Paediatric is defined as age ≤18 years and adult age >18 years

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

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

## CHAPTER 2

### CORNEAL TRANSPLANTATION

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## 2.0 INTRODUCTION

Cornea transplantation surgery allows restoration of vision in patients with corneal blindness. Corneal transplantation in Malaysia dates back to the 1970's. Today it is widely performed by ophthalmologists throughout the country both in the government and private sectors with each centre maintaining its own data. Until recently there was no central data collection on a standardised format.

The National Transplant Registry (NTR) was established in December 2003. The cornea transplant section of the NTR was given the task of establishing a systematic centralised data collection centre for all cornea transplantation performed in the country.

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

**Retrospective data** (from 1998 to 2003) on cornea transplant activities were collected to identify the trend of cornea transplant surgery in the past few years. Retrospective data collected was recorded on the **Retrospective Cornea Transplant Notification Form (Form R-mds)**. This was limited to *minimal data set* which were i) demographic data, ii) type of cornea transplant surgery and iii) primary diagnosis for cornea transplantation. All surgeons agreed to provide all information required in the retrospective cornea transplant notification form.

**Prospective data** (from the year 2004) on cornea transplant activities involved gathering information on all cornea transplants performed in Malaysia on two forms. The first form was the i) **Cornea 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. Most surgeons sent a complete data set from 2004 as required in the prospective Cornea Transplant Notification Form. Some surgeons chose to provide only minimal data set as per the retrospective cornea transplant notification form (Form R-mds). The second form was the ii) **Cornea 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. Most surgeons sent a complete data set from 2004 as required in the prospective Cornea Transplant Outcome Forms. Some surgeons chose to provide only minimal data set as in the Cornea Transplant Outcome minimal data set Form (Form O-mds).

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

*Section 2.1* and *Section 2.2* covers notification data on cornea transplantation over 8 years from 1998 to 2005. Effort was made to ensure that all cases of cornea transplantation were reported. To the best of our knowledge, this report provides information on all cornea transplants performed in the country.

*Section 2.3* covers prospective notification data on cornea transplantation (*from 2004 onwards*) from surgeons who sent a complete data set.

*Section 2.4* covers prospective outcome data on cornea transplantation (*from 2004 onwards*).

*Section 2.5* covers prospective outcome data on cornea transplantation complications (*from 2004 onwards*). These data were confined to surgeons who sent a complete data set (Form O-cds).

**2.1 CORNEA TRANSPLANT ACTIVITIES AND TRENDS (1998 – 2005)**

The number of cornea transplants performed showed an increasing trend from 119 in 1998 to 221 in 2001, following which there was a slight decline in 2003 followed by a progressive increase each year to 192 in 2005 (Table 2.1.1).

Penetrating keratoplasty was the most frequent type of cornea transplant surgery and was performed in 94% of cases (Table 2.1.2).

Table 2.1.1: New Transplant Rate per million population (pmp), 1998-2005

Year	1998	1999	2000	2001	2002	2003	2004	2005
New transplants	119	122	126	221	203	165	184	192
New transplant rate pmp	5	5	5	9	8	7	7	7

Figure 2.1.1: New transplant rate, 1998-2005

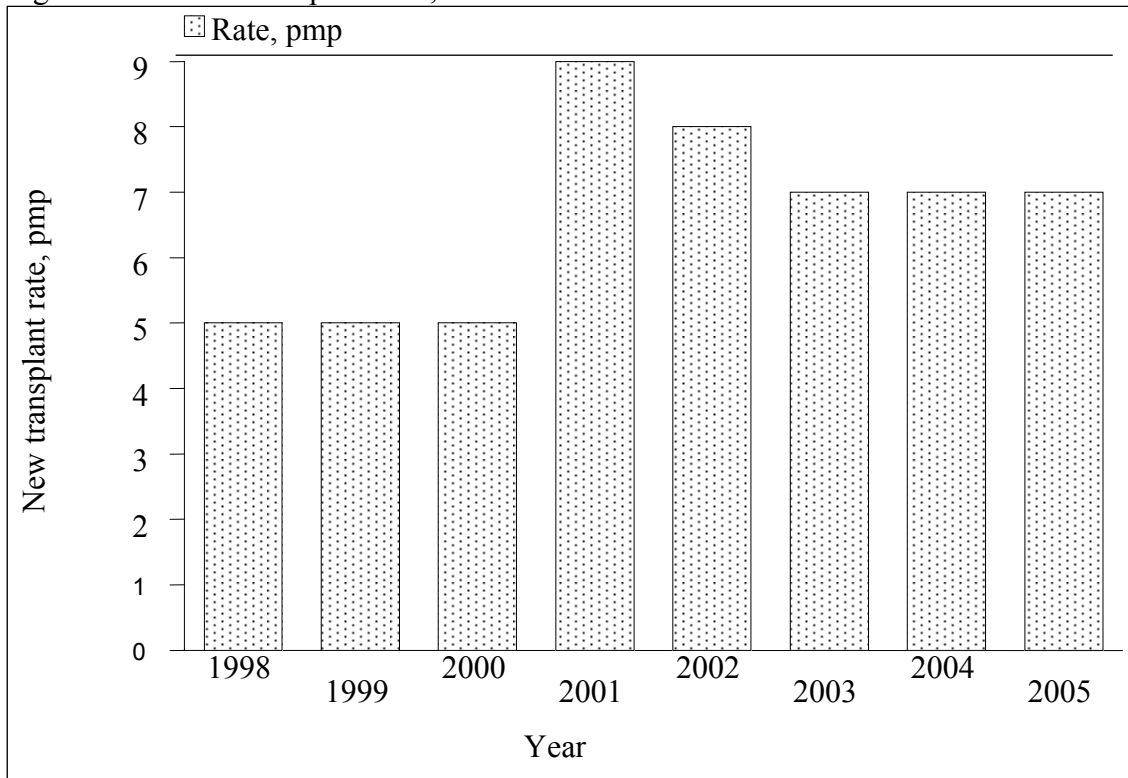


Table 2.1.2: Types of Cornea Transplant, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	114	96	116	95	120	95	207	94	196	97
Lamellar Keratoplasty	1	1	5	4	5	4	14	6	5	2
Patch Graft for Cornea	0	0	0	0	0	0	0	0	0	0
Patch Graft for Sclera	0	0	0	0	0	0	0	0	0	0
Cornea Scleral Keratoplasty	0	0	1	1	0	0	0	0	0	0
No data	4	3	0	0	1	1	0	0	2	1

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	156	95	165	90	173	90	1247	94
Lamellar Keratoplasty	8	5	10	5	13	7	61	5
Patch Graft for Cornea	0	0	2	1	3	2	5	0
Patch Graft for Sclera	0	0	0	0	1	0	1	0
Cornea Scleral Keratoplasty	1	0	7	4	2	1	11	1
No data	0	0	0	0	0	0	7	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 (39%) were the predominant race undergoing cornea transplant surgery followed by Malays (32%) and Indians (22%) (Table 2.2.2, Figure 2.2.1).

The mean age was 45 years (SD 21) with a range from as young as 2 months of age to as old as 92 years (Table 2.2.3, Figure 2.2.2).

The 9 commonest primary indications for surgery were keratoconus (16%), cornea scar (16%), other (non-pseudophakic) bullous keratopathy (13%), microbial keratitis (12%), pseudophakic bullous keratopathy (12%) and failed previous cornea grafts (8%), cornea perforation (non microbial keratitis related) (8%), Corneal dystrophy (4%), cornea perforation (microbial related) (4%) and congenital opacity (1%) were the least common indications (Table 2.2.4, Figure 2.2.3).

There may be one or more indications for cornea 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, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Gender										
Male	78	66	80	66	81	64	143	65	122	60
Female	41	34	42	34	45	36	78	35	81	40
No data	0	0	0	0	0	0	0	0	0	0

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Gender								
Male	114	69	112	61	114	59	844	63
Female	51	31	72	39	77	40	487	37
No data	0	0	0	0	1	1	1	0

Table 2.2.2: Ethnic distribution, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Ethnic group										
Malay	28	24	34	28	41	33	70	32	74	36
Chinese	47	39	46	38	50	40	92	42	83	41
Indian	36	30	35	29	28	22	49	22	35	17
Bumiputra Sabah	0	0	0	0	0	0	0	0	0	0
Bumiputra Sarawak	0	0	0	0	0	0	1	0	0	0
Others	8	7	7	5	6	5	5	2	9	5
No data	0	0	0	0	1	0	4	2	2	1

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Ethnic group								
Malay	52	32	66	36	62	32	427	32
Chinese	67	41	58	32	73	38	516	39
Indian	34	20	43	23	41	21	301	22
Bumiputra Sabah	0	0	1	1	1	1	2	0
Bumiputra Sarawak	0	0	4	2	5	3	10	1
Others	11	7	10	5	10	5	66	5
No data	1	0	2	1	0	0	10	1

\*Others: Non Malaysian

Figure 2.2.1: Ethnic distribution, 1998-2005

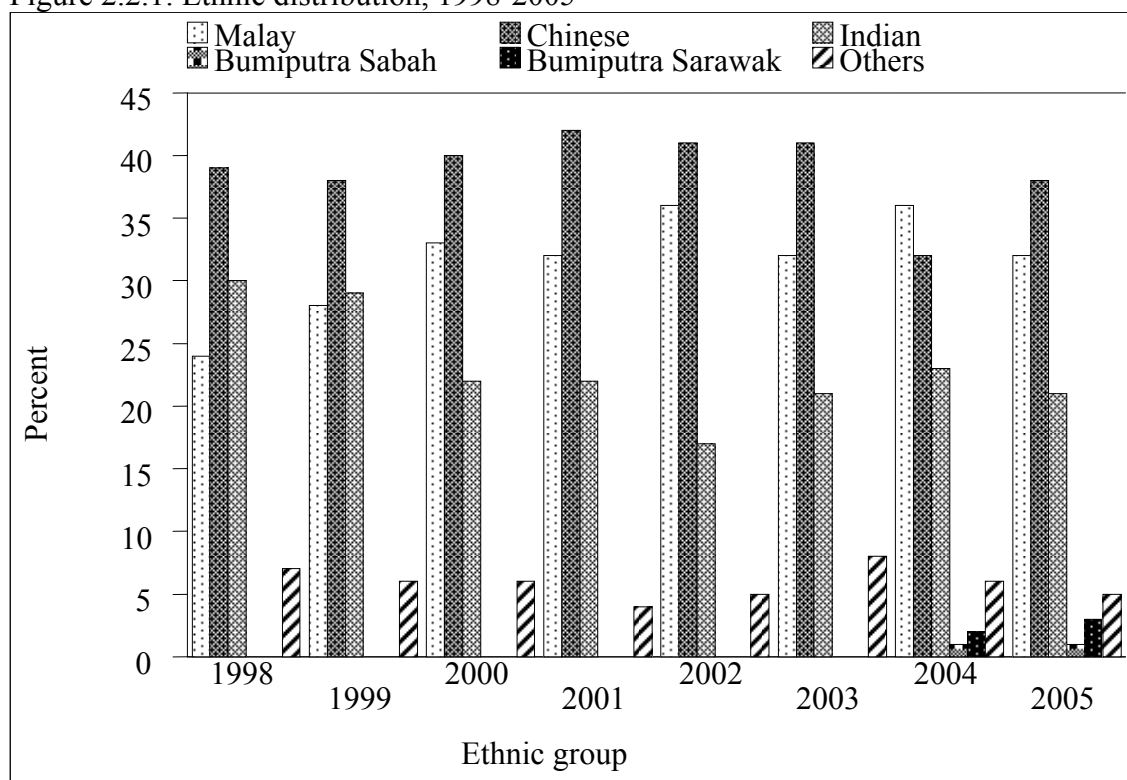


Table 2.2.3: Age distribution of cornea transplant recipient patients, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Age group (years)										
0-9	4	3	5	4	6	5	8	4	9	4
10-19	13	11	17	14	9	7	29	13	16	8
20-39	28	24	34	28	34	27	49	22	53	26
40-59	38	32	32	26	40	32	61	28	57	28
>=60	36	30	34	28	37	29	74	33	68	34
Mean	45		43		44		45		46	
SD	21		22		20		21		21	
Median	45		43		45		50		46	
Minimum	4 months		5		2 months		5 months		1	
Maximum	82		92		86		85		86	

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Age group (years)								
0-9	6	3	6	4	8	4	52	4
10-19	21	13	15	8	14	7	134	10
20-39	36	22	55	30	59	31	348	26
40-59	51	31	52	28	45	24	376	28
>=60	51	31	56	30	66	34	422	32
Mean	45		45		46		45	
SD	21		21		21		21	
Median	46		44		49		46	
Minimum	5 months		2 months		2 months		2 months	
Maximum	84		86		84		92	

Age=date transplant-date birth; age if provided

Figure 2.2.2: Age distribution of cornea transplant recipient patients, 1998-2005

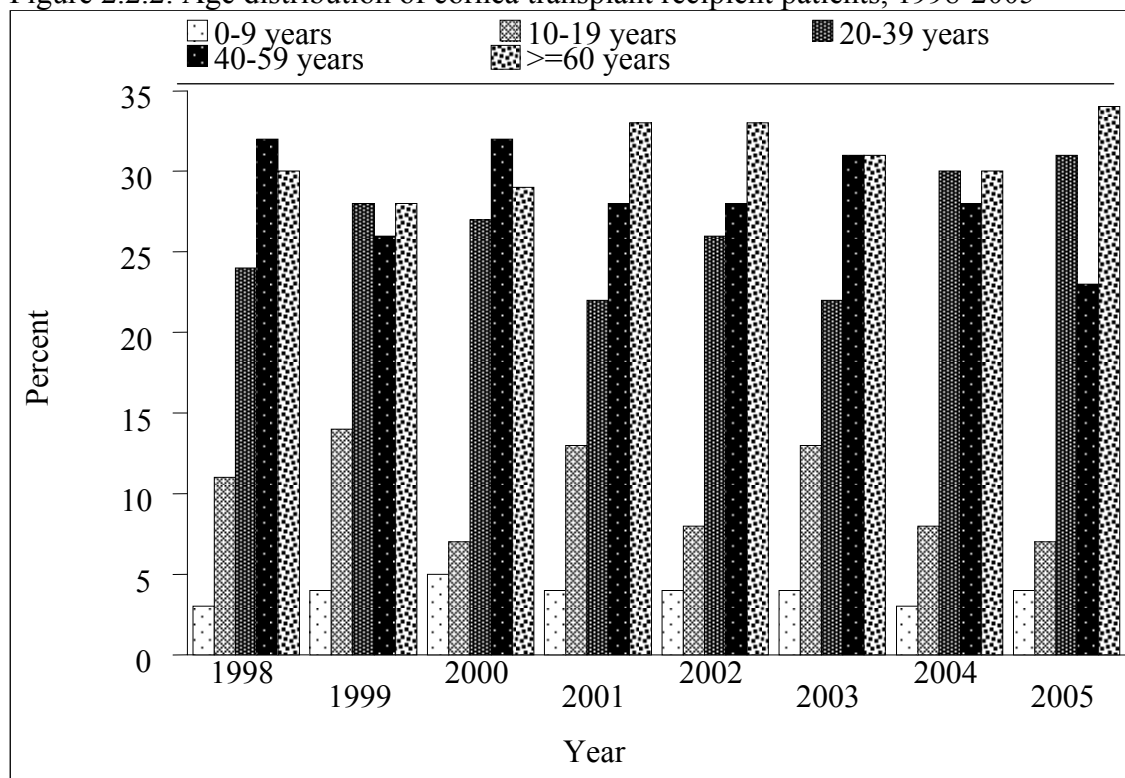


Table 2.2.4: Primary diagnosis, 1998-2005

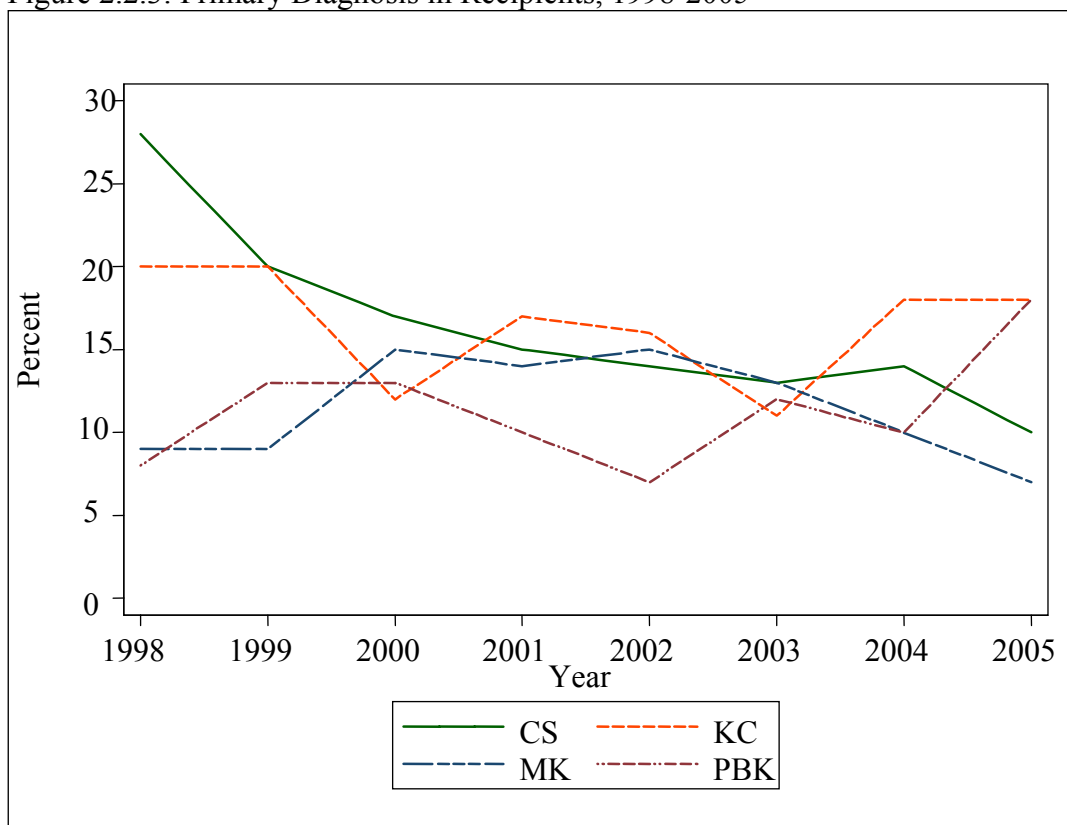
Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Primary Diagnosis										
Corneal scar	33	28	25	20	21	17	34	15	28	14
Keratoconus	24	20	24	20	15	12	38	17	32	16
Microbial keratitis	11	9	11	9	19	15	30	14	31	15
Other (non pseudophakic) bullous keratopathy	14	12	4	3	19	15	37	17	47	23
Corneal perforation (non microbial)	6	5	7	6	8	6	12	5	12	6
Pseudophakic bullous keratopathy	10	8	16	13	17	13	23	10	15	7
Failed previous graft	14	12	12	10	13	10	17	8	15	7
Corneal dystrophy	5	4	6	5	5	4	12	5	9	4
Congenital opacity	1	1	1	1	1	1	1	0	0	0
Microbial keratitis + Corneal perforation	1	1	6	5	1	1	6	3	4	2
Others	3	3	8	7	7	6	15	7	14	7
No data	0	0	2	2	1	1	1	0	0	0

Year	2003 (N=165)		2004 (N=184)		2005 (N=192)		TOTAL (N=1332*)	
	No.	%	No.	%	No.	%	No.	%
Primary Diagnosis								
Corneal scar	21	13	25	14	20	10	207	16
Keratoconus	18	11	34	18	34	18	219	16
Microbial keratitis	21	13	18	10	13	7	154	12
Other (non pseudophakic) bullous keratopathy	25	15	16	9	14	7	176	13
Corneal perforation (non microbial)	27	16	13	7	18	9	103	8
Pseudophakic bullous keratopathy	19	12	19	10	35	18	154	12
Failed previous graft	14	8	12	7	14	7	111	8
Corneal dystrophy	7	4	8	4	6	3	58	4
Congenital opacity	1	1	8	4	3	2	16	1
Microbial keratitis + Corneal perforation	4	2	17	9	20	10	59	4
Others	10	6	34	18	35	18	126	9
No data	0	0	1	1	0	0	5	0

\*1219 patients have 1 primary diagnosis, 104 have 2 primary diagnoses, 4 patients had 3 diagnoses, and 1 patient had 4 diagnoses



Figure 2.2.3: Primary Diagnosis in Recipients, 1998-2005



CS = Corneal Scar  
 KC = Keratoconus  
 MK = Microbial keratitis  
 PBK = Pseudophakic bullous keratopathy

Table 2.2.5: Indications of cornea transplant, 2004-2005

Indication of transplant	2004 (N = 184)		2005 (N = 192)		Total (N = 376)	
	No.	%	No.	%	No.	%
Optical	119	65	131	68	250	66
Tectonic	26	14	23	11	49	13
Therapeutic	29	16	22	11	51	14
Tectonic + Therapeutic	9	5	9	5	18	5
Optical + Tectonic	1	0	1	1	2	1
Optical + Tectonic + Therapeutic	0	0	1	1	1	0
Others	0	0	4	2	4	1
No data	0	0	1	1	1	0

## 2.3 TRANSPLANT DATA, 2004-2005

### 2.3.1 Stock and Flow

There was an increase in the number of cornea transplant notification - complete data sets returned from 75% in 2004 to 82% in 2005 (Table 2.3.1.1). Data in this section covers notification data from surgeons who sent a complete data set.

Table 2.3.1.1: Number of cornea transplants with complete data set

	2004		2005		Total	
	No.	%	No.	%	No.	%
Total no. of cornea transplants performed	184	100	192	100	376	100
No. of cornea transplants with notification complete data set	138	75	158	82	296	79

### 2.3.2 Pre-transplant data

Regrafts were performed in 10% of cases (Table 2.3.2.1). Corneal vascularisation was the most frequently encountered per-operative ocular co-morbidity, followed by ocular inflammation and glaucoma (raised intraocular pressure).

Eighty percent of cases were legally blind (vision 3/60 or worse) prior to cornea transplantation (Table 2.3.2.3).

Table 2.3.2.1: No of previous grafts in grafted eye, 2004-2005

Graft Number	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
0	123	89	143	90	266	90
1	11	8	12	8	23	8
2	3	2	2	1	5	2
3	0	0	1	1	1	0
4	1	1	0	0	1	0

Table 2.3.2.2: Ocular co-morbidity, 2004-2005

	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Ocular co-morbidity						
Any ocular co-morbidity (a to c below)	88	64	102	65	190	64
a) Cornea vascularisation	77	56	78	49	155	82
• Superficial vascularisation	44	32	48	30	92	48
• Deep vascularisation	42	30	38	24	80	42
b) History of glaucoma	29	21	36	23	65	34
c) Current ocular inflammation	41	30	49	31	90	47

\*Patient might have multiple ocular co-morbidity

Table 2.3.2.3: Pre-operative vision, 2004-2005

	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Unaided VA						
6/6	3	2	0	0	3	1
6/9	1	1	1	1	2	1
6/12	0	0	2	1	2	1
6/18	0	0	1	1	1	0
6/24	3	2	5	3	8	3
6/36	4	3	6	4	10	3
6/60	7	5	16	10	23	8
5/60	1	1	0	0	1	0
4/60	3	2	1	1	4	1
3/60	2	1	2	1	4	1
2/60	1	1	2	1	3	1
1/60	4	3	9	6	13	4
CF	47	34	47	29	94	33
HM	47	34	46	29	93	32
PL	13	10	15	9	28	9
NPL	2	1	1	1	3	1
No data	0	0	4	3	4	1

2.3.3 Donor details

Eye Banks in the United States of America (USA) were the most frequent sources of the corneal tissues (Table 2.3.3.1). The majority of donors were elderly patients with a median age of 58 years (Table 2.3.3.2). Optisol GS was the commonest cornea tissue storage medium used at 80% (Table 2.3.3.3). The major causes of death of the donors were related to the cardiac or circulatory system (28%) followed by malignancy (15%) and cerebrovascular system (14%) (Table 2.3.3.4).

Table 2.3.3.1: Source of Donor Cornea Tissue, 2004-2005

Source of donor	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Local	20	14	19	12	39	13
USA	95	69	112	71	207	70
Sri Lanka	22	16	27	17	49	17
No data	1	1	0	0	1	0
If Local, ethnic group:						
• Malay	0	0	4	21	4	10
• Chinese	14	70	8	42	22	56
• Indian	5	25	6	32	11	28
• No data	1	5	1	5	2	6

Figure 2.3.3.1: Source of Donor Corneal Tissue, 2004-2005

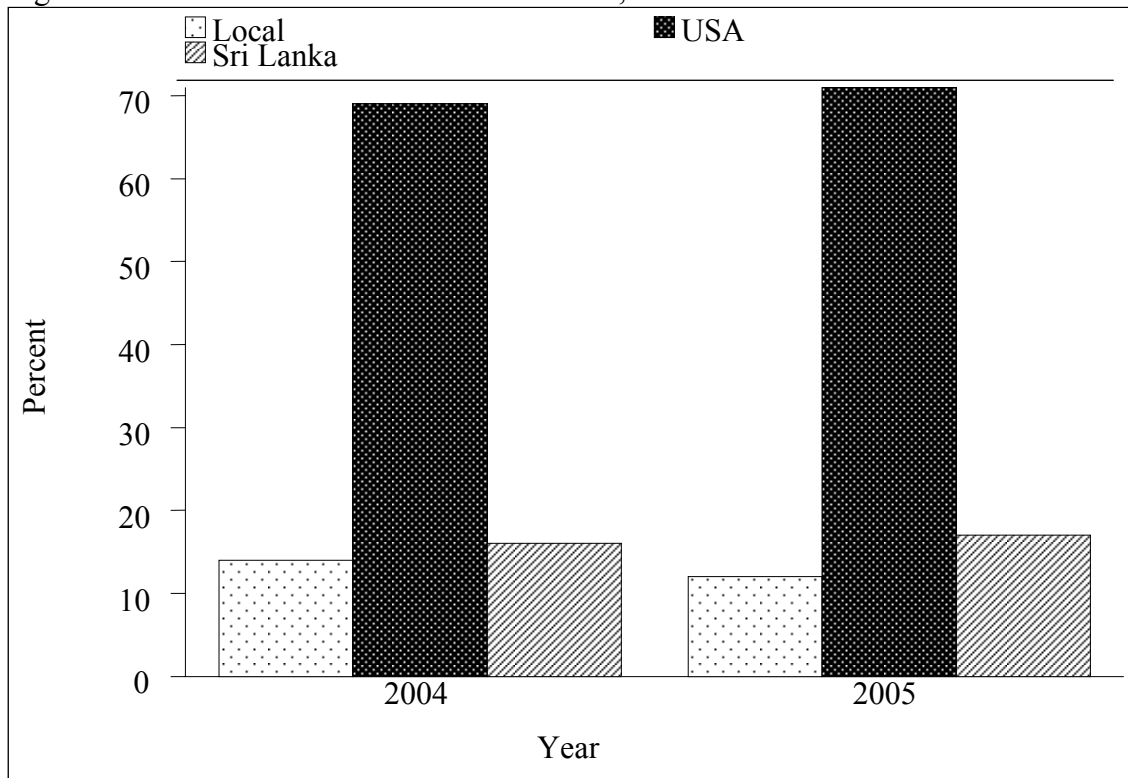


Table 2.3.3.2: Donor age distribution, 2004-2005

Age, years	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
0-9	2	1	3	2	5	2
10-19	6	4	4	3	10	3
20-39	11	8	7	4	18	6
40-59	52	38	77	49	129	44
>=60	67	49	67	42	134	45
Mean	56		57		57	
SD	15		14		15	
Median	59		57		58	
Minimum	8		3		3	
Maximum	78		79		79	

Figure 2.3.3.2: Donor age distribution, 2004-2005

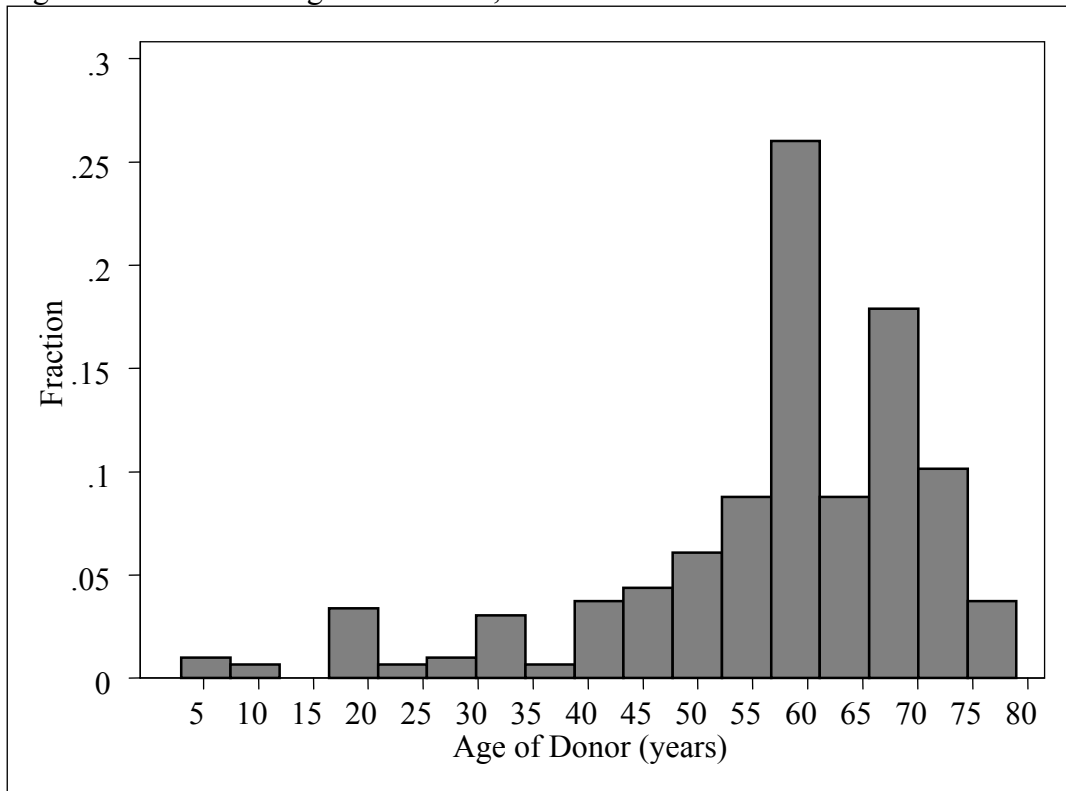


Table 2.3.3.3: Preservation media, 2004-2005

Preservation media	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Optisol GS	110	80	127	80	237	80
MK Medium	22	16	25	16	47	16
Moist Chamber	4	3	3	2	7	2
No data	2	1	3	2	5	2

Figure 2.3.3.3: Preservation media, 2004-2005

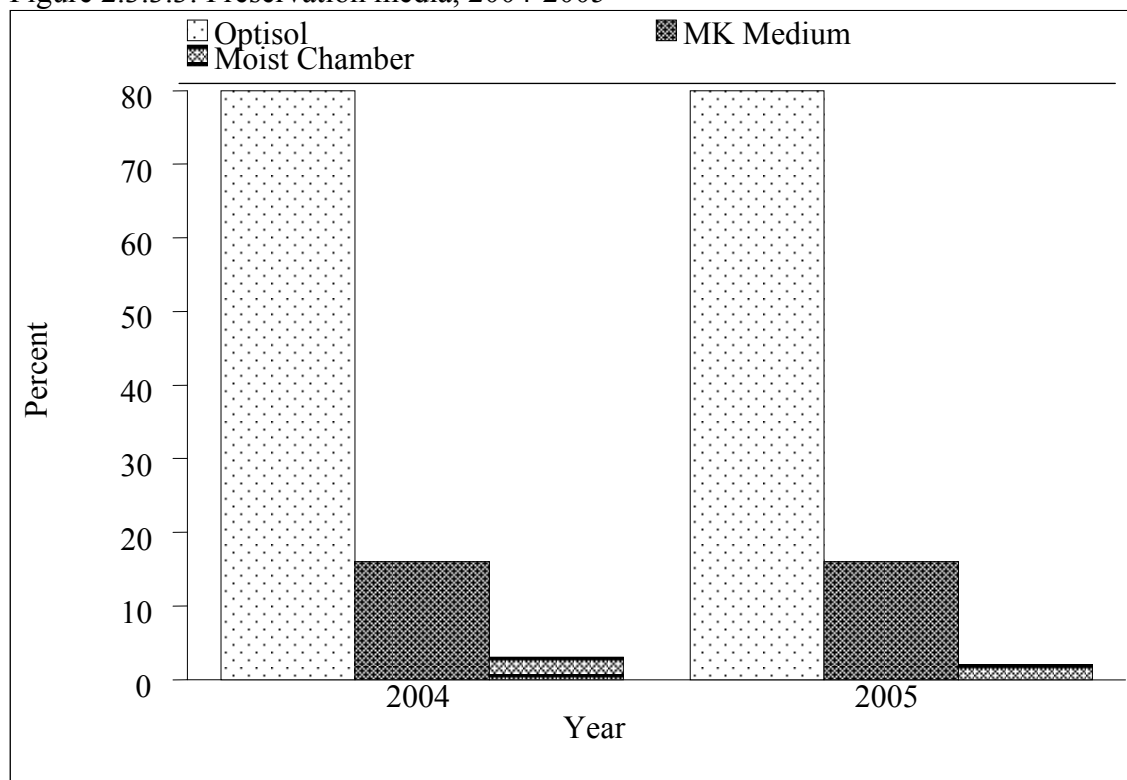


Table 2.3.3.4: Cause of death in cornea donors, 2004-2005

Cause of death	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Cardiac / Circulatory System	47	35	37	23	84	28
Cerebrovascular System	17	12	23	15	40	14
Malignancy	19	14	26	16	45	15
Trauma / Accident	20	14	10	6	30	10
Respiratory System	15	11	8	5	23	8
Others	17	12	13	8	30	10
No data	3	2	41	27	44	15

## 2.3.4 Transplant Practices

Penetrating Keratoplasty (PK) was the commonest type of surgery performed (88%) (Table 2.3.4.1). Cornea 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 (51%) (Table 2.3.4.2).

The recipient graft size ranged from 2mm to 10mm, with the mean recipient cornea graft size being 7.5mm (SD 1) (Table 2.3.4.3). The majority cases had the donor tissue over-sized by 0.5mm (Table 2.3.4.4). The commonest suture technique was interrupted sutures (Table 2.3.4.5).

Table 2.3.4.1: Type of surgery, 2004-2005

Type of surgery	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Penetrating Keratoplasty	120	88	139	88	259	88
Lamellar Keratoplasty	10	7	13	8	23	7
Patch Graft for Cornea	2	1	3	2	5	2
Patch Graft for Sclera	0	0	1	1	1	0
Cornea Scleral Keratopalsty	6	4	2	1	8	3

Table 2.3.4.2: Type of Combined surgery, 2004-2005

Type of surgery	2004 (N=138)*		2005 (N=158)**		Total (N = 296)	
	No.	%	No.	%	No.	%
Combined surgery	No.	%	No.	%	No.	%
No. of patients with combined surgery	31	22	26	16	57	19
(a) Glaucoma surgery	2	1	3	2	5	9
(b) Cataract Extraction	16	12	13	8	29	51
(c) IOL	14	10	9	6	23	40
(d) Retinal Surgery ± Internal Tamponade	1	1	1	1	2	4
(e) Anterior vitrectomy	9	7	3	2	12	21
(f) Others	5	4	8	5	13	23

\*14 patients had 2 types of surgeries and 1 patient had 3 types of surgeries, combined with the corneal transplant surgery

\*\*11 patients had 2 types of surgeries combined with the corneal transplant surgery.

Table 2.3.4.3: Recipient Cornea Trephined Size, 2004-2005

Graft size, mm	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
2	1	1	1	1	2	1
3	0	0	1	1	1	0
4	1	1	2	1	3	1
5	0	0	0	0	0	0
5.5	1	1	0	0	1	0
6	3	2	0	0	3	1
6.25	0	0	1	1	1	0
6.50	2	1	5	3	7	2
6.75	1	1	3	2	4	1
7	25	18	36	23	61	22
7.25	10	7	10	6	20	7
7.50	36	26	18	11	54	18
7.75	10	7	11	7	21	7
8	19	14	7	4	26	9
8.25	4	3	4	3	8	3
8.50	6	4	6	4	12	4
8.75	0	0	1	1	1	0
9	8	6	3	2	11	4
9.25	0	0	0	0	0	0
9.50	0	0	2	1	2	1
9.75	0	0	0	0	0	0
10	1	1	0	0	1	0
No data	10	7	47	29	57	19
Mean	7.5		7.3		7.4	
SD	1		1		1	
Median	7.5		7.25		7.5	
Minimum	2		2		2	
Maximum	10		9.5		10	

Table 2.3.4.4: Difference in trephined sizes of recipient and donor corneas, 2004-2005

Difference in Graft size, mm	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Same size	9	7	8	5	17	6
0.25	29	21	19	12	48	16
0.5	87	62	84	53	171	59
0.75	1	1	0	0	1	0
1	1	1	0	0	1	0
2	1	1	0	0	1	0
No data	10	7	47	30	57	19

Table 2.3.4.5: Suture Technique, 2004-2005

Suture Technique	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Interrupted only	132	96	138	88	270	92
Continuous only	0	0	0	0	0	0
Combined	6	4	18	12	24	8



## 2.4 CORNEA TRANSPLANT OUTCOME 2004

Eighty two percent of patients who had transplants performed in 2004 maintained follow up for at least 12 months (Table 2.4.1.1). Of these patients, 20% of the corneal grafts (all diagnoses) failed at the end of one year (Table 2.4.2.1).

The cases were grouped into two based on indication for surgery - Optical and Non-Optical (Table 2.2.5). Cornea transplantation in optical cases is primarily performed to restore vision. The primary indication in non-optical cases is not restoration of vision (e.g. in infective keratitis). At the end of one year graft survival was 92% in the Optical group and 57% in the Non-Optical group.

The cause of graft failure was elicited only from surgeons who submitted a complete data set (Table 2.5.1).

### 2.4.1 Stock and Flow

Table 2.4.1.1: Stock and flow

Year	2004	
	No.	%
New transplant	184	100
On follow up	150	82
Lost to follow up	34	18
Dead	0	0

### 2.4.2 Outcome – graft survival

Table 2.4.2.1: Post transplant graft status (Optical and Non-Optical)

	2004 (N = 150)	
	No.	%
Graft survival	120	80
Graft failure	30	20

Table 2.4.2.2: Post Transplant graft Status by Optical and Non-Optical Indication

	2004 (N = 150)			
	Optical (N = 99)		Non-Optical (N = 51)	
	No.	%	No.	%
Graft survival	91	92	29	57
Graft failure	8	8	22	43

\* Subjects with both optical & non-optical indications were classified into the optical group

Table 2.4.2.3: Causes of graft failure

		<b>2004</b>	
		No.	%
Graft Failure		30	20
Cause of Failure	Primary graft failure or Primary Endothelial decompensation	4	13
	Recurrence of primary disease	4	13
	Late Endothelial decompensation	8	27
	Glaucoma	5	17
	Infection	4	13
	Graft rejection	6	20
	Others	7	23
	No data	3	10

\*Each patient may have more than one cause of graft failure

\* Data represents causes from surgeons who provided a complete data set

### 2.4.3 Outcome – Vision

Vision outcome of cornea transplant were analysed based on available data provided by the surgeons (Table 2.4.3.1). Eighteen percent of cases (all indications) had an unaided vision of 6/18 or better (Table 2.4.3.2) and 67% of cases had a best corrected visual acuity of 6/18 or better (Table 2.4.3.3).

In cases where the indication for surgery was optical, 75% had an unaided vision of 6/60 or better and for the non-optical cases this was only 35% (Table 2.4.3.4).

Table 2.4.3.1: Available data on post corneal transplant vision

	Unaided Vision (N = 150)		Best Corrected Visual Acuity (N = 150)	
	No.	%	No.	%
Data available	137	91	45	30
No data	13	9	105	70

Table 2.4.3.2: Post transplant Unaided Vision (Optical and Non-Optical)

Post transplant Unaided Vision	2004 (N = 137)	
	No.	%
6/6	3	2
6/9	5	4
6/12	5	4
6/18	11	8
6/24	20	15
6/36	18	13
6/60	24	18
5/60	0	0
4/60	0	0
3/60	3	2
2/60	1	0
1/60	1	0
CF	16	12
HM	19	14
PL	6	4
NPL	5	4

Figure 2.4.3.1: Post transplant Unaided Vision

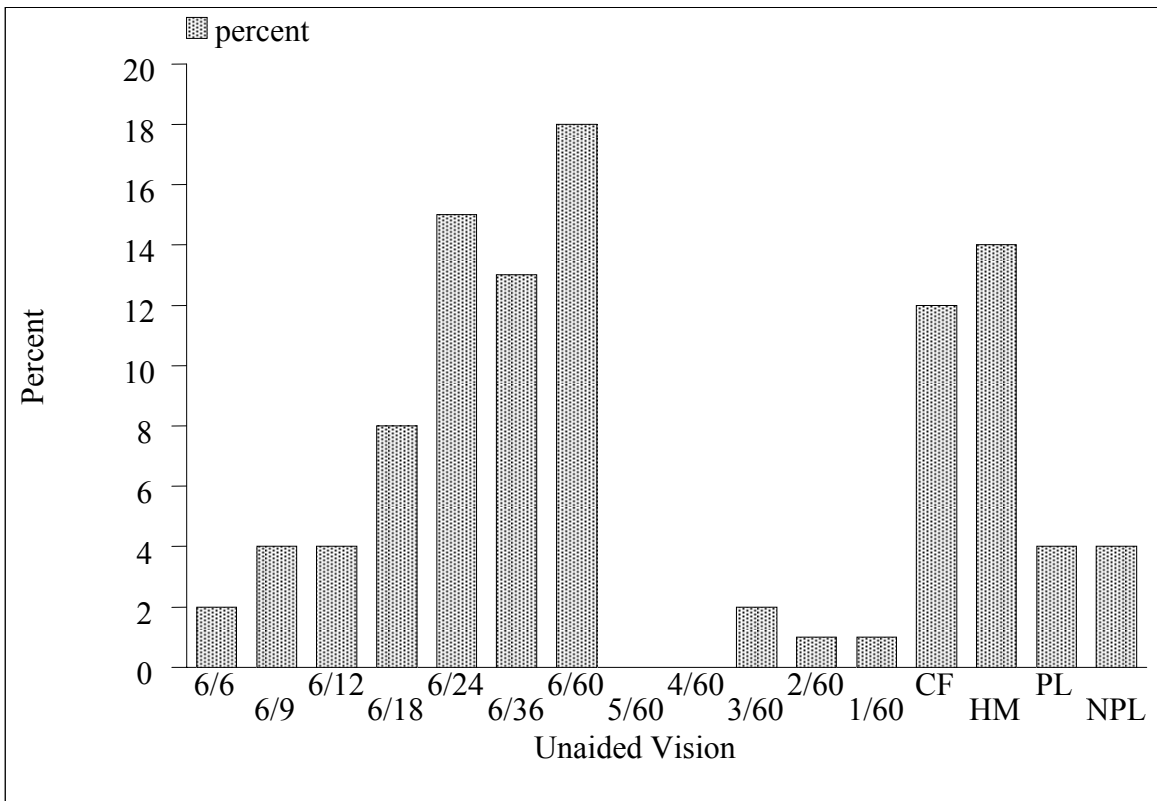


Table 2.4.3.3: Post transplant Best Corrected Visual Acuity (Optical and Non-Optical)

Post transplant best corrected Visual Acuity	2004 (N = 45)	
	No.	%
6/6	4	9
6/9	7	16
6/12	13	29
6/18	6	13
6/24	5	11
6/36	3	7
6/60	3	7
5/60	0	0
4/60	0	0
3/60	0	0
2/60	0	0
1/60	1	2
CF	2	4
HM	1	2
PL	0	0
NPL	0	0

Figure 2.4.3.2: Post transplant Best Corrected Visual Acuity

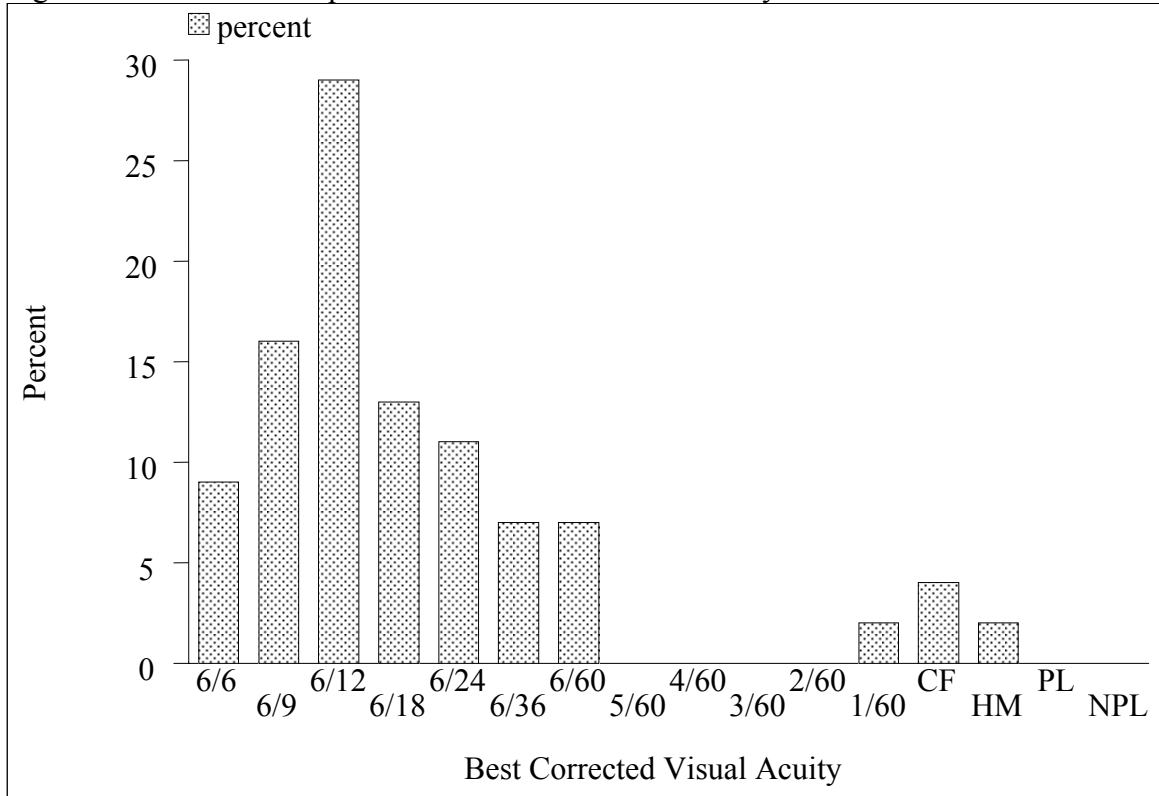


Table 2.4.3.4: Post transplant Unaided Vision by Optical and Non-Optical indication

Post Transplant Unaided Vision	2004 (N = 137)			
	Optical (N = 94)		Non-Optical (N = 43)	
	No.	%	No.	%
6/6	0	0	3	7
6/9	2	2	3	7
6/12	4	4	0	0
6/18	9	10	2	5
6/24	18	20	2	5
6/36	16	18	1	2
6/60	19	21	4	9
5/60	0	0	0	0
4/60	0	0	0	0
3/60	2	2	1	2
2/60	0	0	1	2
1/60	1	1	0	0
CF	10	11	6	14
HM	7	8	12	28
PL	1	1	5	12
NPL	2	2	3	7

\* Missing unaided vision excluded

Figure 2.4.3.3a: Post transplant Unaided Vision by Optical indication

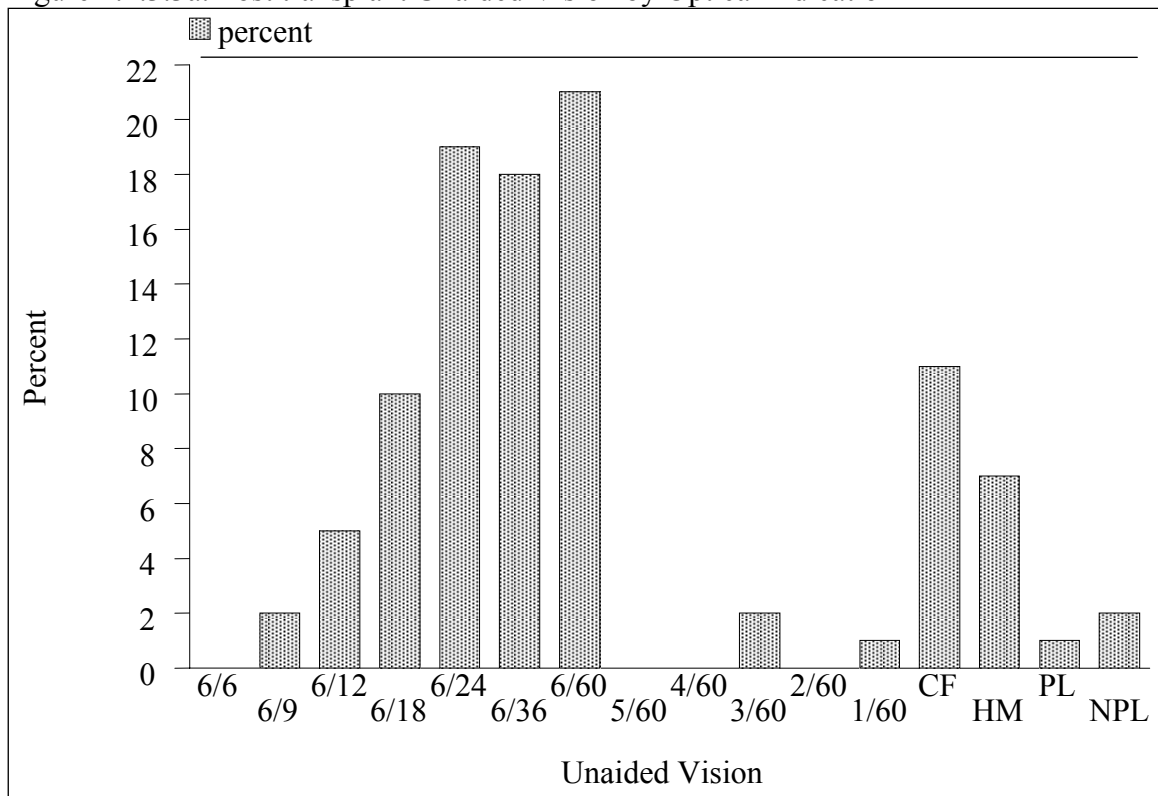


Figure 2.4.3.3b: Post transplant Unaided Vision by Non-Optical indication

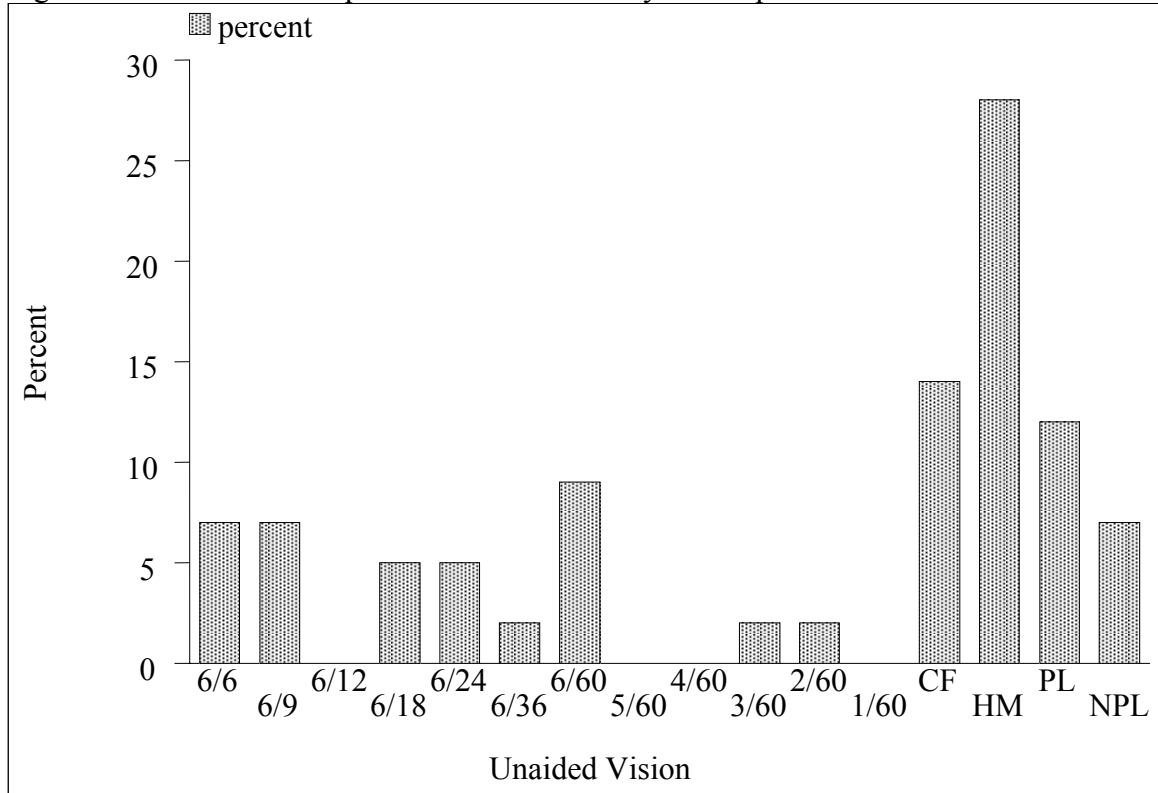


Table 2.4.3.5: Factors for Post-op Best Corrected Visual Acuity of worse than 6/12

		2004	
		No.	%
Post BCVA worse than 6/12		21	47
Factors	High astigmatism	4	20
	Glaucoma	1	5
	Retinal Detachment	0	0
	Cataract	4	20
	Cornea Decompensation	2	10
	DM Retinopathy	0	0
	Others	5	25
	No data	7	35

\*Patient with BCVA worse than 6/12 might have more than one factor

## 2.5 POST CORNEA TRANSPLANT COMPLICATIONS

Fifty-nine percent of cases experienced at least 1 episode of complications post-operatively (Table 2.5.2).

Table 2.5.1: Stock and Flow

	2004	
	No.	%
Total no. of cornea transplants performed	184	100
No. of cornea transplants on follow-up	150	82
No. of outcome with complete data set	79	43

Table 2.5.2: Post transplant complications

		2004	
		No.	%
Any complications		47	59
Complications	Epithelial Problem	7	15
	Wound Dehiscence	1	2
	Suture infiltration / abscess	4	9
	Endophthalmitis	0	0
	Microbial keratitis	6	13
	Vascularisation	5	11
	Post-keratoplasty glaucoma	13	28
	Graft Rejection	8	17
No data		18	38

\* Each patient may have more than one complication

Table 2.5.3: Post transplant graft rejection types

		2004	
		No.	%
Graft Rejection		8	10
Types	Epithelial	2	25
	Stromal	1	13
	Endothelial	5	63
	No data	1	13

\* Each patient may have more than one type of rejection



## CHAPTER 3

### HEART AND LUNG TRANSPLANTATION

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### 3.0 INTRODUCTION

The first heart transplant in Malaysia was carried out at Institut Jantung Negara (IJN) Kuala Lumpur in December 1997. The main limitation to the performance of heart transplants has been the lack of donor organs. Since 2004, IJN in collaboration with Institut Perubatan Respiratori (IPR) of the Ministry of Health has been preparing to perform lung transplantation as well as heart lung transplant and the first lung transplant was carried out in December 2005.

The rest of the report that follows will review the results of heart and lung transplantation in Malaysia till end of 2005.

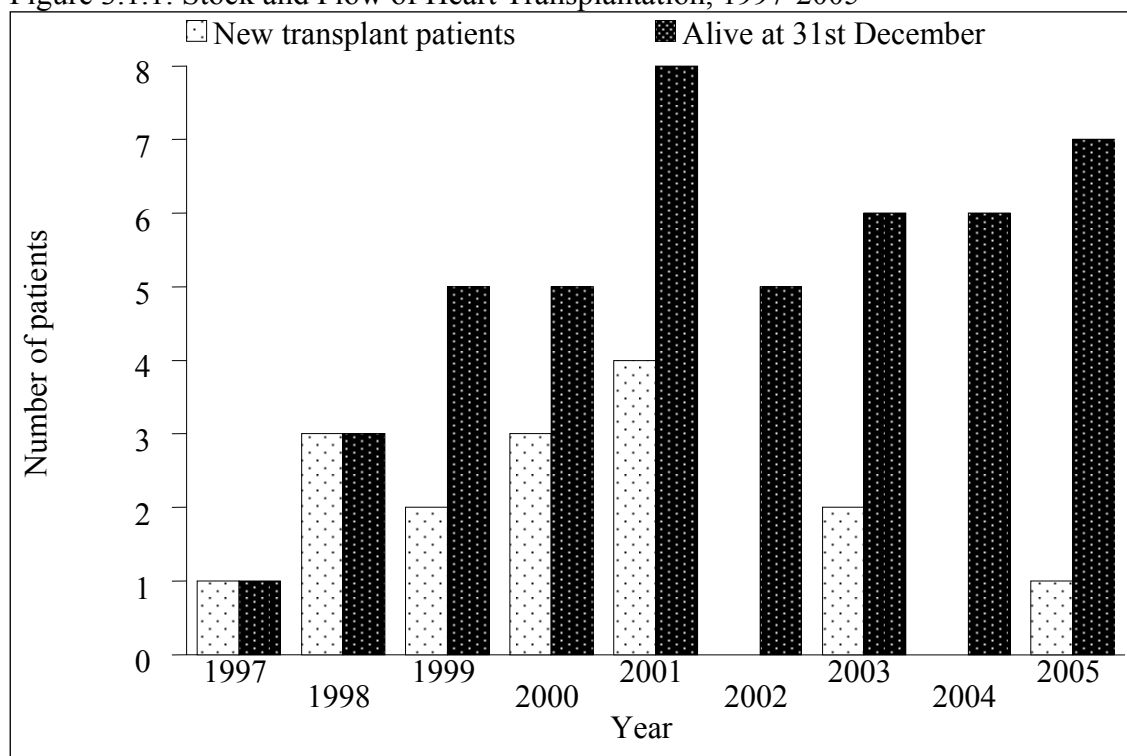
### 3.1 STOCK AND FLOW

Table 3.1.1: Stock and Flow of Heart Transplantation, 1997-2005

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

N.B. There was no heart transplants carried out in 2004

Figure 3.1.1: Stock and Flow of Heart Transplantation, 1997-2005



### 3.2 RECIPIENTS' CHARACTERISTICS

A total of 16 heart transplants have been carried out from 1997 to 2005. Two thirds of the recipients were males and over half were Indians. The mean age of recipients was 36 years (range 13-55 years) (Table 3.2.3).

The aetiology of heart failure is as listed in Table 3.2.4. Ischaemic cardiomyopathy was the most commonest aetiology followed by dilated cardiomyopathy.

Table 3.2.1: Gender distribution, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Gender	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Male	1	3	0	2	2	0	2	0	1	11
Female	0	0	2	1	2	0	0	0	0	5
TOTAL	1	3	2	3	4	0	2	0	1	16

Table 3.2.2: Ethnic group distribution, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Ethnic group	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Malay	0	0	1	1	2	0	0	0	1	5
Chinese	0	0	0	1	0	0	1	0	0	2
Indian	1	3	1	1	2	0	1	0	0	9
TOTAL	1	3	2	3	4	0	2	0	1	16

Table 3.2.3: Age distribution, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Age, years	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
0-19	0	0	2	1	1	0	0	0	1	5
20-39	0	2	0	0	0	0	0	0	0	2
40-59	1	1	0	2	3	0	2	0	0	9
>=60	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	2	0	1	16
Mean	51	40	16	37	38	-	46	-	15	36
SD	-	9	1	22	17	-	8	-	-	16
Median	51	37	16	44	43	-	46	-	15	40
Minimum	51	33	15	13	14	-	40	-	15	13
Maximum	51	50	16	55	54	-	52	-	15	55

Age=date of transplant-date of birth

Table 3.2.4: Primary diagnosis, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Primary diagnosis	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Ischaemic Cardiomyopathy	1	3	0	1	1	0	2	0	0	8
Idiopathic Dilated Cardiomyopathy	0	0	2	1	2	0	0	0	1	6
Restrictive Cardiomyopathy	0	0	0	0	0	0	0	0	0	0
End Stage Valvular Heart Disease	0	0	0	0	1	0	0	0	0	1
Hypertrophic Cardiomyopathy	0	0	0	1	0	0	0	0	0	1
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	2	0	1	16

### 3.3 TRANSPLANT PRACTICES

The majority of patients received orthotopic biatrial and only 2 had orthotopic bicaval procedure (Table 3.3.1).

At the time of transplant all patients received methylprednisolone followed by prednisolone. All also received cyclosporine and azathioprine, but in 3 patients, azathioprine was later replaced by mycophenolate mofetil (Table 3.3.2).

All patients surviving to discharge were sent home on Neoral<sup>®</sup>. During follow up, 56% of patients were still on prednisolone. Nearly half the patients were switched from azathioprine to mycophenolate mofetil (Table 3.3.3).

Four of the recipients were transplanted when they presented with severe heart failure, before they were formally listed on the waiting list. The other 11 recipients were transplanted from the waiting list and their average waiting time was 9 months (Table 3.3.4). The patient who had heart transplant in 2005 was a boy who had a Thoratec implantable Ventricular Assist Device (VAD) placed as a bridge to transplant. He was on the VAD for 4.5 months before finally receiving his heart transplant.

Table 3.3.1: Heart Procedure, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Heart Procedure	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Orthotopic Bicaval	1	1	0	0	0	0	0	0	0	2
Orthotopic Traditional	0	2	2	3	4	0	2	0	1	14
Heterotopic	0	0	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	2	0	1	16

Table 3.3.2: Immunosuppressive used, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Type of immunosuppressive	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
<i>Steroids</i>										
Prednisolone	1	3	2	3	4	0	1	0	1	15
Methylprednisolone	1	3	2	3	4	0	2	0	1	16
<i>Calcineurin Inhibitors</i>										
Neoral <sup>®</sup>	1	3	2	3	4	0	1	0	1	15
<i>Antimetabolites</i>										
Azathioprine (AZA)	1	3	2	3	4	0	2	0	0	15
Mycophenolate Mofetil	0	0	0	0	1	0	1	0	1	3
TOTAL patients at notification	1	3	2	3	4	0	2	0	1	16

Table 3.3.3: Immunosuppressive used at time of last follow-up up to 2005

Year of transplant*	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Type of immunosuppressive	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
<i>Steroids</i>										
Prednisolone	1	4	1	0	3	0	0	0	0	9
Methylprednisolone	1	1	0	0	1	0	0	0	0	3
<i>Calcineurin Inhibitors</i>										
Neoral®	1	4	3	1	4	0	2	0	0	15
<i>Antimetabolites</i>										
Azathioprine (AZA)	1	2	1	1	3	0	0	0	0	8
Mycophenolate Mofetil (MMF)	0	2	2	0	1	0	2	0	0	7
TOTAL patients at follow-up	1	2	2	1	3	0	1	0	0	10

\*Data according to year of transplant of patient

Table 3.3.4: Duration of waiting time on waiting list, 1997-2005

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Duration (months)	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
<5	0	2	1	0	1	0	1	0	0	5
5-<10	1	0	1	0	1	0	0	0	1	4
10-<15	0	0	0	1	0	0	0	0	0	1
15-<20	0	0	0	1	0	0	0	0	0	1
20-<25	0	0	0	0	0	0	0	0	0	0
25-<30	0	0	0	0	0	0	0	0	0	0
30-<35	0	0	0	0	0	0	0	0	0	0
35-<40	0	0	0	0	0	0	1	0	0	1
TOTAL	1	2	2	2	2	0	2	0	1	12
Mean	6	2	4	15	5	-	20	-	9	9
SD	-	0	1	6	5	-	25	-	-	10
Median	6	2	4	15	5	-	20	-	9	6
Minimum	6	2	3	10	1	-	2	-	9	1
Maximum	6	2	5	19	8	-	37	-	9	37

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

### 3.4 TRANSPLANT OUTCOMES

Hypertension and hyperlipidaemia requiring drug treatment was common post transplant with high incidence in recipients (Table 3.4.1). Two patients were treated for rejection out of the 10 patients who were discharged from hospital (Table 3.4.4).

Five (33%) of the heart transplant recipients died in hospital following transplant (Table 3.4.5). One died of hyperacute graft rejection. The other 4 died of multiorgan failure with septicaemia (Table 3.4.7). The 1 year Kaplan Meier patient survival rate was 60% (Fig 3.4.6).

Four patients had succumbed to late deaths after their heart transplant. One of the deaths occurred within a year (sudden death, cause unclear), while the other 3 deaths occurred more than a year post transplant. One patient died of small cell lung cancer (he was a smoker, but stopped before his transplant). Another patient died suddenly but autopsy showed cardiac allograft rejection which was due to non-compliance to immunosuppression. One other death in a peripheral hospital was classified as severe bleeding but the actual cause of death was unclear (Table 3.4.8).

Table 3.4.1: Post Transplant Events at last follow-up up to 2005

<b>Year of transplant*</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOTAL</b>
Type of post transplant events	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Drug Treated Hypertension	1	2	2	1	3	0	1	0	0	10
Bone Disease (Symptomatic)	1	0	0	0	1	0	0	0	0	2
Chronic Liver Disease	0	0	0	0	0	0	0	0	0	0
Cataracts	0	0	0	0	0	0	0	0	0	0
Diabetes	1	2	0	0	0	0	1	0	0	4
Renal Dysfunction	1	0	0	0	1	0	0	0	0	2
Stroke	0	0	0	0	0	0	0	0	0	0
Drug Treated Hyperlipidaemia	1	2	2	1	3	0	1	0	0	10
TOTAL patients at follow-up	1	2	2	1	3	0	1	0	0	10

\*Data according to year of transplant of patient



Table 3.4.2: Post Transplant Malignancies at follow-up up to 2005

Year of transplant*	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Type of post transplant malignancies	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Recurrence of pre-transplant tumor	0	0	0	0	0	0	0	0	0	0
De Novo solid tumor	1	0	0	0	0	0	0	0	0	1
De Novo lymphoproliferative disorder	0	0	0	0	0	0	0	0	0	0
Skin	0	0	0	0	0	0	0	0	0	0
TOTAL patients at follow-up	1	2	2	1	3	0	1	0	0	10

\*Data according to year of transplant of patient

Table 3.4.3: Non-compliance at follow-up up to 2005

Year of transplant*	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Non-compliance during follow-up	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
• Yes	0	0	2	0	0	0	1	0	0	3
• No	1	2	0	1	3	0	0	0	0	7
TOTAL patients at follow-up	1	2	2	1	3	0	1	0	0	10
<i>Areas of non-compliance:</i>										
• Immunosuppression medication	0	0	1	0	0	0	1	0	0	2
• Patient unable to afford immunosuppression medications	0	0	0	0	0	0	0	0	0	0
• Other medication	0	0	0	0	0	0	0	0	0	0
• Other therapeutic regimen	0	0	1	0	0	0	0	0	0	1
TOTAL patients with noncompliance	0	0	2	0	0	0	1	0	0	3

\*Data according to year of transplant of patient

Table 3.4.4: Patient treated for rejection at follow-up up to 2005

Year of transplant*	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Patient treated for rejection	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
• Yes	0	1	1	0	0	0	0	0	0	2
• No	1	1	1	1	2	0	1	0	0	7
TOTAL patients with follow-up	1	2	2	1	3	0	1	0	0	10
<i>Number of rejection events</i>										
• 1	0	1	0	0	0	0	0	0	0	1
• 2	0	0	0	0	0	0	0	0	0	0
• 3	0	0	1	0	0	0	0	0	0	1
TOTAL patients with rejection	0	1	1	0	0	0	0	0	0	2

\*Data according to year of transplant of patient

Table 3.4.5: Time of deaths, 1997-2005

Year of discharge	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Time of deaths	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
<3 months (at discharge)	0	1	0	2	0	1	1	0	0	5
3-<6 months	0	0	0	0	0	0	0	0	0	0
6 months-1 year	0	0	0	0	0	1	0	0	0	1
> 1 year	0	0	0	1	1	1	0	0	0	3
TOTAL patients who died	0	1	0	3	1	3	1	0	0	9

\*Time=Date of death–date of transplant

Table 3.4.6: Patient survival, year of transplant 1997-2005

Year of Transplant	1997-2005	
Interval	% Survival	SE
6 months	67	1
1 year	60	1
2 year	47	1
3 year	40	1

SE=standard error

\*Duration=date follow up-date transplant, if alive at discharge  
=date of discharge-date of transplant, if dead at discharge

Figure 3.4.6: Patient survival, year of transplant 1997-2005

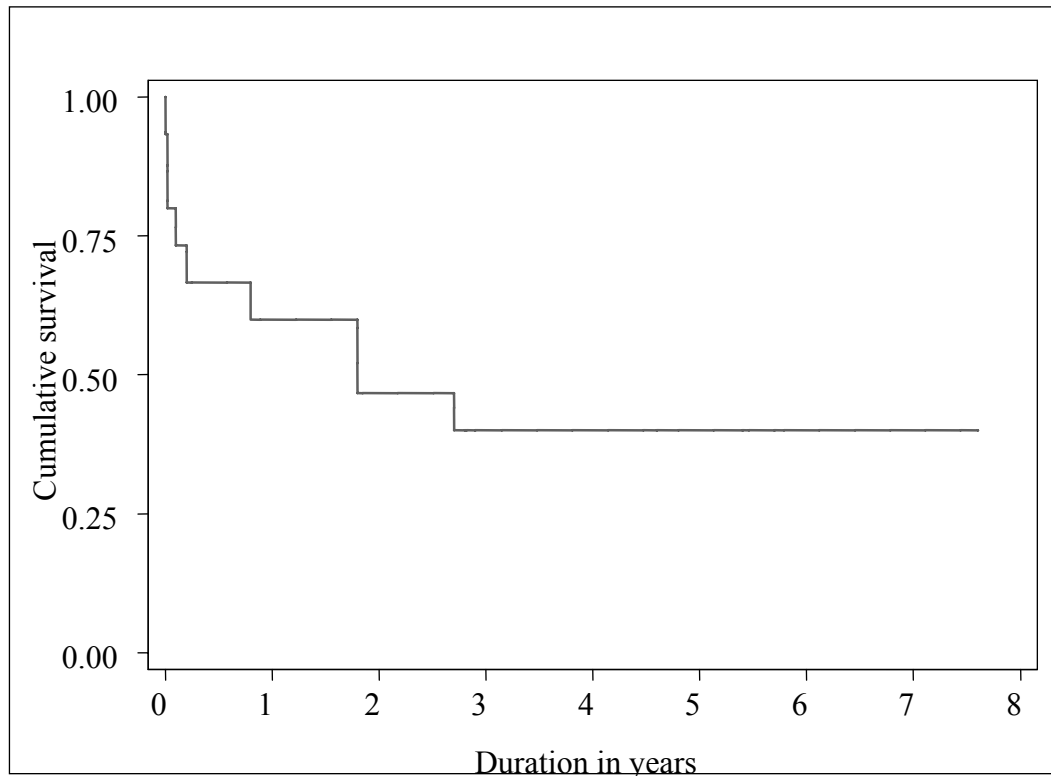


Table 3.4.7: Cause of death at discharge, 1997-2005

<b>Year</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOTAL</b>
Cause of death	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Hyperacute rejection	0	0	0	0	0	0	1	0	0	1
Multi organ failure	0	0	0	1	0	0	0	0	0	1
Respiratory failure secondary to septicaemia	0	0	0	0	0	1	0	0	0	1
Respiratory failure, renal function and liver failure, ARDS, septicaemia	0	0	0	1	0	0	0	0	0	1
Septicaemia, multiorgan failure	0	1	0	0	0	0	0	0	0	1
TOTAL patients who died at discharge	0	1	0	2	0	1	1	0	0	5

Table 3.4.8: Cause of death at follow-up, 1997-2005

<b>Year</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOTAL</b>
Cause of death	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Severe bleeding	0	0	0	0	0	1	0	0	0	1
Lung cancer, small cell type, septicaemia, bronchopneumonia	0	0	0	1	0	0	0	0	0	1
Rejection due to non-compliance	0	0	0	0	1	0	0	0	0	1
Unknown	0	0	0	0	0	1	0	0	0	1
TOTAL patients who died at follow-up	0	0	0	1	1	2	0	0	0	4

## CHAPTER 4

### LIVER TRANSPLANTATION

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#### **4.0 INTRODUCTION**

The year 2005 saw only 5 liver transplants being carried out at Selayang Hospital. The dismal donor rates continue to plague the programme and live donors remain the main source of this precious 'commodity'. Until and unless the rate of cadaveric donation can be increased, the future of the liver transplant programme hinges on the balance.

Liver transplant data was collected from Selayang Hospital and two follow-up centres which are Hospital Kuala Lumpur and UMMC.

**4.1 STOCK AND FLOW**

Five transplants were performed in 2005 and there were 4 deaths in the same period.

Table 4.1.1: Stock and Flow of Liver Transplantation, 1993-2005

Year	93	94	95	96	*97	98	99	00	01	02	**03	04	05
New transplant patients	1	1	8	13	3	2	8	3	5	10	5	16	5
Deaths	0	0	3	4	1	0	4	1	2	5	1	4	4
Re-transplant	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	1	1
Functioning graft at 31 <sup>st</sup> December	1	2	7	16	17	19	23	24	27	31	34	45	45

\* 1 patient who was alive until 05/12/1997 is recorded died with missing date of death

\*\* 1 patient who had transplanted in 2003 is recorded as death with missing date of death

Figure 4.1.1: Stock and Flow of Liver Transplantation, 1993-2005

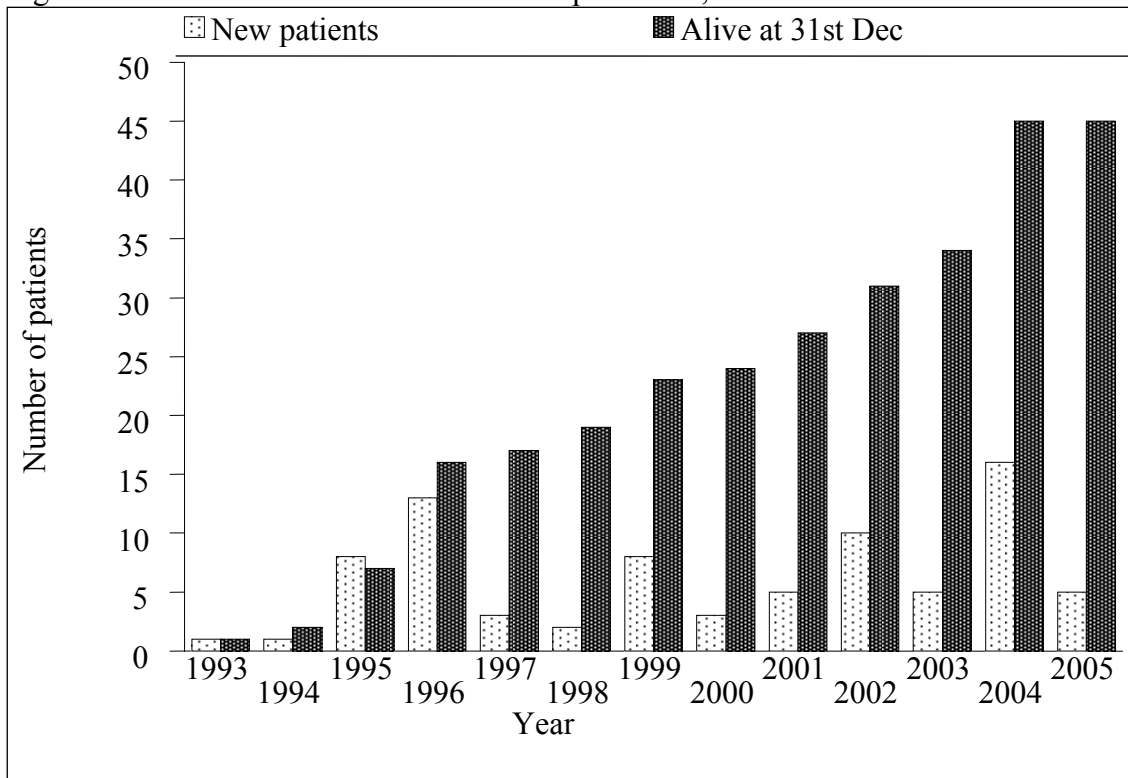


Table 4.1.2: Place of Transplant, 1993-2005

Year	93	94	95	96	97	98	99	00	01	02	03	04	05	TOTAL
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Local	0	0	8	10	1	1	8	3	5	9	2	14	5	66
Overseas	1	1	0	3	2	1	0	0	0	1	3	2	0	14
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	80

Table 4.1.3: Centres for Liver transplantation, 1993-2005

Year	93	94	95	96	97	98	99	00	01	02	03	04	05	TOTAL
Centre	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Subang Jaya Medical Centre	0	0	8	10	1	1	8	3	5	6	2	7	0	51
Hospital Selayang	0	0	0	0	0	0	0	0	0	3	0	7	5	15
Australia	1	0	0	3	1	0	0	0	0	0	0	0	0	5
National University Hospital, Singapore	0	0	0	0	1	1	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	1
Tianjin, China	0	0	0	0	0	0	0	0	0	0	1	1	0	2
Asian Centre for Liver Disease & Transplantation, Singapore	0	0	0	0	0	0	0	0	0	1	2	1	0*	4
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	80

\* Data was not reported.

Table 4.1.4: Distribution of Centres of Follow-up of Transplant Recipients, 2005

Centre	No.	%
Number of patient with functioning graft at 31 <sup>st</sup> December 2005	45	100
Kuala Lumpur Hospital	2	4
SJMC	27*	60
Selayang Hospital	12	27
Singapore	1*	2
UMMC	3	7

\* Follow-up data was not reported.



**4.2 RECIPIENTS' CHARACTERISTICS**

Table 4.2.1: Gender distribution, 1993-2005

Year	93	94	95	96	97	98	99	00	01	02	03	04	05	TOTAL
Gender	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Male	0	0	6	5	2	1	3	1	2	7	5	10	2	44
Female	1	1	2	8	1	1	5	2	3	3	0	6	3	33
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	80

Figure 4.2.1: Gender distribution, 1993-2005

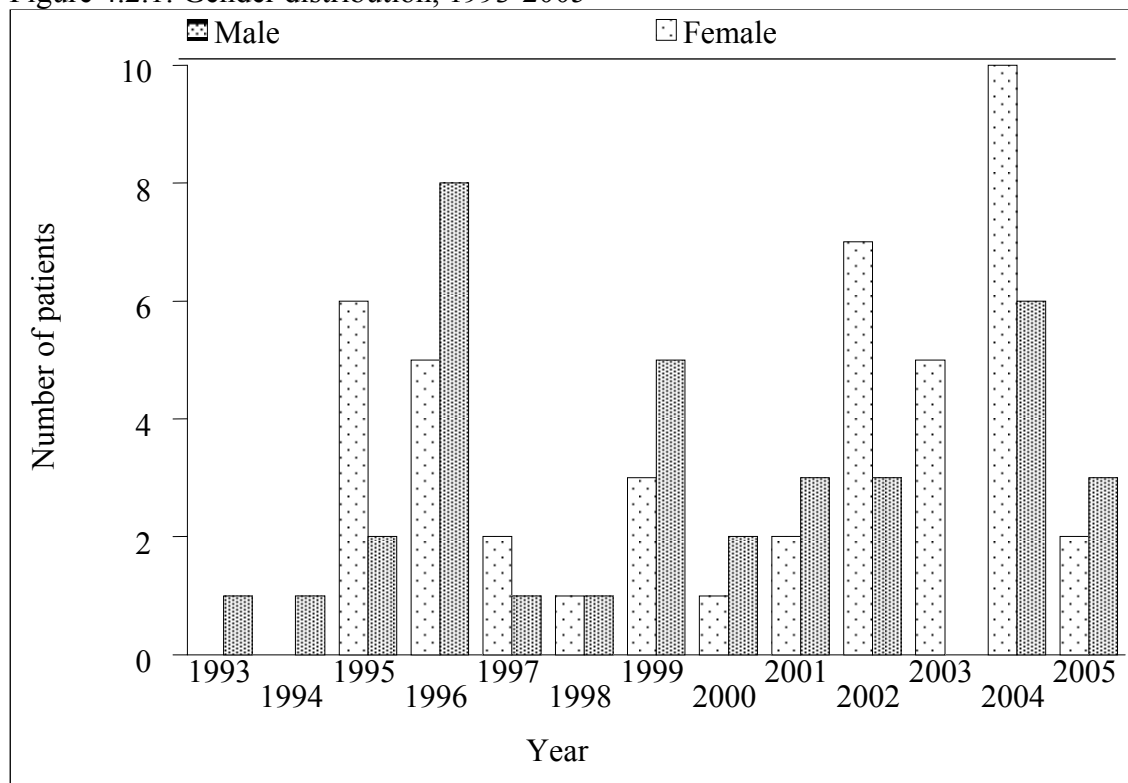


Table 4.2.2: Ethnic group distribution, 1993-2005

Year	93	94	95	96	97	98	99	00	01	02	03	04	05	TOTAL
Ethnic group	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Malay	0	1	2	3	1	0	4	1	2	3	1	11	3	32
Chinese	1	0	6	8	2	1	2	2	3	6	4	5	1	41
Indian	0	0	0	2	0	1	1	0	0	0	0	0	1	5
Others	0	0	0	0	0	0	1	0	0	1	0	0	0	2
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	80

Figure 4.2.2: Ethnic group distribution, 1993-2005

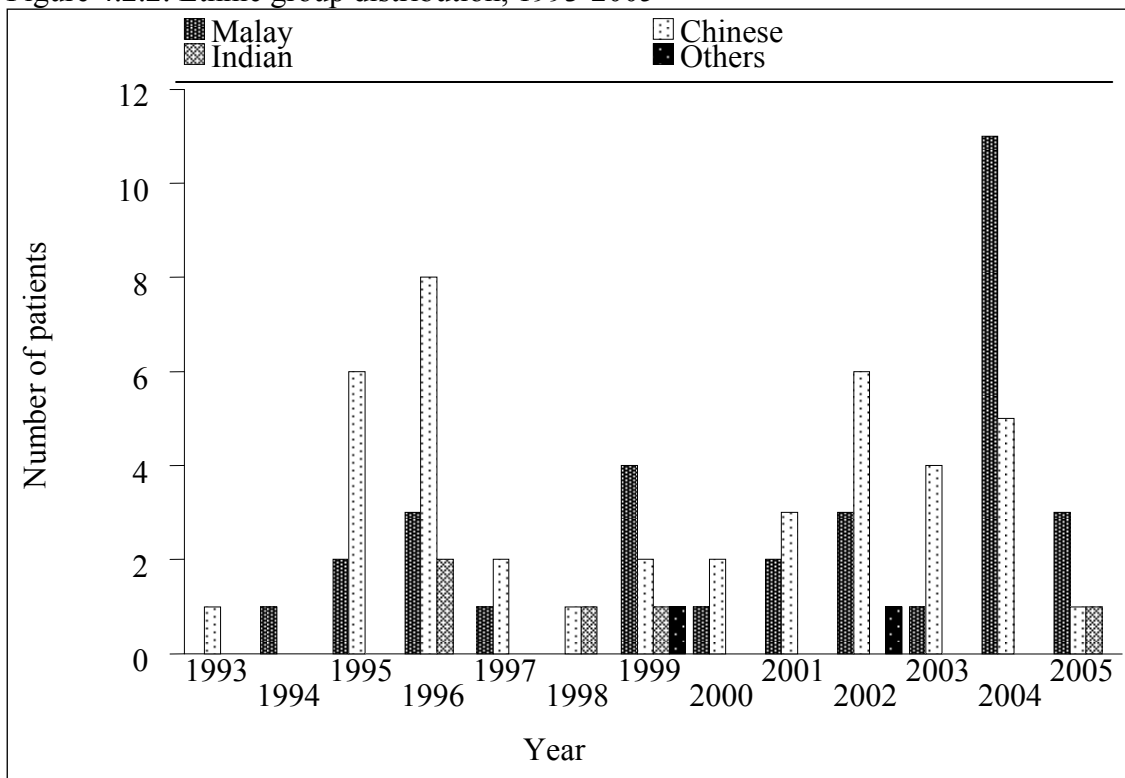


Table 4.2.3: Age distribution, 1993-2005

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Age, years	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
<1	0	0	0	0	0	1	0	0	0	1	0	0	0	2
1-4	1	1	3	11	3	1	5	3	4	4	2	9	2	49
5-9	0	0	3	1	0	0	2	0	1	4	2	3	3	19
10-14	0	0	1	1	0	0	0	0	0	0	0	1	0	3
15-19	0	0	0	0	0	0	1	0	0	0	0	1	0	2
20-39	0	0	1	0	0	0	0	0	0	1	0	0	0	2
40-59	0	0	0	0	0	0	0	0	0	0	0	1	0	1
>=60	0	0	0	0	0	0	0	0	0	0	1	1	0	2
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	80
Mean	2	4	9	4	2	1	4	1	2	6	25	12	4	7
SD	-	-	9	4	1	1	5	1	2	7	42	22	3	13
Median	2	4	6	2	2	1	3	1	2	4	1	3	5	2
Minimum	2	4	2	2	1	3 months	1	1	1	4 months	1	1	1	3 months
Maximum	2	4	30	14	2	1	15	2	5	24	73	74	8	74

\* Age=date of transplant – date of birth

Table 4.2.4: Primary diagnosis, 1993-2005 (N=80)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Primary Diagnosis	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Biliary atresia	1	1	7	12	3	1	7	2	5	6	2	10	4	61
Metabolic liver disease	0	0	1	1	0	0	0	0	0	2	0	2	0	6
Cholestatic liver disease	0	0	0	0	0	1	0	1	0	0	0	0	1	3
Primary biliary cirrhosis	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
Autoimmune hepatitis	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Chronic hepatitis B	0	0	0	0	0	0	0	0	0	0	3	2	0	5
Chronic hepatitis C	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
Malignancies	0	0	0	0	0	0	0	0	0	1	2	1	0	4
Acute liver failure	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Idiopathic / Cryptogenic	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

\*5 patients have more than one primary disease

Table 4.2.5: Indication for Transplantation, 1993-2005 (N=80)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Indication for Transplantation	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Indication for Transplantation	0	0	1	0	0	0	1	0	0	1	0	0	0	3
Recurrent encephalopathy	0	0	0	0	7	1	0	4	1	1	0	2	0	16
Uncontrolled bleeding varices	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intractable ascites	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
Poor liver function	1	1	7	11	3	1	8	3	5	9	3	11	4	67
Malignancy	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Unacceptable quality of life	0	0	0	0	0	0	0	0	0	1	0	0	1	2
Failure to thrive, growth retardation in paediatric patients	0	0	6	10	3	2	6	3	5	7	2	10	3	57
Others	0	0	0	0	0	0	0	0	0	0	0	1	2	3
No data	0	0	0	0	0	0	0	0	0	1	1	2	0	4

\*15 patients had 1 indication for transplantation, 61 had more than 1 indication for transplantation

Table 4.2.6: Recipient blood group, 1993-2005 (N=80)

<b>Year</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>TOTAL</b>
<b>Blood group</b>	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
A	0	1	2	0	0	0	3	0	1	3	1	4	1	16
B	0	0	1	2	0	1	2	0	1	1	0	1	1	10
AB	0	0	0	1	0	1	0	0	0	0	0	1	1	4
O	0	0	2	5	1	0	3	3	3	5	1	8	2	33
No data	1	0	3	5	2	0	0	0	0	1	3	2	0	17
<b>TOTAL</b>	1	1	8	13	3	2	8	3	5	10	5	16	5	80

### 4.3 TRANSPLANT PRACTICES

There were 2 cadaveric transplants and three living related transplants performed. Tacrolimus was the main immunosuppressant used.

Table 4.3.1: Type of transplant, 1993-2005 (N=80)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Type of Transplant	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Cadaveric	1	0	0	3	1	0	0	0	0	1	1	4	2	13
Living related - Mother	0	1	5	2	1	2	5	2	2	2	2	7	1	32
Living related - Father	0	0	2	7	1	0	2	0	2	3	0	1	2	19
Living related - Son	0	0	0	0	0	0	0	0	0	0	1	1	0	2
Living related - Brother	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	1
Living unrelated	0	0	1	1	0	0	1	1	1	3	0	3	0	11
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	5	79

\* 1 patient is Living related - Other

Table 4.3.2: Immunosuppressive drug treatment at transplantation, 1993-2005 (N=80)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Immunosuppressive drugs	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Steroids	0	0	2	5	0	2	5	2	5	5	1	12	5	44
Azathioprine	0	0	0	0	0	0	0	0	0	0	0	4	5	9
Cyclosporin A	1	1	1	2	0	0	0	1	0	0	0	0	0	6
Tacrolimus (FK506)	0	0	3	7	2	2	8	2	5	9	5	13	5	61
Mycophenolate Mofetil (MMF)	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	3
Monoclonal / Polyclonal antibody	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anti IL2R Antibodies	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
No data	0	0	4	3	1	0	0	0	0	1	0	4	0	13
TOTAL patients	1	1	8	13	3	2	8	3	5	10	5	16	5	80

\* 21 patients had 1 type of drug, 37 patients had 2 types, 9 patients had 3 types

## 4.4 TRANSPLANT OUTCOMES

Table 4.4.1: Patient survival by year of transplant, 1993-2005 (N=80)

Year of Transplant Interval (months)	1993 - 1998		1999 - 2005	
	% Survival	SE	% Survival	SE
1	82	7	80	6
6	71	9	66	7
12	71	9	66	7

SE=standard error

Figure 4.4.1: Patient survival by year of transplant, 1993-2005

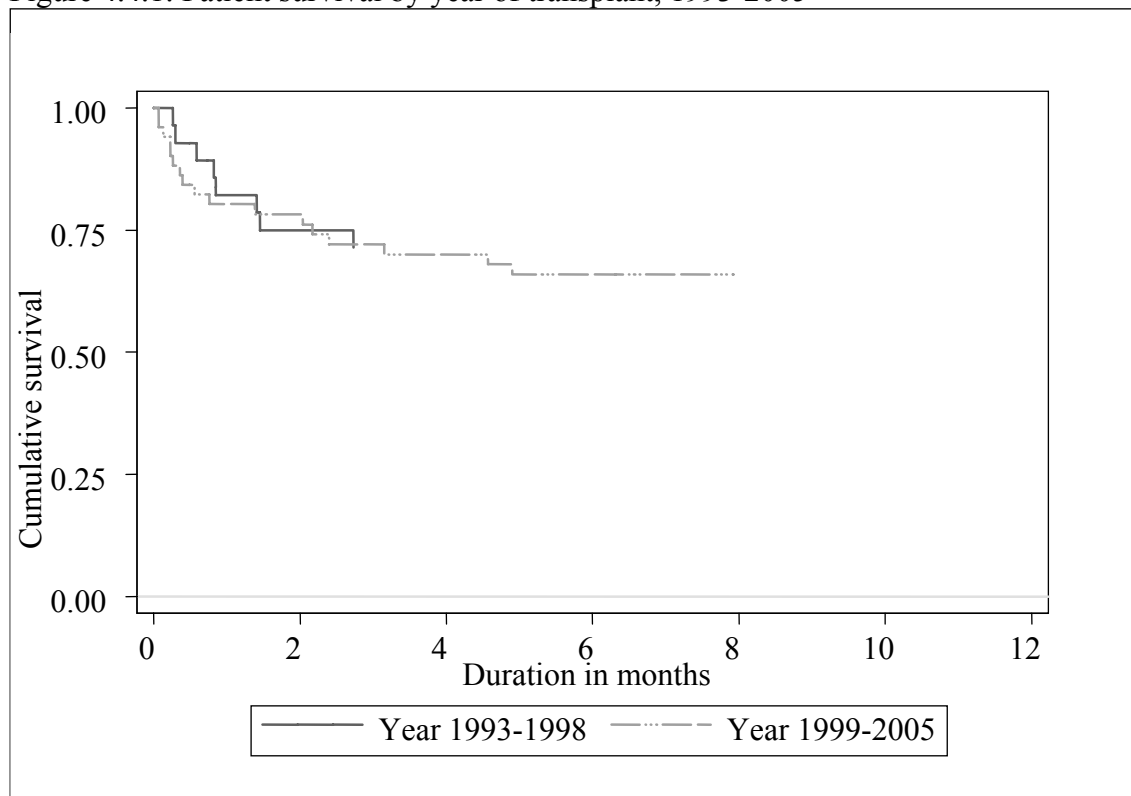


Table 4.4.2: Patient survival by gender, 1993-2005 (N=80)

Gender	Male		Female		
	Interval (months)	% Survival	SE	% Survival	SE
1		80	6	83	6
6		68	7	69	8
12		68	7	69	8

SE=standard error

Figure 4.4.2: Patient survival by gender, 1993-2005

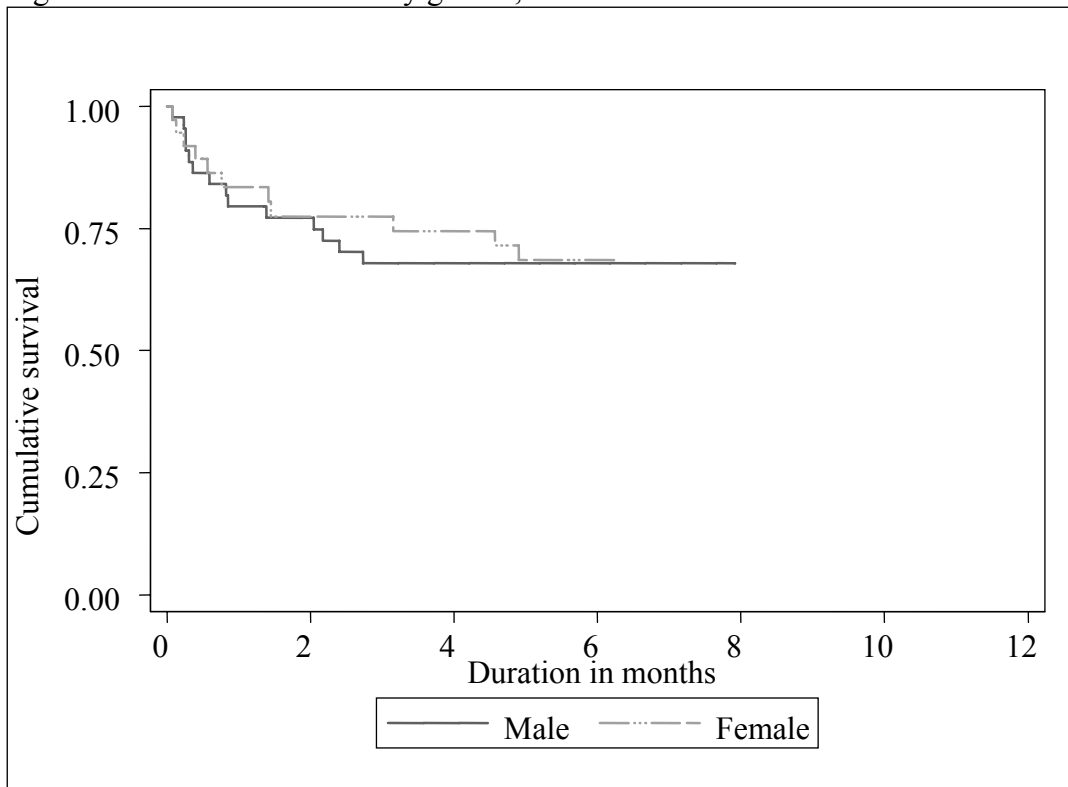




Table 4.4.3: Patient survival by age group, 1993-2005 (N=80)

Age group	0-9 years		≥10 years		
	Interval (months)	% Survival	SE	% Survival	SE
1		79	5	100	-
6		66	6	88	12
12		66	6	88	12

SE=standard error

Figure 4.4.3: Patient survival by age group, 1993-2005

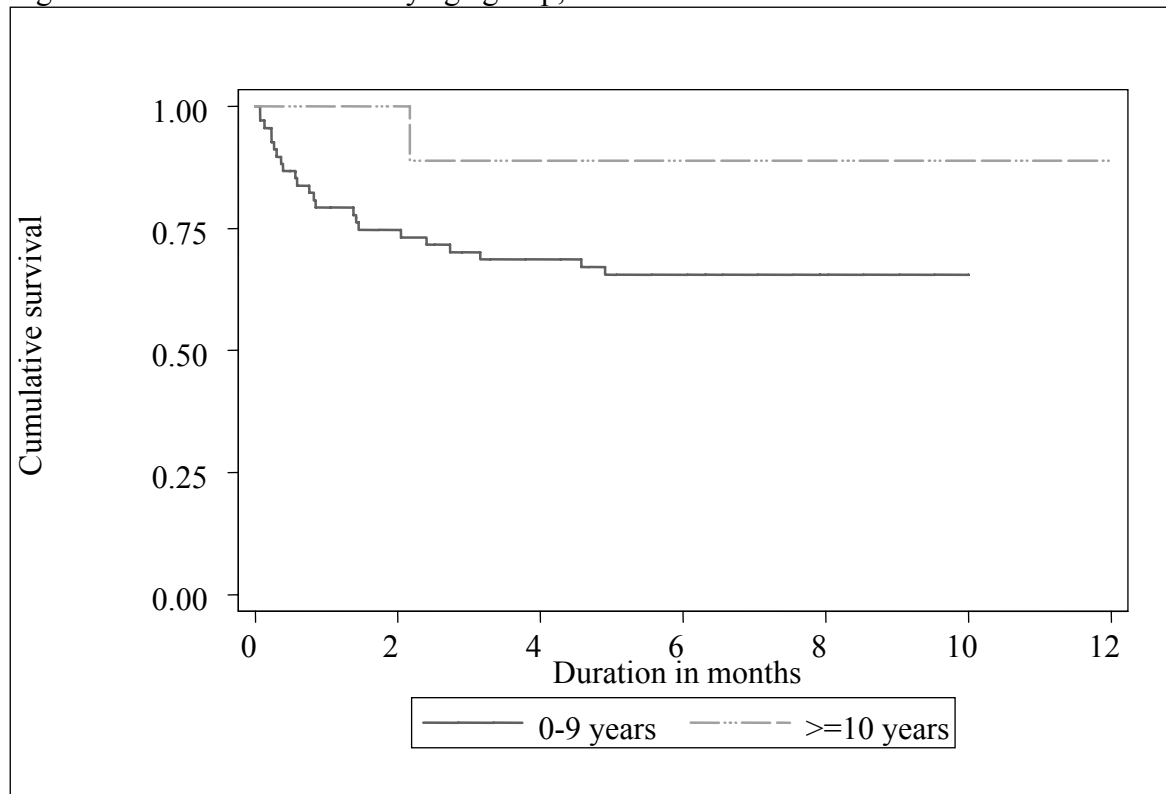


Table 4.4.4: Causes of death, 1993-2005 (N=80)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Causes of death												
Died due to graft failure. Cause unknown. Recurrent histocytosis?	0	0	0	0	0	0	0	0	0	0	1	1
Portal vein thrombosis	0	0	0	0	0	0	0	0	0	1	0	1
Chronic graft rejection	0	0	0	0	0	0	1	0	0	0	0	1
Intra abdominal bleeding	0	0	0	0	0	0	0	0	1	0	0	1
Ischaemic liver necrosis	0	0	0	0	0	1	0	0	0	0	0	1
Peritonitis and Septicaemia	0	0	0	0	0	0	0	1	0	0	0	1
? Graft versus host reaction	0	0	0	0	0	0	0	0	0	0	1	1
CMV Pneumonia	0	0	0	0	1	0	0	0	0	0	0	1
Decompensated Liver cirrhosis post liver transplant with DIVC	0	0	0	0	0	0	0	1	0	0	0	1
Died at home	0	0	0	0	0	0	0	0	0	1	0	1
Intra-cerebral Haeorrhage	0	0	0	0	1	0	0	0	0	0	0	1
Intracranial Haeorrhage	0	1	0	0	0	0	0	0	0	0	0	1
Metastasis to scalp and chest.	0	0	0	0	0	0	0	0	0	0	1	1
NA	1	0	0	0	0	0	0	0	0	0	0	1
Not Available as notes disposed	1	0	0	0	0	0	0	0	0	0	0	1
Notes not available	1	0	0	0	0	0	0	0	0	0	0	1
Oesophageal Varices / Bleeding	0	0	0	0	1	0	0	0	0	0	0	1
Pneumonia and Respiratory Failure	0	1	0	0	0	0	0	0	0	0	0	1
Post Transplant Lymphoproliferative Disease and Septicaemia	0	0	0	0	0	0	1	0	0	0	0	1
Sepsis	0	0	0	0	0	0	0	1	0	0	0	1
Sepsis severe and multi-organ failure	0	1	0	0	0	0	0	0	0	0	0	1
Bleeding Oesophageal	0	0	1	0	1	0	0	0	0	0	0	2
Septicaemia	0	0	0	0	0	0	0	0	0	1	1	2
Septicaemia with DIVC	0	1	0	0	0	0	0	1	0	0	0	2
Unknown	0	0	0	0	0	0	0	1	0	1	0	2
TOTAL	3	4	1	0	4	1	2	5	1	4	4	29

\* 2 patients with no date of death

## CHAPTER 5

### RENAL TRANSPLANTATION

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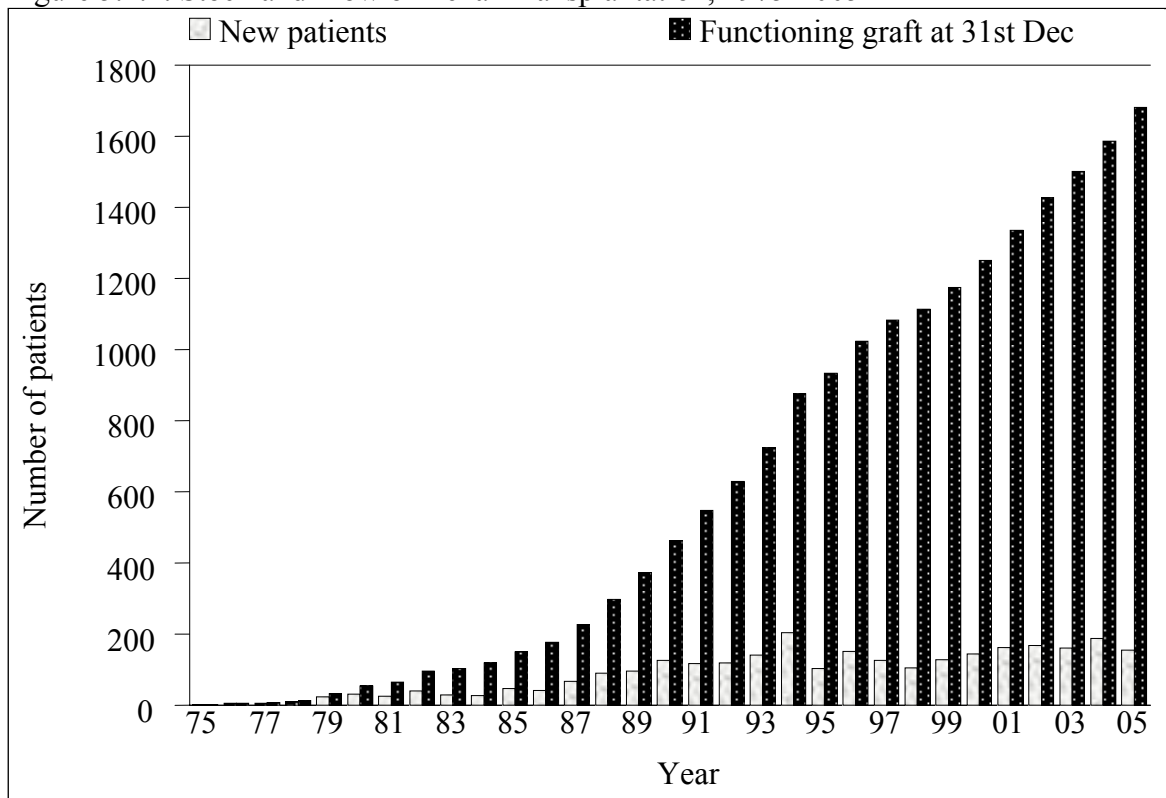
### 5.1 STOCK AND FLOW

New renal transplant patients showed a modest increase from 151 transplants per year in 1996 to 187 per year in 2004. By 2005, the number of functioning renal transplants has increased to 1681 (Table 5.1.1).

Table 5.1.1: Stock and Flow of Renal Transplantation, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New transplant patients	151	126	104	127	143	161	168	160	187	155
Died	31	29	23	25	27	35	31	36	37	38
Graft failure	28	38	48	36	32	40	38	41	44	15
Lost to follow up	1	0	2	4	9	2	7	9	21	6
Functioning graft at 31st December	1023	1082	1113	1175	1250	1334	1426	1500	1585	1681

Figure 5.1.1: Stock and Flow of Renal Transplantation, 1975-2005



Incident rate for renal transplantation stabilised at a modest rate of 5-7 per million population for the last decade (Table 5.1.2), while the transplant prevalence rate maintained at 48-69 per million population for the last 10 years (Table 5.1.3).

Table 5.1.2: New transplant rate per million population (pmp), 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New transplant patients	151	126	104	127	143	161	168	160	187	155
New transplant rate, pmp	7	6	5	6	6	7	7	6	7	6

Figure 5.1.2: New transplant rate, 1996-2005

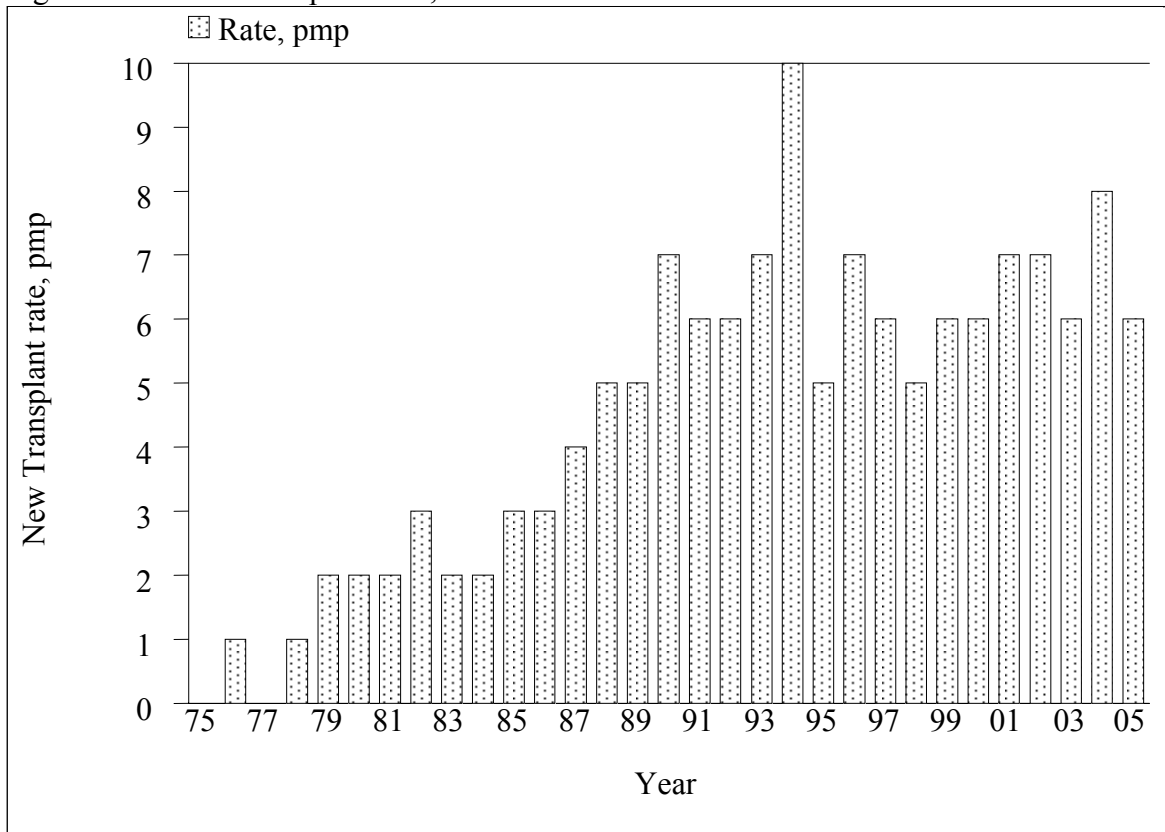


Table 5.1.3: Transplant prevalence rate per million population (pmp), 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Functioning graft at 31st December	1023	1082	1113	1175	1250	1334	1426	1500	1585	1678
Transplant prevalence rate, pmp	48	50	50	52	53	56	58	60	66	69

Figure 5.1.3: Transplant prevalence rate, 1996-2005

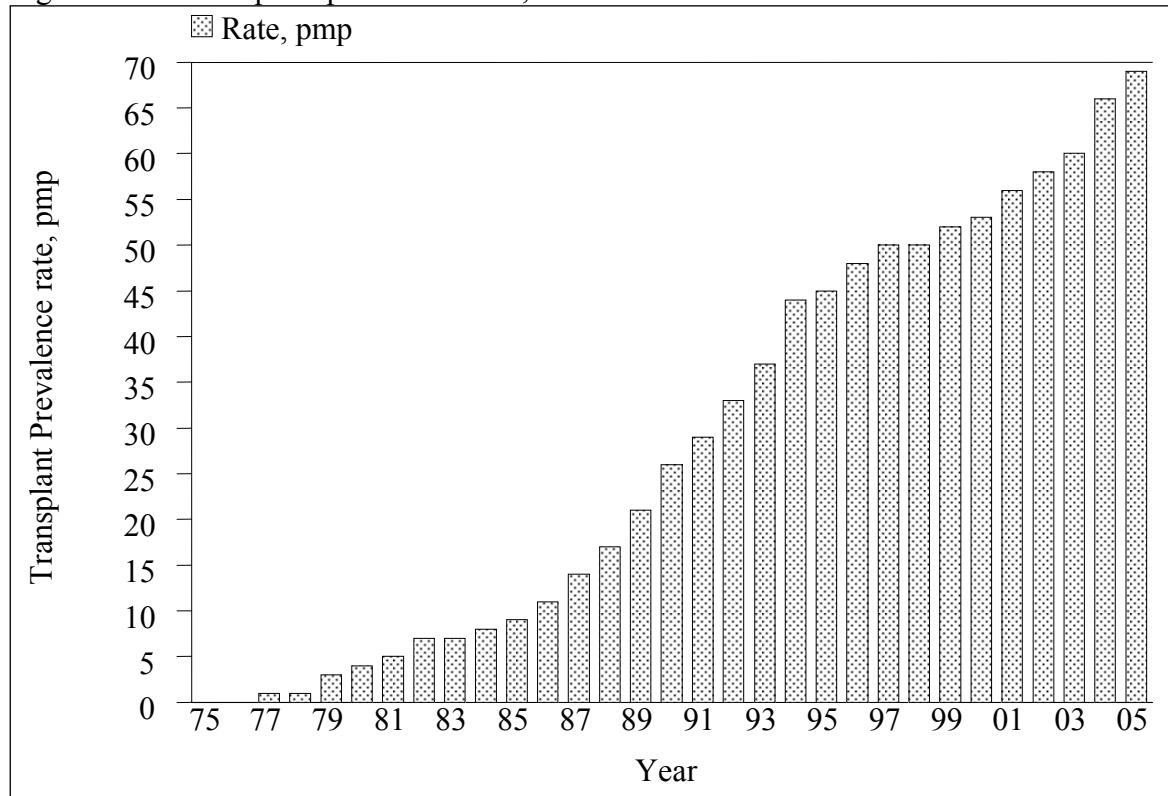




Table 5.1.4: Place of transplantation, 1996-2005

Year	1996		1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	32	21	29	23	33	32	36	28	28	20	33	20
UMMC	7	5	6	5	7	7	16	13	19	13	23	14
Selayang Hospital	0	0	0	0	0	0	0	0	4	3	11	7
Other local	0	0	0	0	0	0	1	1	3	2	4	2
China	105	70	79	63	50	48	61	48	80	56	82	51
India	6	4	7	6	7	7	5	4	9	6	7	4
Other overseas	1	1	3	2	3	3	2	2	0	0	1	1
Unknown	0	0	2	2	4	4	6	5	0	0	0	0
TOTAL	151	100	126	100	104	100	127	100	143	100	161	100

Year	2002		2003		2004		2005		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	28	17	26	16	20	11	30	19	295	20
UMMC	14	8	6	4	7	4	6	4	111	7
Selayang Hospital	11	7	11	7	11	6	5	3	53	4
Other local	1	1	1	1	2	1	5	3	17	1
China	102	61	111	69	134	72	104	67	909	61
India	12	7	4	3	11	6	5	3	73	5
Other overseas	0	0	1	1	2	1	0	0	13	1
Unknown	0	0	0	0	0	0	0	0	11	1
TOTAL	168	100	160	100	187	100	155	100	1482	100

## 5.2 RECIPIENTS' CHARACTERISTICS

The mean age for new transplant recipients is between 36±6 years to 42±13 years over the last 10 years (Table 5.2.1). Men are still in the majority among renal transplant recipients and they made up 70% of all recipients in year 2005. Over the last 10 years, the proportion of diabetic transplant recipients has increased, from 9% in 1996 to about 20% for the last 3 years.

In 2005, 3% were HbsAg positive and 2% had anti-HCV antibodies at the time of transplantation. The proportion of HbsAg positivity had reduced from 10-20% in the period 1985-1994 to 3-7% for the last 5 years while the number of recipients with anti-HCV antibodies at the time of transplantation had also reduced from 20-30% in the early 1990's to 2-15% for the last 5 years since the screening test was introduced in 1989. For those transplanted prior to the screening test, anti-HCV antibodies were found in 40-60%.

Table 5.2.1: Renal Transplant Recipients' Characteristics, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New Transplant Patients	151	126	104	127	143	161	168	160	187	155
Age at transplant (years), Mean	39	36	37	37	40	41	41	42	41	38
Age at transplant (years), SD	11	12	11	13	13	13	13	13	13	14
% Male	57	63	58	61	64	63	57	66	62	70
% Diabetic (co-morbid / primary renal disease)	9	11	9	10	15	19	15	22	21	19
% HBsAg positive	13	6	6	4	5	4	7	8	6	3
% Anti-HCV positive	20	7	18	11	8	15	9	10	8	2

**RENAL TRANSPLANTATION**

Chronic glomerulonephritis was the primary cause of ESRF in 25-34% for the last 5 years (Table 5.2.2). As expected, patients with diabetes mellitus had become increasingly frequent renal transplant recipients, from 7% in 1996 to 17% in 2005. Majority of renal transplant recipients still presented late with unknown primary renal disease, contributing to 29-50% of all the recipients for the last decade.

Table 5.2.2: Primary causes of end stage renal failure, 1996-2005

Year	1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	151	100	126	100	104	100	127	100	143	100
Glomerulonephritis	48	32	30	24	28	27	41	32	49	34
Diabetes Mellitus	10	7	9	7	5	5	10	8	16	11
Hypertension	8	5	4	3	5	5	7	6	18	13
Obstructive uropathy	2	1	3	2	4	4	4	3	3	2
ADPKD	4	3	2	2	1	1	1	1	3	2
Drugs/toxic nephropathy	0	0	0	0	0	0	0	0	0	0
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0
Unknown	76	50	64	51	55	53	62	49	54	38
Others	11	7	18	14	10	10	6	5	12	8

Year	2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	161	100	168	100	160	100	187	100	155	100
Glomerulonephritis	41	25	53	32	54	34	62	33	45	29
Diabetes Mellitus	23	14	16	10	26	16	31	17	27	17
Hypertension	17	11	24	14	25	16	50	27	37	24
Obstructive uropathy	3	2	2	1	2	1	3	2	2	1
ADPKD	1	1	3	2	5	3	4	2	3	2
Drugs/toxic nephropathy	0	0	0	0	2	1	2	1	0	0
Hereditary nephritis	0	0	0	0	0	0	1	1	0	0
Unknown	61	38	68	40	58	36	82	44	47	30
Others	22	14	15	9	12	8	27	14	15	10

### 5.3 TRANSPLANT PRACTICES

In 2005, commercial transplants from China constituted 65% of all new renal transplantation, while live donor transplantation made up 25% and local cadaveric transplants contributed only 5% of all new renal transplantation (Table 5.3.1).

Table 5.3.1: Type of Renal Transplantation, 1996-2005

Year	1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial Cadaver	106	72	80	66	51	52	62	51	80	56
Commercial Live Donor	4	3	7	6	4	4	4	3	9	6
Live Donor (genetically related)	36	24	27	22	27	27	40	33	21	15
Live Donor (emotionally related)	0	0	0	0	2	2	5	4	6	4
Cadaver	2	1	8	7	15	15	10	8	27	19
Total	148	100	122	100	99	100	121	99	143	100

Year	2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial Cadaver	82	51	102	61	112	70	139	76	101	65
Commercial Live Donor	6	4	11	7	3	2	5	3	8	5
Live Donor (genetically related)	32	20	30	18	25	16	21	11	35	23
Live Donor (emotionally related)	4	2	3	2	5	3	2	1	3	2
Cadaver	37	23	22	13	15	9	17	9	8	5
Total	161	100	168	100	160	100	184	100	155	100

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

Table 5.3.2: Biochemical data, 2004-2005

Biochemical parameters	Summary	2004	2005
Creatinine, umol/L	N	1550	1633
	Mean	132	133.6
	SD	63.8	65.5
	Median	120	120
	Minimum	38	35
	Maximum	817	763
Hb, g/dL	N	1550	1633
	Mean	12.9	12.9
	SD	1.9	1.9
	Median	12.9	12.9
	Minimum	4.9	5.5
	Maximum	19.7	20.6
Albumin, g/L	N	1550	1633
	Mean	39.3	39.3
	SD	1	0.5
	Median	39.3	39.3
	Minimum	22	34
	Maximum	50	46
Calcium, mmol/L	N	1550	1633
	Mean	2.4	2.3
	SD	0.2	0.2
	Median	2.3	2.3
	Minimum	1.1	1.2
	Maximum	3.3	3.3
Phosphate, mmol/L	N	1550	1633
	Mean	1.1	1.1
	SD	0.2	0.2
	Median	1.1	1.1
	Minimum	0.3	0.3
	Maximum	2.7	3.3
Alkaline Phosphatase (ALP), U/L	N	1550	1633
	Mean	79.5	78.9
	SD	46.5	46.5
	Median	73	73
	Minimum	10	18
	Maximum	994	831
Alanine Transferase (ALT), U/L	N	1550	1633
	Mean	31.5	30.6
	SD	32.6	29.8
	Median	25	24
	Minimum	4	4
	Maximum	563	613
Total cholesterol, mmol/L	N	1550	1633
	Mean	5.5	5.4
	SD	1.1	1
	Median	5.4	5.4
	Minimum	2.6	2.1
	Maximum	20	13.1
LDL cholesterol, mmol/L	N	1550	1633
	Mean	3.1	3
	SD	0.7	0.8
	Median	3.1	3.1
	Minimum	1	0.9
	Maximum	8.5	9.2
HDL cholesterol, mmol/L	N	1550	1633
	Mean	1.6	1.6
	SD	0.4	0.5
	Median	1.6	1.6
	Minimum	0.2	0.2

<b>Biochemical parameters</b>	<b>Summary</b>	<b>2004</b>	<b>2005</b>
	Maximum	4.3	5.6
Systolic Blood Pressure, mmHg	N	1550	1633
	Mean	132.3	133.4
	SD	15.9	16.9
	Median	130	130
	Minimum	80	80
	Maximum	200	220
Diastolic Blood Pressure, mmHg	N	1550	1633
	Mean	80.3	80.6
	SD	9.6	9.2
	Median	80	80
	Minimum	40	50
	Maximum	121	127

Cyclosporine/prednisolone based triple therapy has remained the backbone of maintenance immunosuppressive therapy. In year 2005, 78% of renal transplant recipients were on CsA while 98% were on prednisolone. Only 14% were on tacrolimus. However, 44% of the recipients were on MMF as opposed to 39% on azathioprine.

Table 5.3.3: Medication data, 2004-2005

Medication data	Single drug treatment				Combined drug treatment			
	2004		2005		2004		2005	
	N	%	N	%	N	%	N	%
All patients	1416	100	1557	100	1416	100	1557	100
<b>(i) Immunosuppressive drug(s) treatment</b>								
Prednisolone	13	1	12	1	1394	98	1524	98
Azathioprine	0	0	1	0	603	43	605	39
Cyclosporin A	4	0	4	0	1135	80	1219	78
Tacrolimus (FK506)	0	0	0	0	185	13	221	14
Mycophenolate Mofetil (MMF)	1	0	0	0	524	37	679	44
Rapamycin	0	0	0	0	5	0	8	1
Others	1	0	0	0	16	1	10	1
<b>(ii) Non-Immunosuppressive drug(s) treatment</b>								
Beta blocker	104	7	105	7	650	46	665	43
Calcium channel blocker	188	13	195	13	795	56	820	53
ACE inhibitor	35	2	60	4	272	19	342	22
AIIRB	11	1	19	1	76	5	159	10
Anti-lipid	73	5	66	4	566	40	600	39
Other anti-hypertensive	5	0	5	0	130	9	157	10

Sixty-four percent of the recipients had hypertension as a co-morbidity before transplantation while another 27% developed hypertension post transplantation (Table 5.4.1). Among these patients, only 29% were on monotherapy while the rest were on multiple drug treatment. For those on combination therapy, majority was on calcium channel blockers (53%) and beta blockers (43%). Only 22% were on ACE inhibitors while another 10% were on AIIRBs.

## 5.4 TRANSPLANT OUTCOMES

### 5.4.1 Post-transplant complications

Table 5.4.1: Post transplant complications, 2004-2005

Post transplant complications	Complication developed before transplant (regardless of complication after transplantation)				Complication developed only after transplantation			
	2004		2005		2004		2005	
	N	%	N	%	N	%	N	%
All patients	1550	100	1633	100	1550	100	1633	100
Diabetes (either as Primary Renal Disease or co-morbid)	356	23	368	23	126	8	123	8
Cancer	3	0	2	0	17	1	19	1
Cardiovascular disease + cerebrovascular disorder	147	9	148	9	83	5	45	3
Hypertension	1003	65	1042	64	397	26	440	27

\* Hypertension: BP systolic > 140 and BP diastolic >90

OR have either Beta blocker / Calcium channel blocker / ACE inhibitor / AIIRB / Other anti-hypertensive

It is also interesting to note while 23% of the prevalent renal transplant recipients had diabetes mellitus before transplantation (either as primary renal disease or co-morbidity), another 8% of them developed diabetes mellitus post transplantation (PTDM).



### 5.4.2 Deaths and Graft loss

In 2005, 38 (2%) of transplant recipients died and 15 (1%) lost their grafts. These rates of transplant death and graft loss have remained constant for the last 10 years (Table 5.4.2). Infection, cardiovascular disease and death at home were among the commonest causes of death for the last decade and in 2005, they accounted for 42%, 11% and 11% of the causes of death respectively (Table 5.4.3). However, death secondary to cancer has become more common over the last 5 years and in 2004, cancer death accounted for 17% of all causes of death. Renal allograft rejection accounted for 50-60% of graft losses for the last 10 years (Table 5.4.4).

Table 5.4.2: Transplant Patients Death Rate and Graft Loss, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
No. at risk	978	1053	1098	1144	1213	1292	1380	1463	1543	1633
Transplant death	31	29	23	25	27	35	31	36	37	38
Transplant death rate %	3	3	2	2	2	3	2	2	2	2
Graft loss	28	38	48	36	32	40	38	41	44	15
Graft loss rate %	3	4	4	3	3	3	3	3	3	1
Acute rejection	0	0	0	0	0	0	0	3	18	14
Acute rejection rate %	0	0	0	0	0	0	0	0	1	1
All losses	59	67	71	61	59	75	69	80	99	67
All losses rate %	6	6	6	5	5	6	5	5	6	4

\*Graft loss=graft failure

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

Figure 5.4.2(i): Transplant Recipient Death Rate, 1975-2005

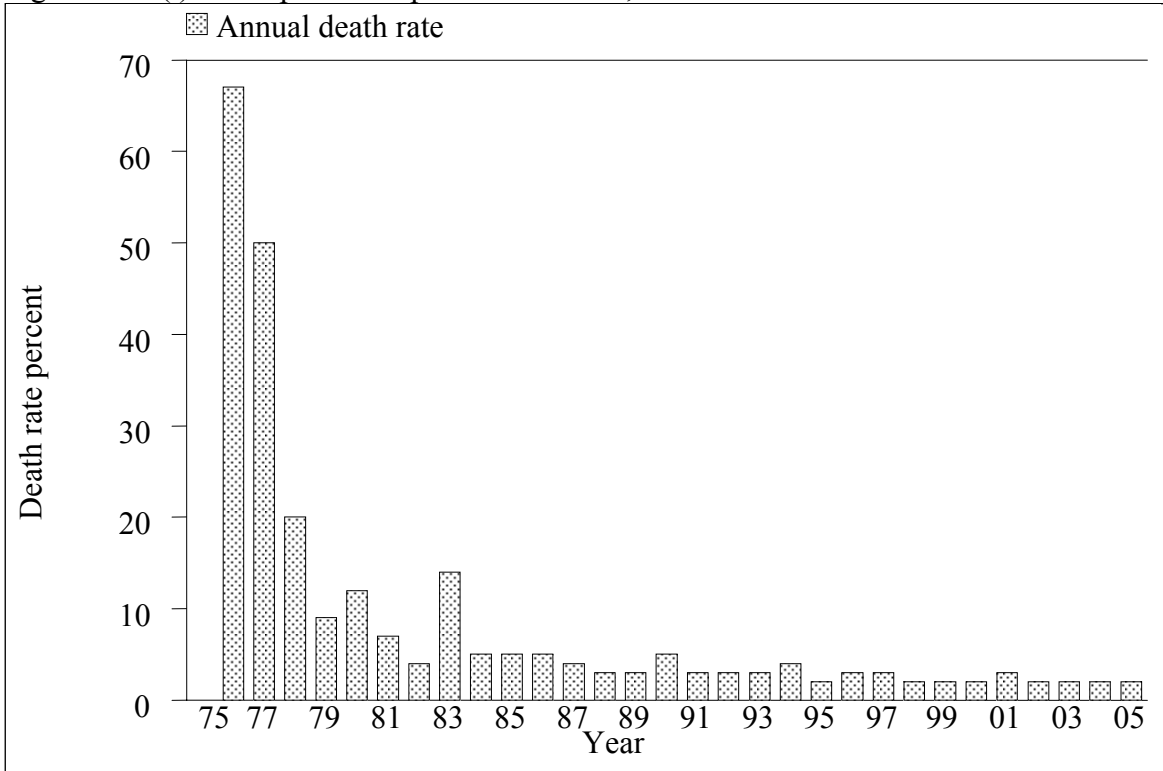


Figure 5.4.2(ii): Transplant Recipient Graft Loss Rate, 1975-2005

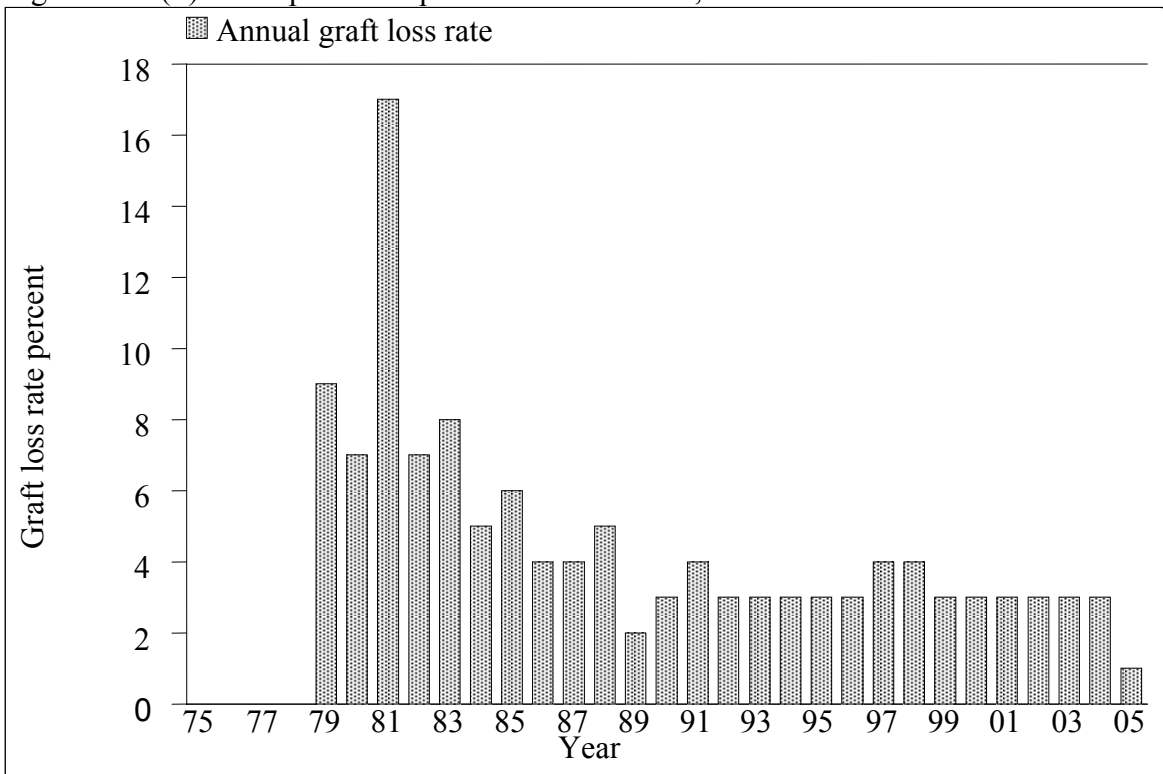


Table 5.4.3: Causes of Death in Transplant Recipients, 1996-2005

Year	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	4	13	3	10	3	13	4	13	10	32	6	15	5	16	9	23	3	7	4	11
Died at home	3	9	2	7	4	17	6	19	1	3	5	12	5	16	5	13	6	15	4	11
Infection	18	56	14	48	9	38	7	23	11	35	19	46	9	29	10	26	9	22	16	42
Graft failure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	2	6	0	0	3	13	3	10	2	6	6	15	4	13	6	15	7	17	2	5
Liver disease	3	9	2	7	2	8	3	10	1	3	1	2	3	10	2	5	3	7	3	8
Accidental death	0	0	0	0	0	0	1	3	1	3	1	2	1	3	0	0	0	0	0	0
Others	1	3	4	14	0	0	5	16	3	10	2	5	2	6	5	13	9	22	3	8
Unknown	1	3	4	14	3	13	2	6	2	6	1	2	2	6	2	5	4	10	6	16
TOTAL	32	100	29	100	24	100	31	100	31	100	41	100	31	100	39	100	41	100	38	100

Table 5.4.4: Causes of Graft Failure, 1996-2005

Year	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Rejection	14	50	21	54	27	52	23	64	19	59	25	61	22	55	22	50	33	70	18	78
Calcineurin toxicity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0
Ureteric obstruction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infection	0	0	0	0	1	2	0	0	1	3	2	5	0	0	2	5	1	2	1	4
Vascular causes	1	4	4	10	3	6	1	3	3	9	1	2	0	0	3	7	4	9	2	9
Recurrent/de novo renal disease	2	7	1	3	1	2	0	0	0	0	2	5	2	5	1	2	1	2	0	0
Others	0	0	5	13	5	10	0	0	2	6	0	0	4	10	1	2	0	0	1	4
Unknown	11	39	7	18	15	29	12	33	7	22	11	27	12	30	15	34	7	15	1	4
TOTAL	28	100	39	100	52	100	36	100	32	100	41	100	40	100	44	100	47	100	23	100

### 5.4.3 Patient and Graft Survival

The overall transplant patient survival rate from 1993 to 2005 was 95%, 92%, 89% and 81% at 1 year, 3 years, 5 years and 10 years respectively, while the overall graft survival rate was 92%, 85%, 79% and 63% respectively.

Table 5.4.5: Patient survival, 1993-2005

Interval (years)	No.	% Survival	SE
1	1621	95	1
3	1209	92	1
5	849	89	1
10	258	81	1

\* No.=Number at risk SE=standard error

Figure 5.4.5: Patient survival, 1993-2005

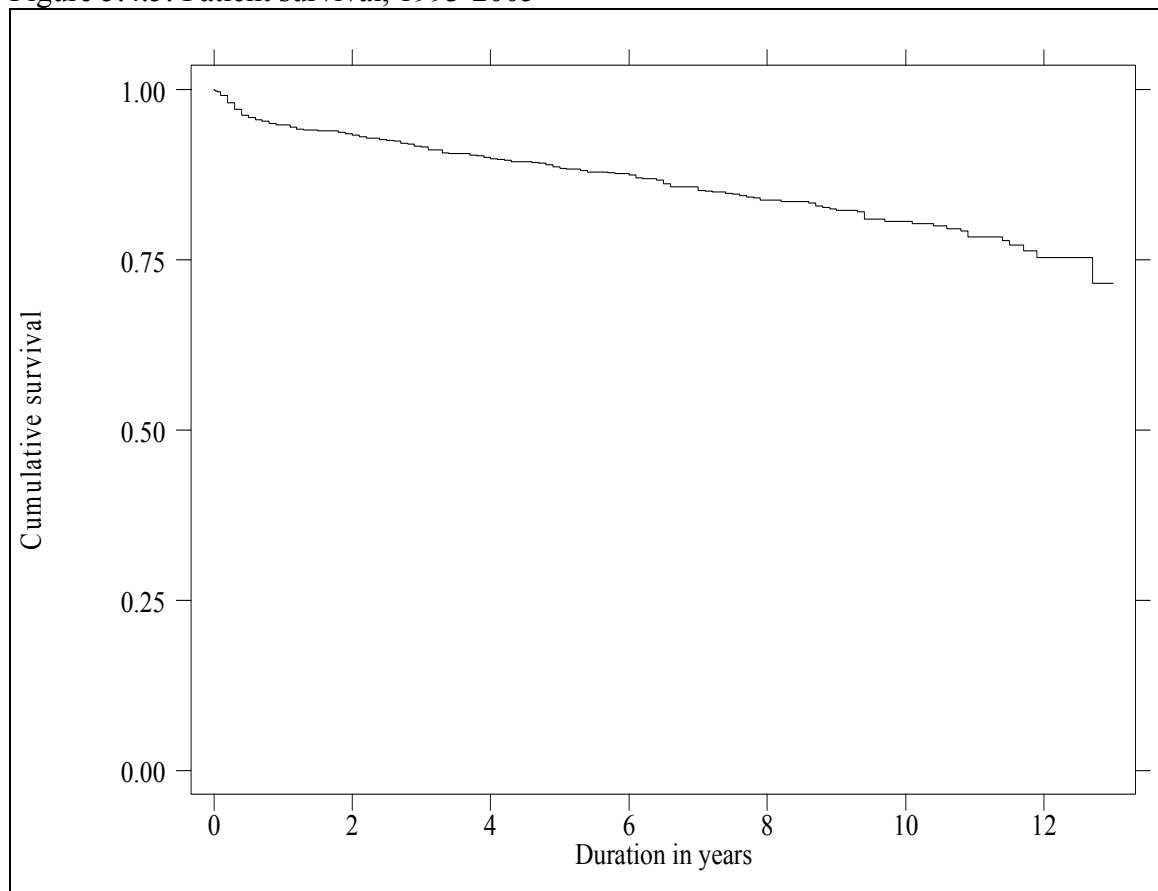
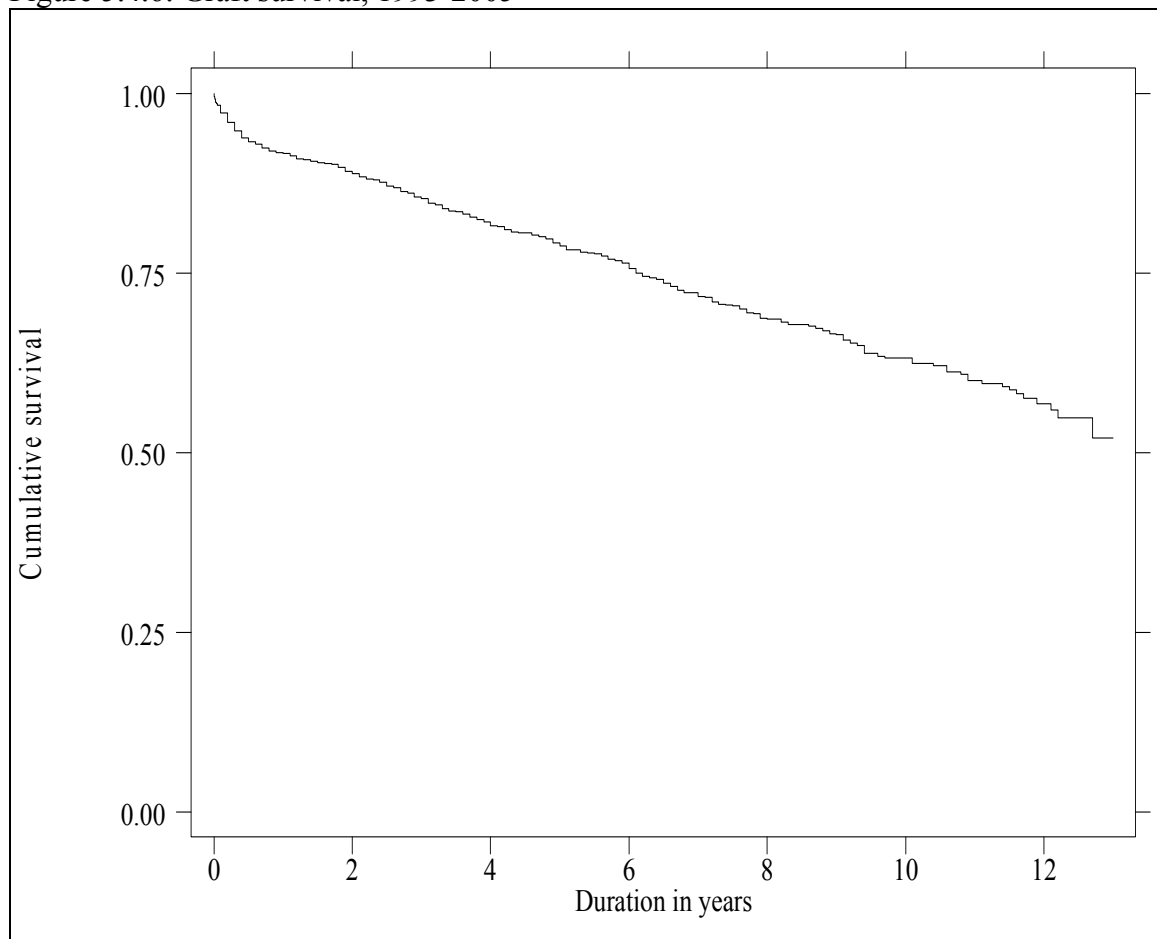


Table 5.4.6: Graft survival, 1993-2005

Interval (years)	No.	% survival	SE
1	1616	92	1
3	1208	85	1
5	848	79	1
10	257	63	1

\* No.=Number at risk SE=standard error

Figure 5.4.6: Graft survival, 1993-2005



Outcomes of renal transplantation from the four donor groups are shown in Figures 5.4.7 and 5.4.8 and demonstrate substantially different patient and graft survival rates. Living donor grafts maintained the best patient and graft survival rates. The 1, 3, 5 and 10 year patient survival rate for recipients of living donor grafts were 96%, 95%, 94% and 89% respectively. The graft survival rates also differed between these 4 groups; living and commercial cadaver donor graft had the best outcomes.

Table 5.4.7: Patient survival by type of transplant, 1993-2005

Type of Transplant	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
1	831	96	1	278	96	1	362	96	1	121	84	1
3	565	93	1	238	91	1	298	95	1	88	79	1
5	363	89	1	200	87	1	219	94	1	50	75	1
10	54	85	1	125	73	1	74	89	1	3	69	1

\* No.=Number at risk SE=standard error

Figure 5.4.7: Patient survival by type of transplant, 1993-2005

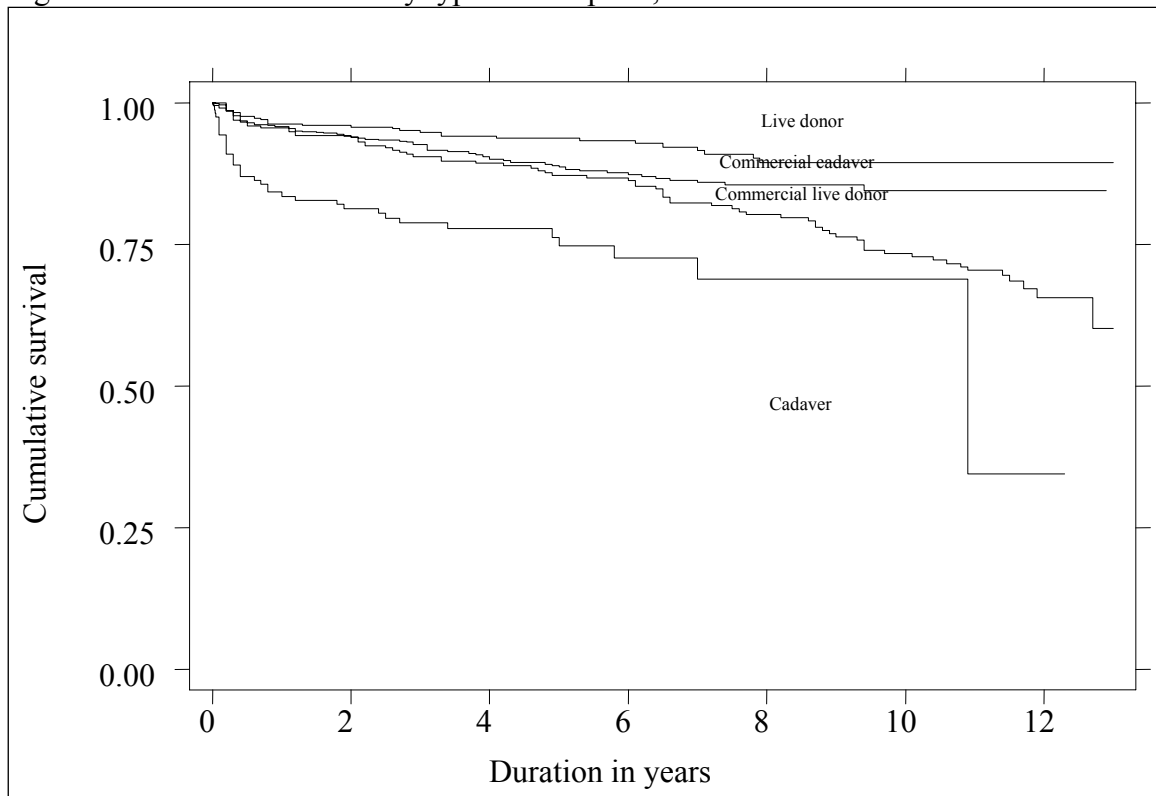
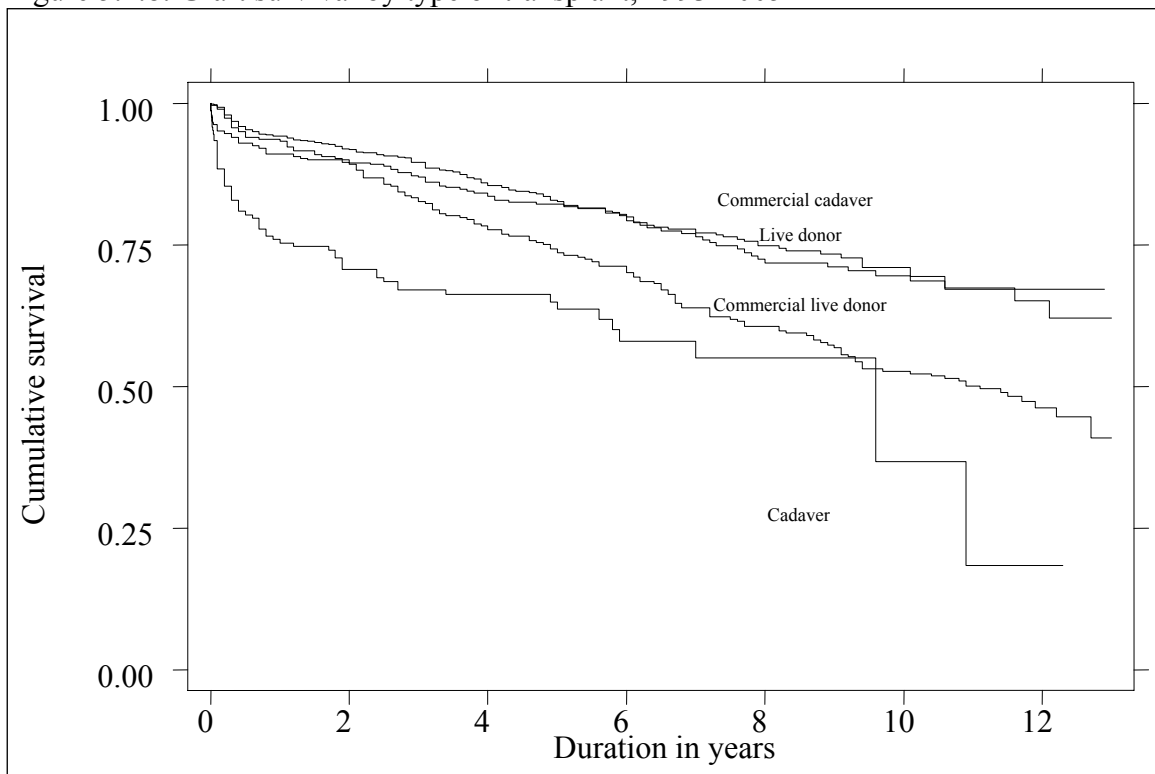


Table 5.4.8: Graft survival by type of transplant, 1993-2005

Type of Transplant Interval (years)	Commercial Cadaver			Commercial Live Donor			Live Donor			Cadaver		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
1	831	94	1	278	93	1	362	91	1	121	75	1
3	565	90	1	238	83	1	298	87	1	88	67	1
5	363	83	1	200	74	1	219	82	1	50	64	1
10	54	71	1	125	53	1	74	70	1	3	37	1

\* No.=Number at risk SE=standard error

Figure 5.4.8: Graft survival by type of transplant, 1993-2005



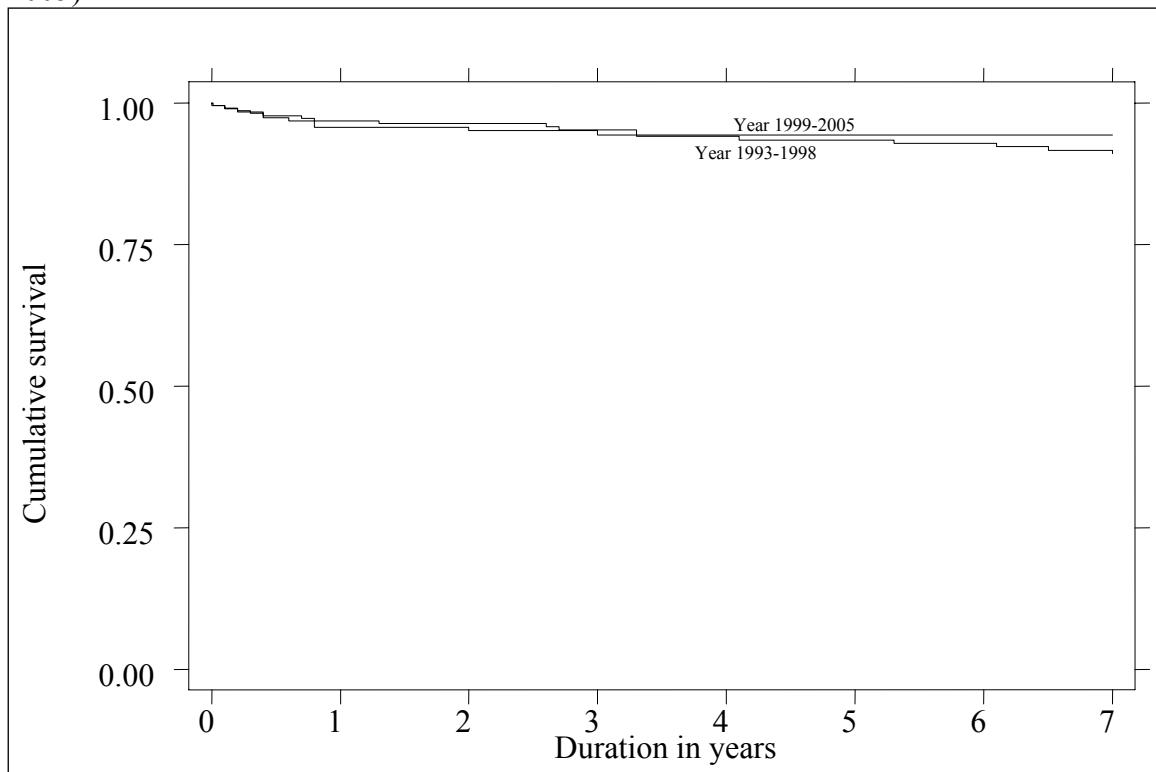
The patient and graft survival rates for 1993-1998 cohort and 1999-2005 cohort were compared. Patient survival rate for living related donor renal transplants has remained excellent and unchanged for these two cohorts (Figure 5.4.9).

Table 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2005)

Year of Transplant Interval (years)	1993-1998			1999-2005		
	No.	% Survival	SE	No.	% Survival	SE
1	181	97	1	182	96	1
3	168	95	1	131	94	1
5	158	93	1	62	94	1
7	146	91	1	1	94	1

\* No.=Number at risk SE=standard error

Figure 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2005)





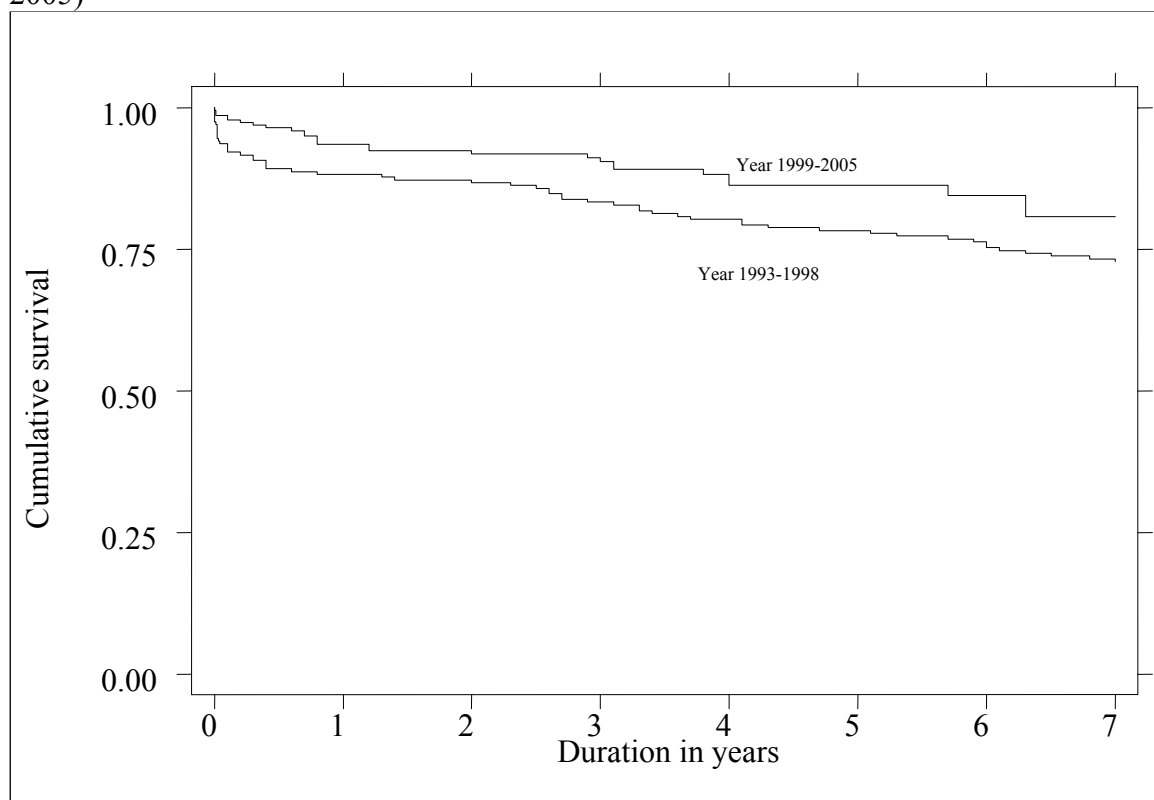
Interestingly, the risk of graft failure for living related donor renal transplantation improved for the 1999-2005 cohort compared to the 1993-1998 cohort (Table & Figure 5.4.10). One possible explanation, among others, is the increasing use of newer immunosuppressive agents such as MMF and FK506 in recent years.

Table 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2005)

Year of Transplant Interval (years)	1993-1998			1999-2005		
	No.	% Survival	SE	No.	% Survival	SE
1	181	88	1	182	94	1
3	168	83	1	131	90	1
5	158	78	1	62	86	1
7	146	73	1	1	81	1

\* No.=Number at risk SE=standard error

Figure 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2005)



Interestingly, our data showed that commercial cadaveric transplants have excellent patient and graft survival rates, which are comparable to living related donor transplants for both 1993-1998 and 1999-2005 cohorts (Figure 5.4.11 and 5.4.12).

Table 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2005)

Year of Transplant Interval (years)	1993-1998			1999-2005		
	No.	% Survival	SE	No.	% Survival	SE
1	288	94	1	544	96	1
3	275	92	1	290	93	1
5	248	87	1	115	90	1
7	226	84	1	2	-	-

\* No.=Number at risk SE=standard error

Figure 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2005)

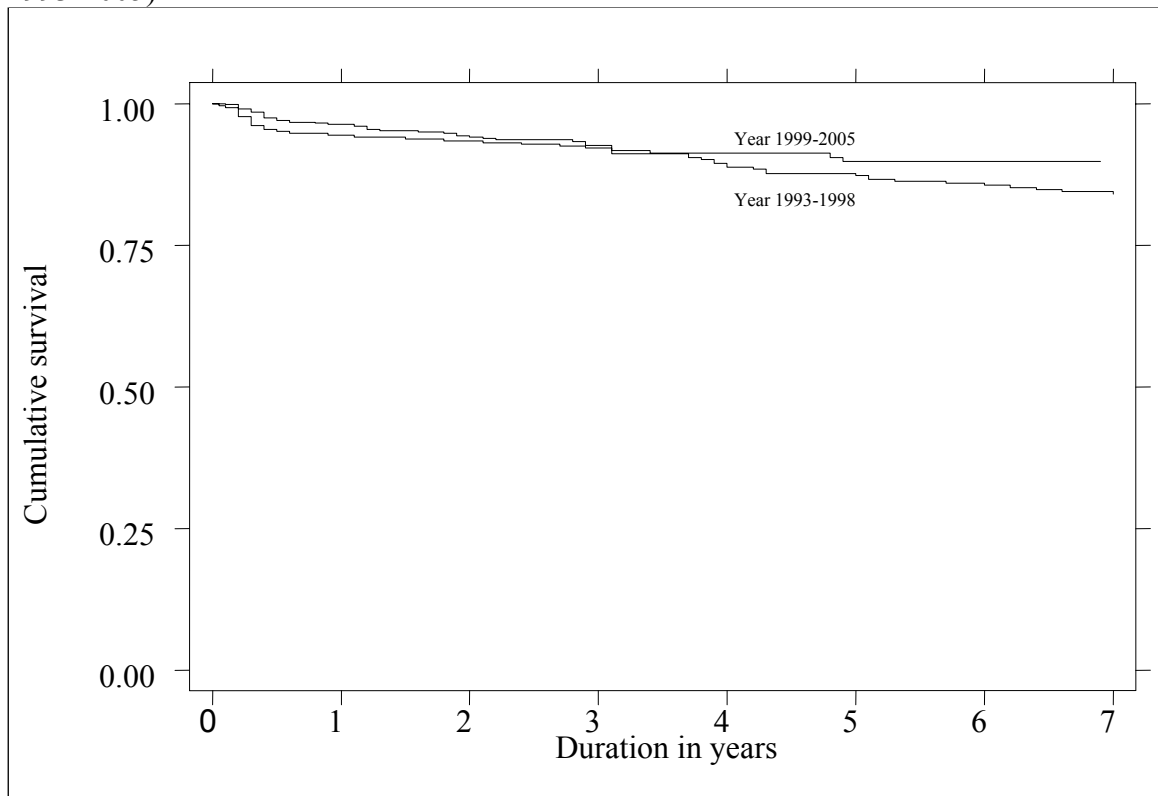
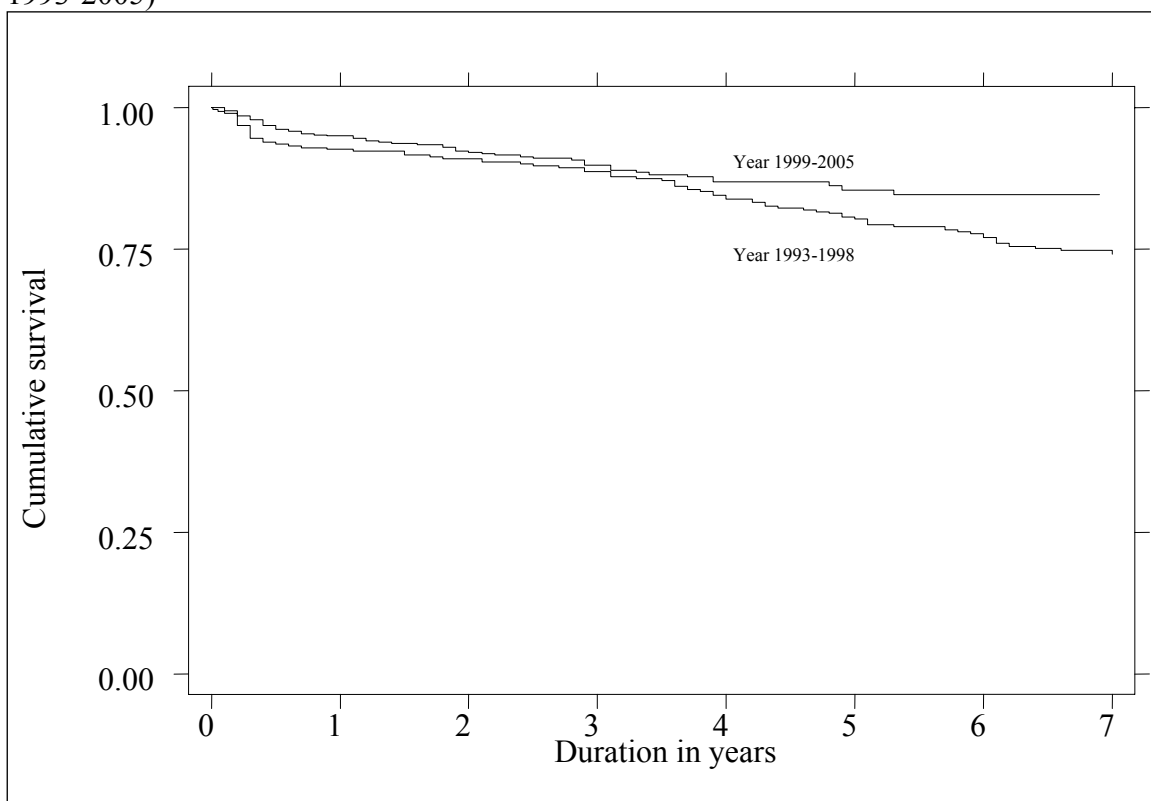


Table 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2005)

Year of Transplant Interval (years)	1993-1998			1999-2005		
	No.	% Survival	SE	No.	% Survival	SE
1	288	93	1	544	95	1
3	275	89	1	290	90	1
5	248	80	1	115	85	1
7	226	74	1	2	-	-

\* No.=Number at risk SE=standard error

Figure 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2005)



## 5.5 Cardiovascular Risk in Renal Transplant Recipients

### 5.5.1 Risk factors for IHD

In year 2005, 88.2% of recipients were hypertensive, 22% had diabetes and 55% had renal insufficiency fulfilling the criteria for CKD III and above. A majority had 2 or more cardiovascular risk factors with 9.2% having 3 major risk factors.

Table 5.5.1: Risk factors for IHD in renal transplant recipients at year 2004 and 2005

	2004	2005
Diabetes	28 (1.9)	19 (1.2)
Hypertension**	504 (34.3)	513 (33.5)
CKD	121 (8.2)	142 (9.3)
Diabetes + Hypertension**	145 (9.9)	157 (10.3)
Diabetes + CKD	21 (1.4)	20 (1.3)
CKD + Hypertension**	530 (36.1)	538 (35.2)
Diabetes + CKD + Hypertension**	120 (8.2)	141 (9.2)

\*\* Hypertension: BP systolic > 140 and BP diastolic >90

OR have either Beta blocker / Calcium channel blocker/ ACE inhibitor/ AIIRB / Other anti-hypertensive drugs

$GFR(mL/min/1.73m^2) = 1.2*(140-age(year))* weight(kg) / creatinine(\mu mol/L)$  if male  
 $GFR(mL/min/1.73m^2) = 0.85*(1.2*(140-age(year))* weight(kg) / creatinine(\mu mol/L))$  if female.

CKD stage III – GFR, 30- 60

CKD stage IV – GFR, 15- 30

CKD stage V – GFR, < 15

Figure 5.5.1a: Venn Diagram for Pre and Post Transplant Complications (in %) at year 2004

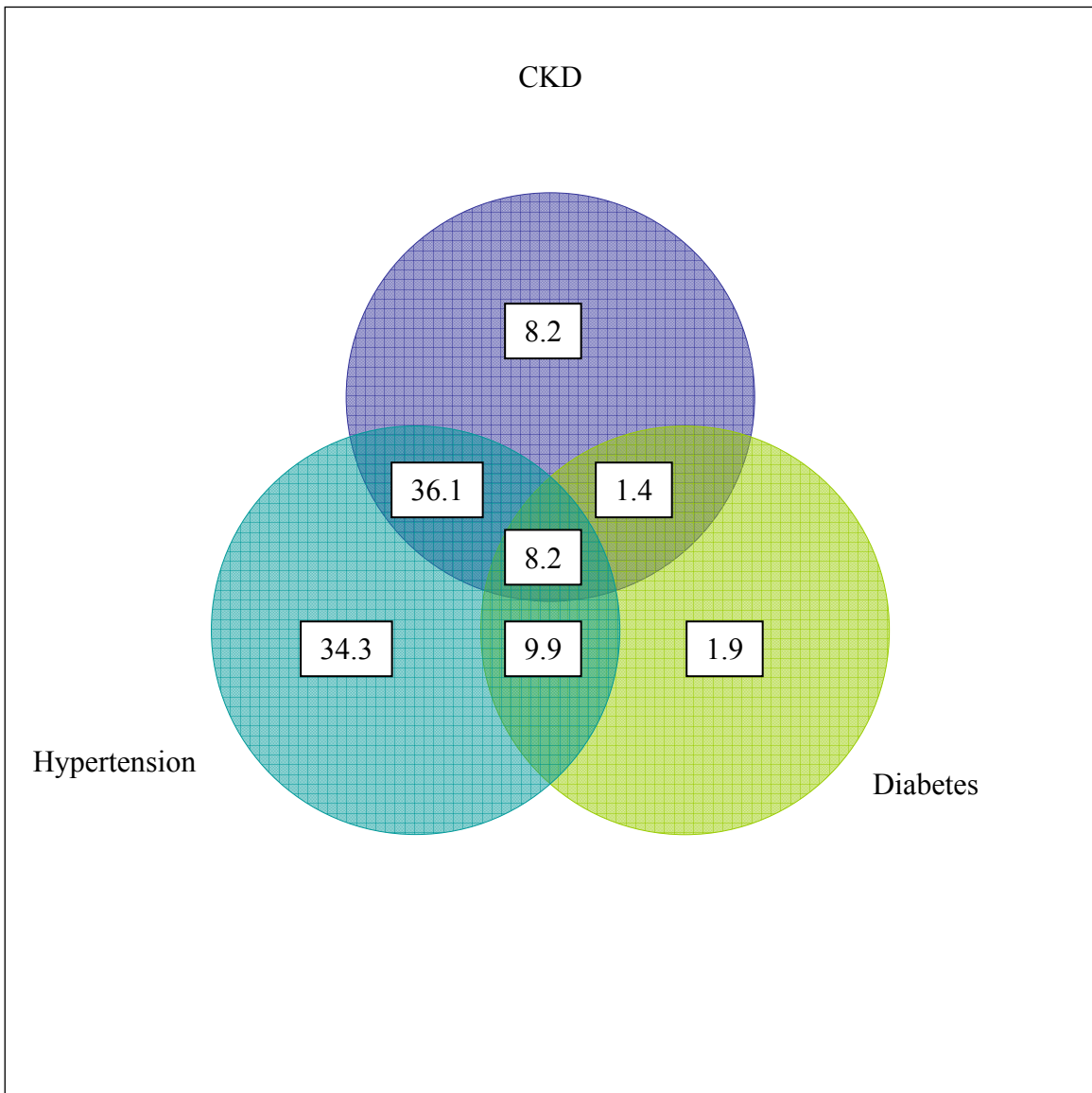
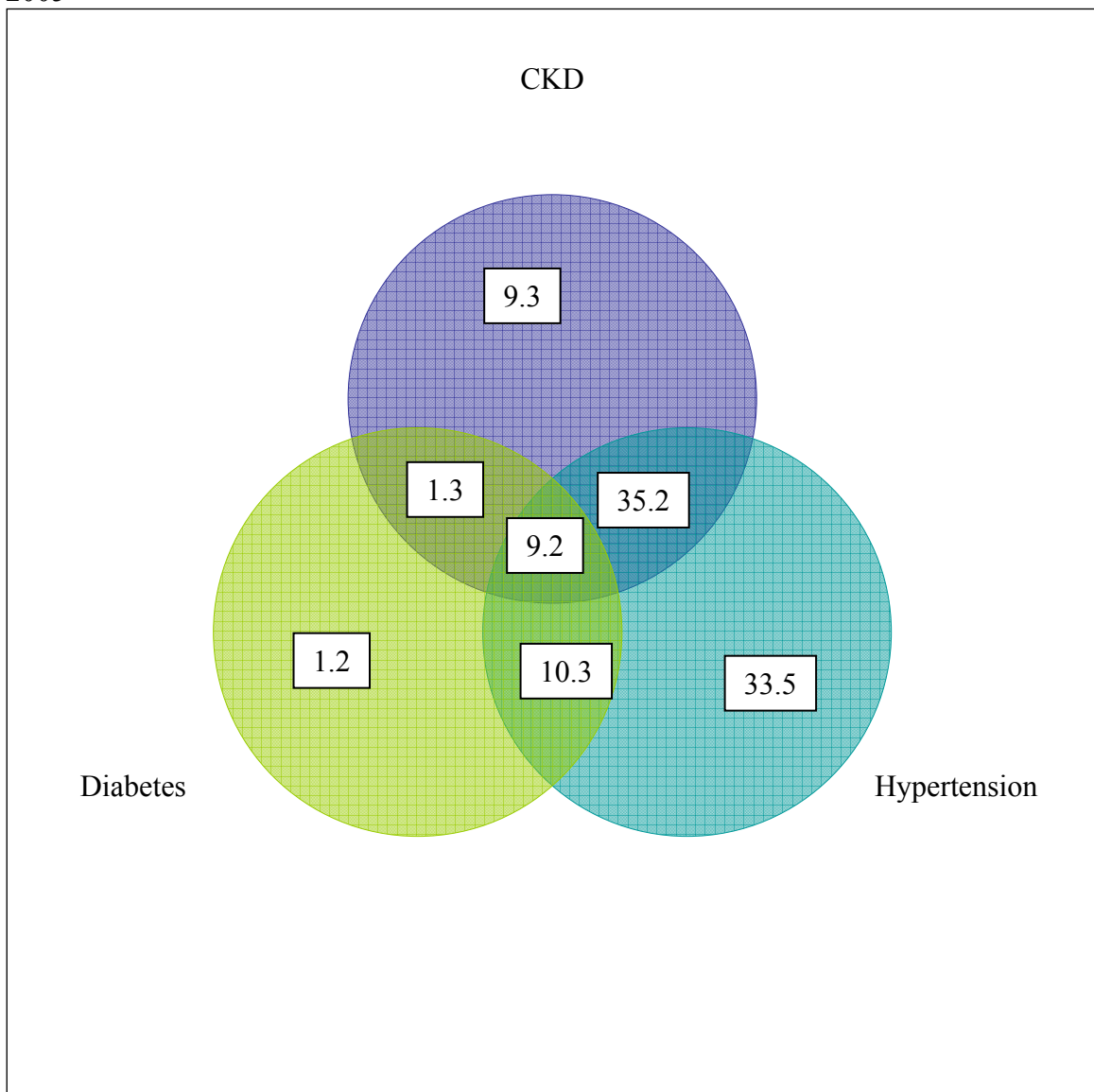


Figure 5.5.1b: Venn Diagram for Pre and Post Transplant Complications (in %) at year 2005



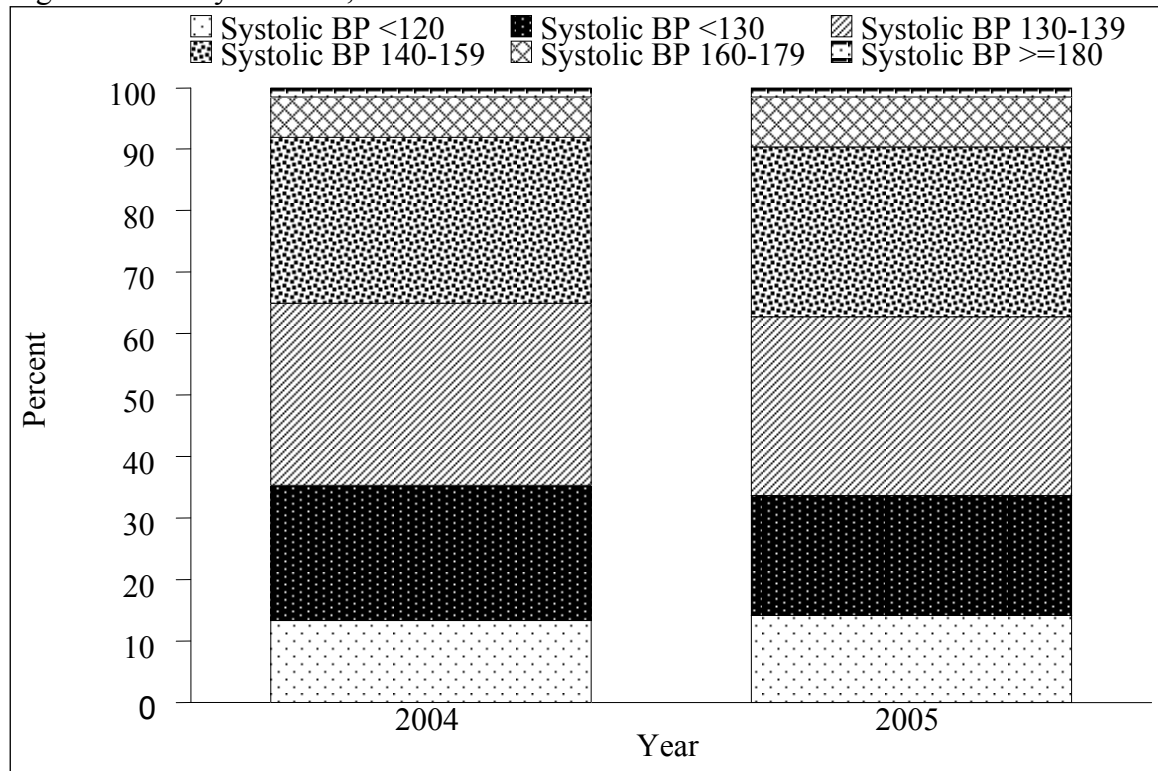
**5.5.2 Blood Pressure classification according to JNC VI criteria, 2004 and 2005**

8.1% had stage II systolic hypertension while another 1.5% had stage III systolic hypertension despite being on treatment.

Table 5.5.2a: Systolic BP, 2004 – 2005

	2004	2005
	No. (%)	No. (%)
Systolic BP <120	207 (13.4)	232 (14.2)
Systolic BP <130	341 (22.0)	318 (19.5)
Systolic BP 130-139	459 (29.6)	474 (29.0)
Systolic BP 140-159	418 (27.0)	452 (27.7)
Systolic BP 160-179	102 (6.6)	133 (8.1)
Systolic BP >=180	23 (1.5)	24 (1.5)

Figure 5.5.2a: Systolic BP, 2004 and 2005



4% had stage II diastolic hypertension while another 0.6% had stage III diastolic hypertension despite being on treatment.

Table 5.5.2b: Diastolic BP, 2004 and 2005

	2004	2005
	No. (%)	No. (%)
Diastolic BP<80	454 (29.3)	465 (28.5)
Diastolic BP<85	661 (42.6)	712 (43.6)
Diastolic BP 85-89	48 (3.1)	73 (4.5)
Diastolic BP 90-99	319 (20.6)	308 (18.9)
Diastolic BP 100-109	56 (3.6)	65 (4.0)
Diastolic BP >=110	12 (0.8)	10 (0.6)

Figure 5.5.2b: Diastolic BP, 2004 and 2005

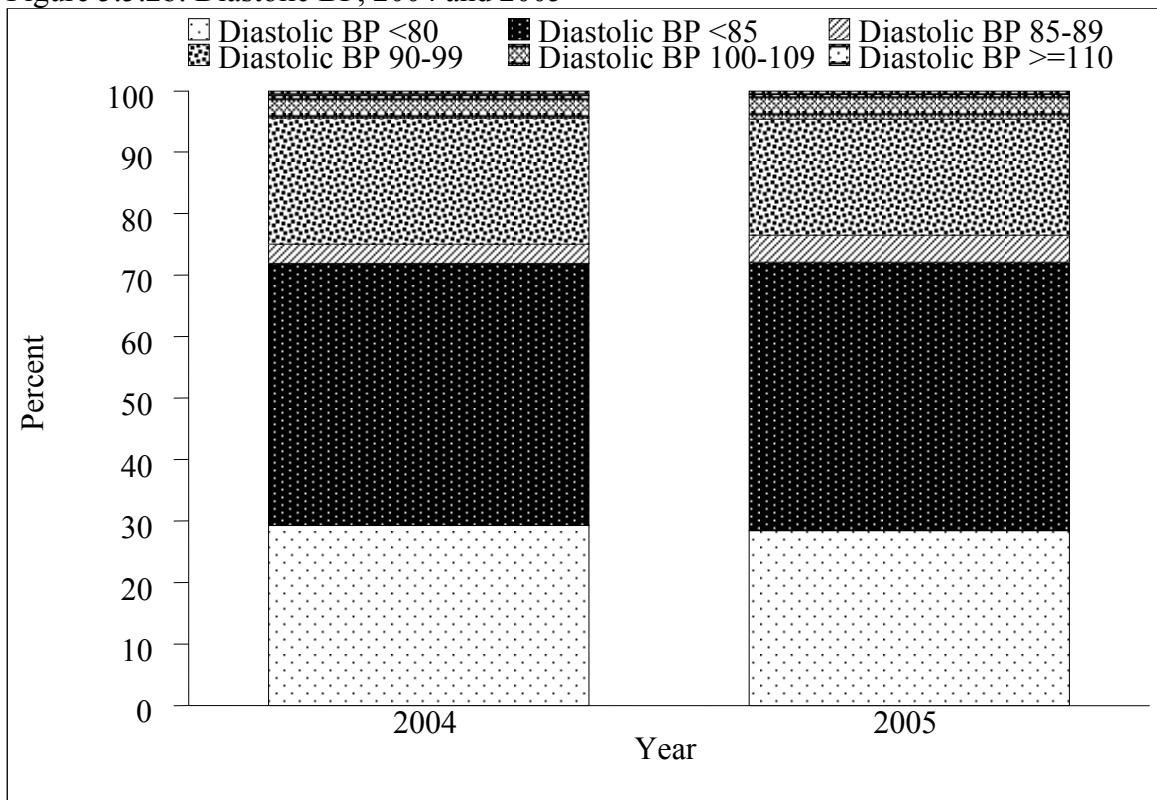


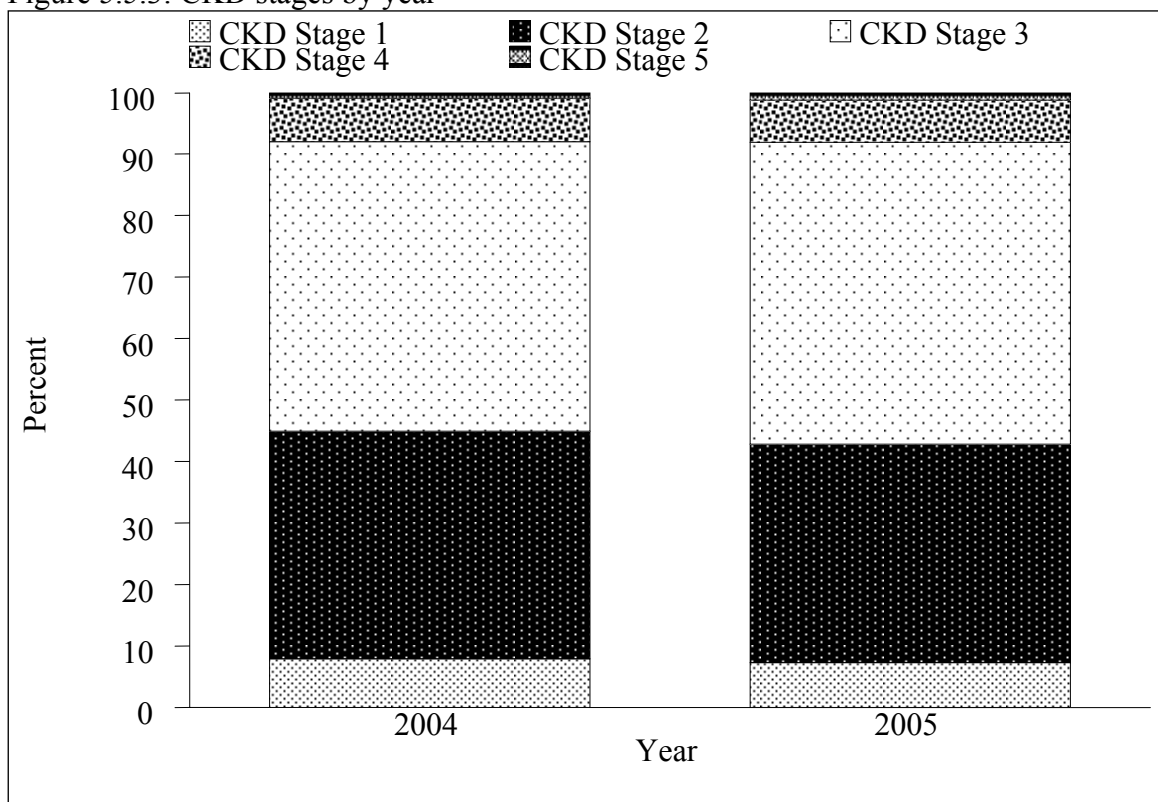


Table 5.5.3 shows classification of renal function according to CKD classification. Estimated GFR is calculated using the Cockcroft and Gault equation. 49.1% had CKD III while another 8.1% had CKD IV or V.

Table 5.5.3: CKD stages, 2004 - 2005

	2004	2005
	No. (%)	No. (%)
CKD stage 1	121 (7.9)	118 (7.3)
CKD stage 2	570 (37.0)	578 (35.6)
CKD stage 3	726 (47.1)	798 (49.1)
CKD stage 4	110 (7.1)	112 (6.9)
CKD stage 5	13 (0.8)	19 (1.2)

Figure 5.5.3: CKD stages by year

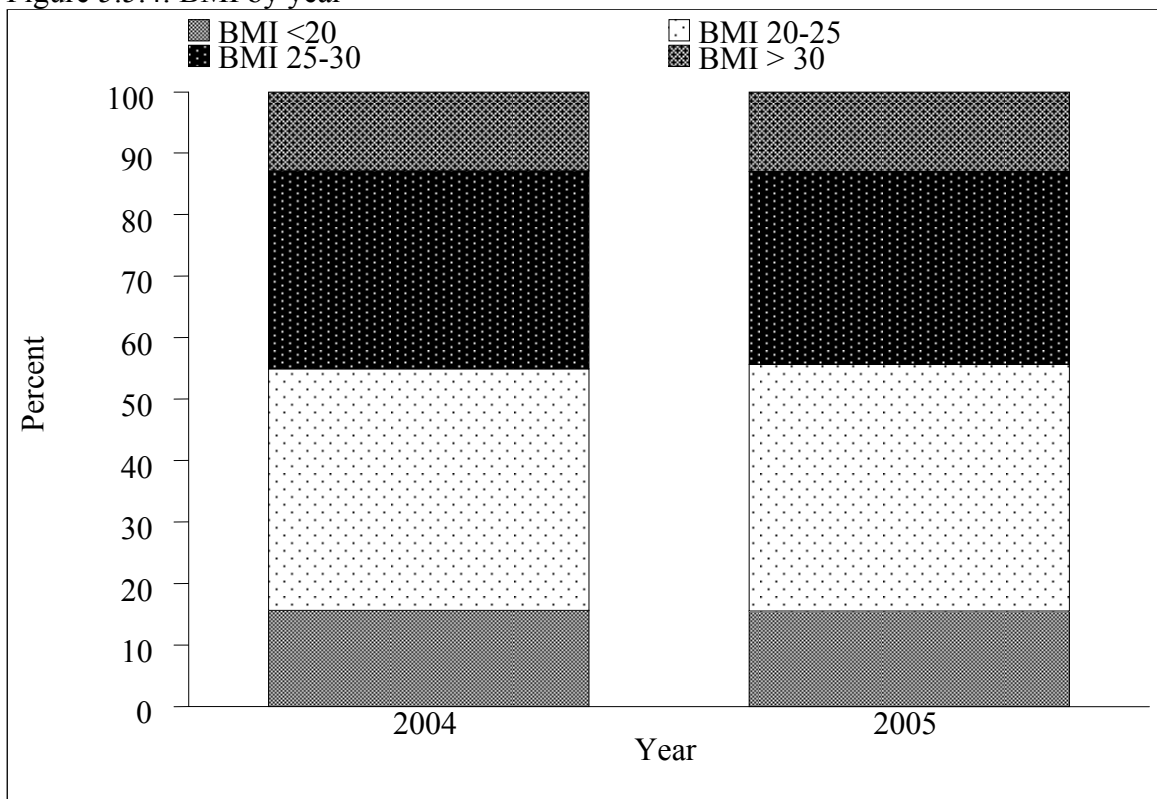


In year 2005, 31.4% were obese while another 13% were morbidly obese with BMI above 30.

Table 5.5.4: BMI, 2004 – 2005

	2004	2005
	No. (%)	No. (%)
BMI <20	242 (15.6)	253 (15.5)
BMI 20-25	610 (39.4)	656 (40.2)
BMI 25-30	499 (32.2)	512 (31.4)
BMI > 30	199 (12.8)	212 (13.0)

Figure 5.5.4: BMI by year



In year 2005, 21.7% had LDL cholesterol  $\geq 3.4$  mmol/L, 62.4% had total cholesterol  $> 5.2$  while 7% had HDL cholesterol  $< 1$ .

Table 5.5.5a: LDL, 2004 – 2005

	2004	2005
	No. (%)	No. (%)
LDL < 2.6	282 (18.2)	418 (25.6)
LDL 2.6-3.4	944 (60.9)	860 (52.7)
LDL $\geq 3.4$	324 (20.9)	355 (21.7)

Figure 5.5.5a: LDL by year

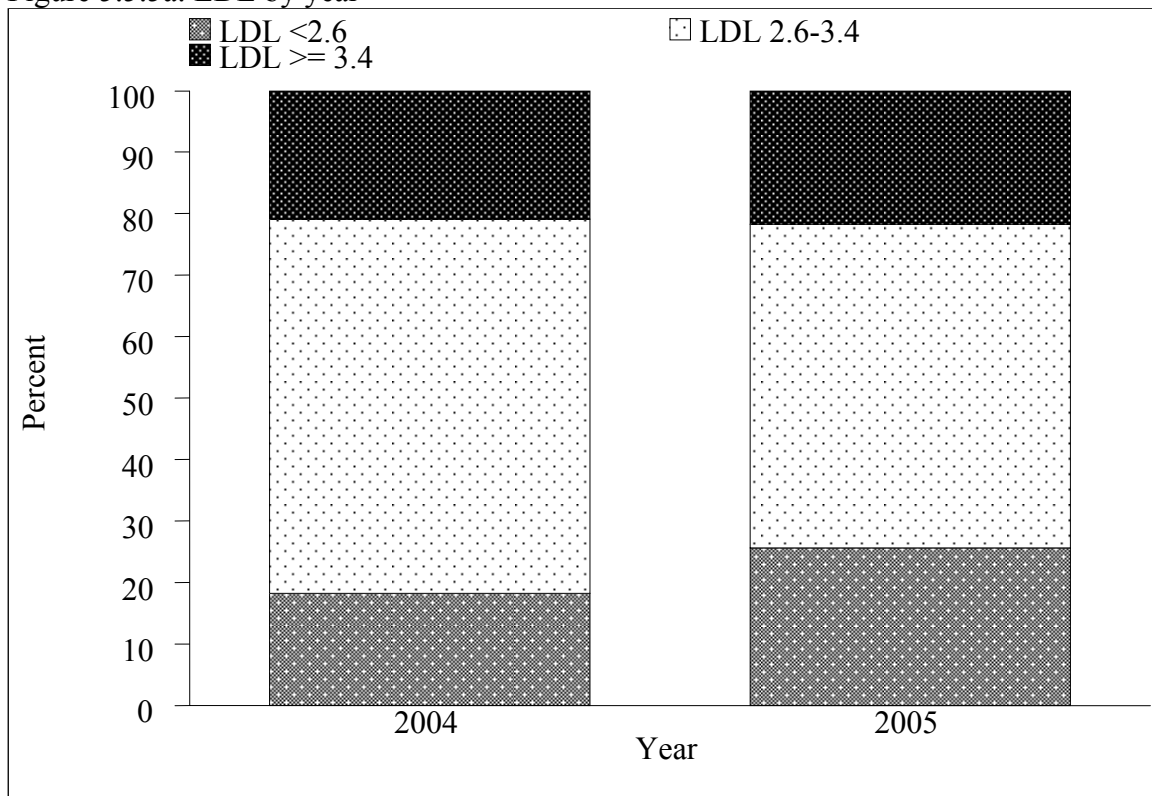


Table 5.5.5b: Total Cholesterol, 2004 - 2005

	2004	2005
	No. (%)	No. (%)
Total Cholesterol <4.1	113 (7.3)	159 (9.7)
Total Cholesterol 4.1-5.1	413 (26.6)	455 (27.9)
Total Cholesterol 5.2-6.2	751 (48.5)	772 (47.3)
Total Cholesterol 6.3- 7.2	197 (12.7)	173 (10.6)
Total Cholesterol > 7.2	76 (4.9)	74 (4.5)

Figure 5.5.5b: Total Cholesterol by year

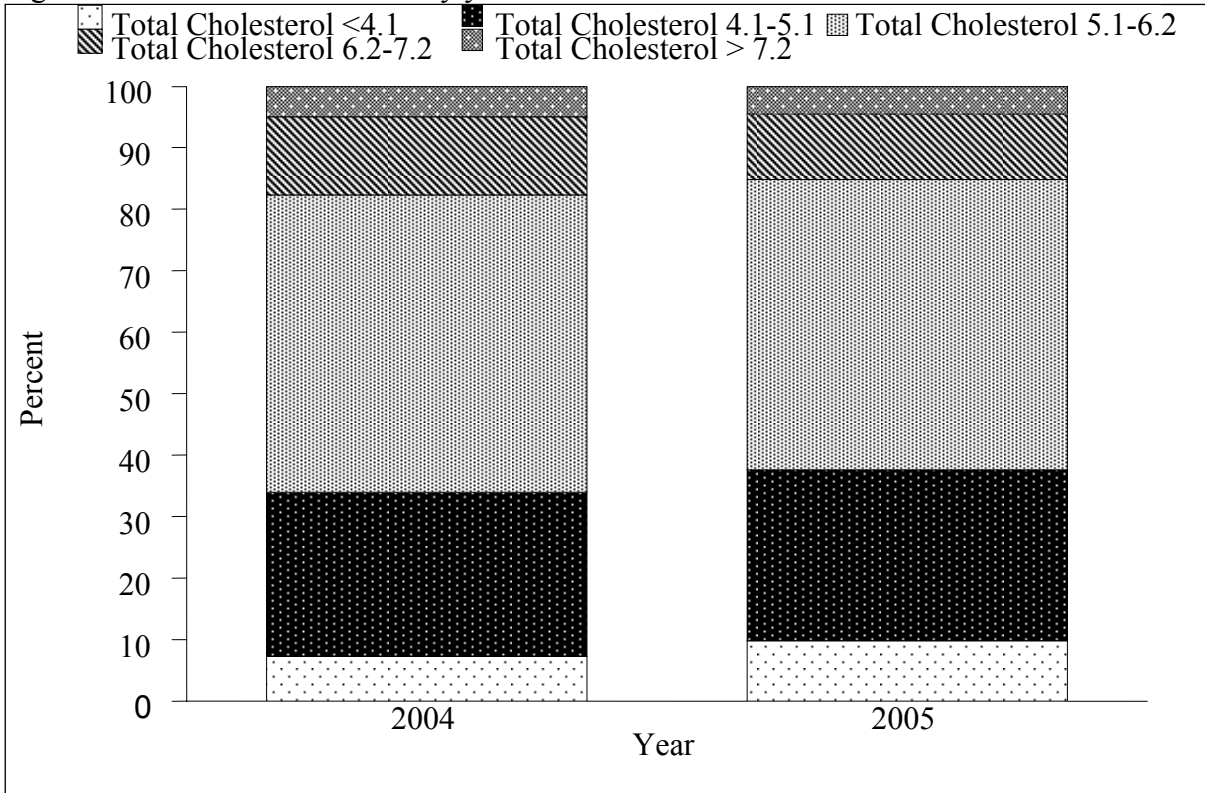
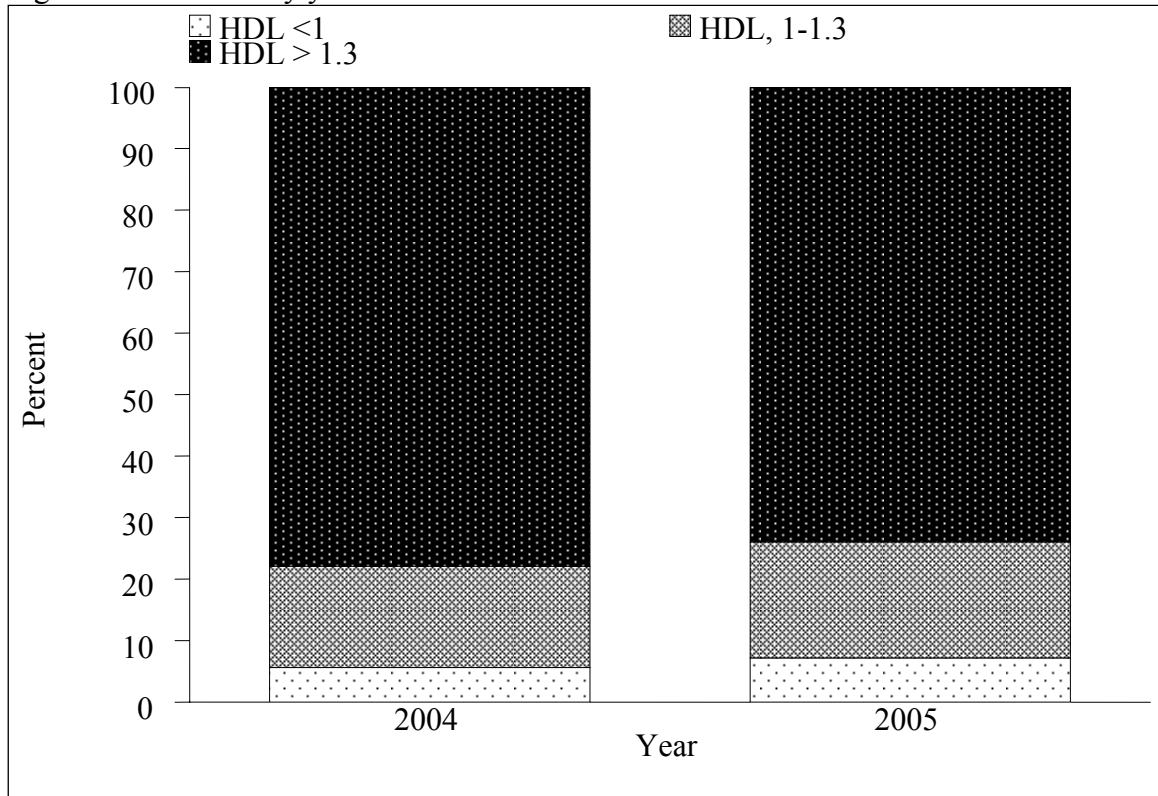


Table 5.5.5c: HDL, 2004 - 2005

	2004	2005
	No. (%)	No. (%)
HDL <1	87 (5.6)	118 (7.2)
HDL 1-1.3	255 (16.5)	308 (18.9)
HDL >1.3	1208 (77.9)	1207 (73.9)

Figure 5.5.5c: HDL by year



Majority of patients were on more than one anti-hypertensive drug with 34% on 2 anti-hypertensives while 18% required 3.

Table 5.5.6a: Treatment for hypertension, 2004 – 2005

Year	No.	% on anti-hypertensives	% on 1 anti-hypertensive drug	% on 2 anti-hypertensives	% on 3 anti-hypertensives
2004	1557	86	29	34	18
2005	1623	84	28	30	19

Table 5.5.6b: Distribution of Systolic BP without anti-hypertensives, 2004 – 2005

Year	No.	Mean	SD	Median	LQ	UQ	% Patients $\geq 160$ mmHg
2004	181	126.3	13.7	130	120	130	4
2005	226	126.7	15.4	130	120	137	4

Table 5.5.6c: Distribution of Diastolic BP without anti-hypertensives, 2004 – 2005

Year	No.	Mean	SD	Median	LQ	UQ	% Patients $\geq 90$ mmHg
2004	181	78.9	9.1	80	73	80	17
2005	226	79.3	11.5	80	70	80	18

Despite being on treatment, a substantial number of patients had SBP $\geq 160$  (11%) and DBP $\geq 90$  (25%).

Table 5.5.6d: Distribution of Systolic BP on anti-hypertensives, 2004 – 2005

Year	No.	Mean	SD	Median	LQ	UQ	% Patients $\geq 160$ mmHg
2004	1311	133.1	16.4	130	120	140	9
2005	1338	134.3	17.9	130	120	143	11

Table 5.5.6e: Distribution of Diastolic BP on anti-hypertensives, 2004 – 2005

Year	No.	Mean	SD	Median	LQ	UQ	% Patients $\geq 90$ mmHg
2004	1311	80.6	9.9	80	74	90	27
2005	1337	80.9	9.9	80	76	90	25

## CHAPTER 6

### HOMOGRAFT - HEART VALVE TRANSPLANTATION

*Editors:*

Mr. Hamdan Leman  
Mr. Mohamed Ezani Hj Md Taib

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## 6.0 INTRODUCTION

Since 1995, Institut Jantung Negara (IJN) has embarked on establishing a cardiovascular tissue bank. This tissue bank is to meet the rising demand for homograft implantation in the growing paediatric cardiothoracic surgical practice. IJN has successfully retrieved, prepared and implanted cardiac homografts in more than 110 patients. The homograft unit at IJN comprises of cardiothoracic surgeons and perfusionists / medical technicians who are involved in retrieving, processing and cryopreserving homograft tissues for storage. The number of homografts harvested over the last year has been less than compared to the previous year (9 for 2005). This reduction in the number of valves harvested is due to lack of organ donation and also the awareness about the possibility of using cardiac valves as homografts in our paediatric cardiothoracic patients. We hope that further streamlining of our organisational structure, frequent organ donation and homograft donation campaigns plus efficient networking systems involving other cardiothoracic units across Malaysia will create better awareness and increase the number of homograft procurement in the coming years.

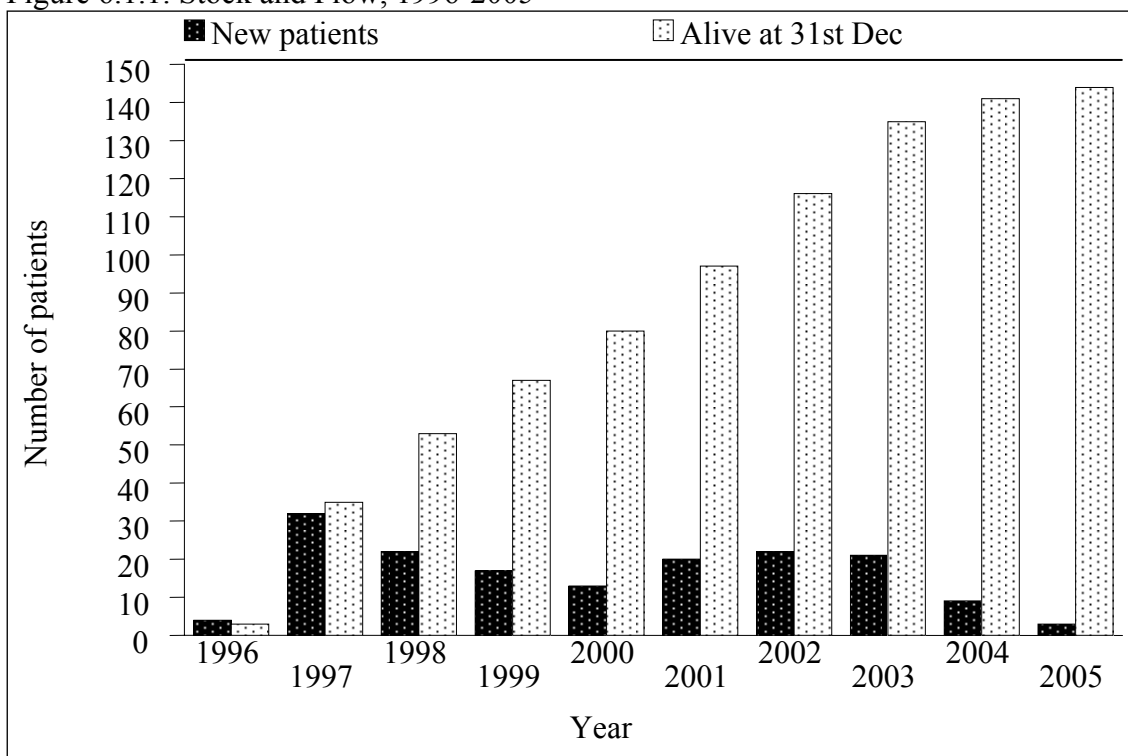
### 6.1 STOCK AND FLOW

Table 6.1.1: Stock and Flow, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
New transplant	4	32	22	17	13	20	22	21	9	3
Deaths*	1	0	4	3	0	3	3	2	3	0
Lost to follow up	0	0	0	0	0	0	0	0	0	0
Alive with functioning graft at 31 <sup>st</sup> December	3	35	53	67	80	97	116	135	141	144

\*based on year of death

Figure 6.1.1: Stock and Flow, 1996-2005



**6.2 RECIPIENTS' CHARACTERISTICS**

Table 6.2.1: Gender distribution, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Gender	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Male	2	19	9	9	10	6	9	14	3	0	81
Female	2	13	13	8	3	14	13	7	6	3	82
TOTAL	4	32	22	17	13	20	22	21	9	3	163

Figure 6.2.1: Gender distribution, 1996-2005

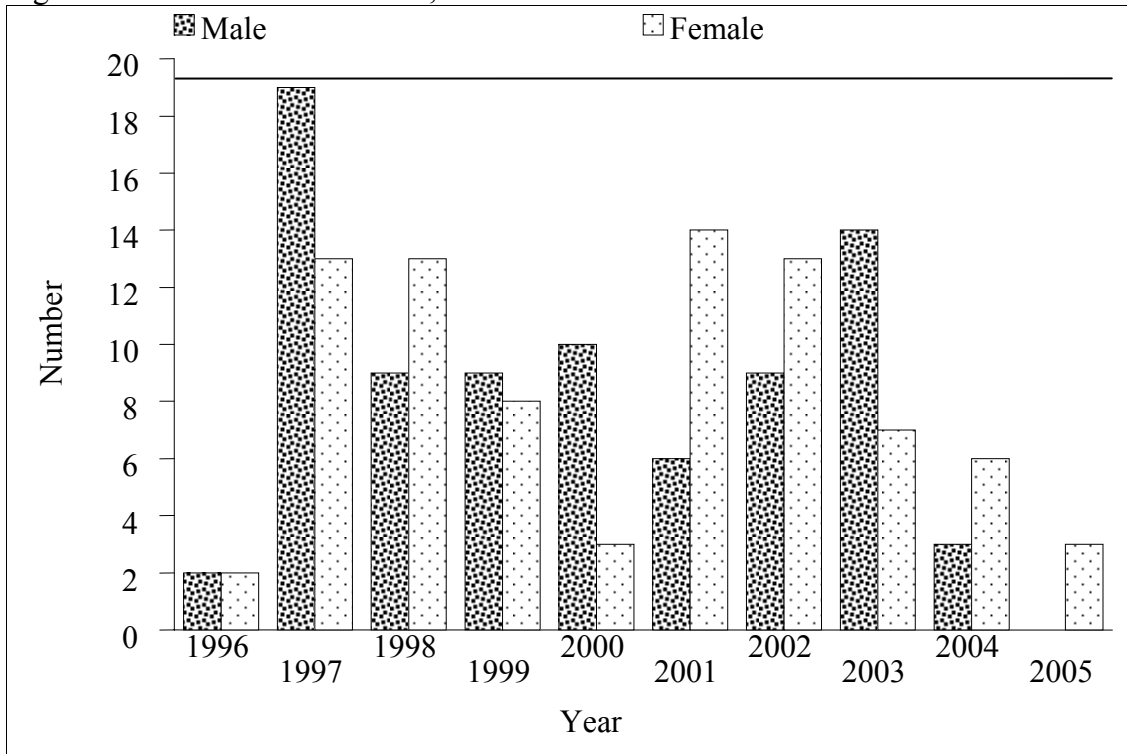


Table 6.2.2: Ethnic group distribution, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Ethnic group	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Malay	1	19	15	9	9	10	16	12	6	3	100
Chinese	3	11	4	3	2	9	4	6	1	0	43
Indian	0	2	2	2	0	1	2	2	1	0	12
Others	0	0	1	3	2	0	0	1	1	0	8
TOTAL	4	32	22	17	13	20	22	21	9	3	163

Figure 6.2.2: Ethnic group distribution, 1996-2005

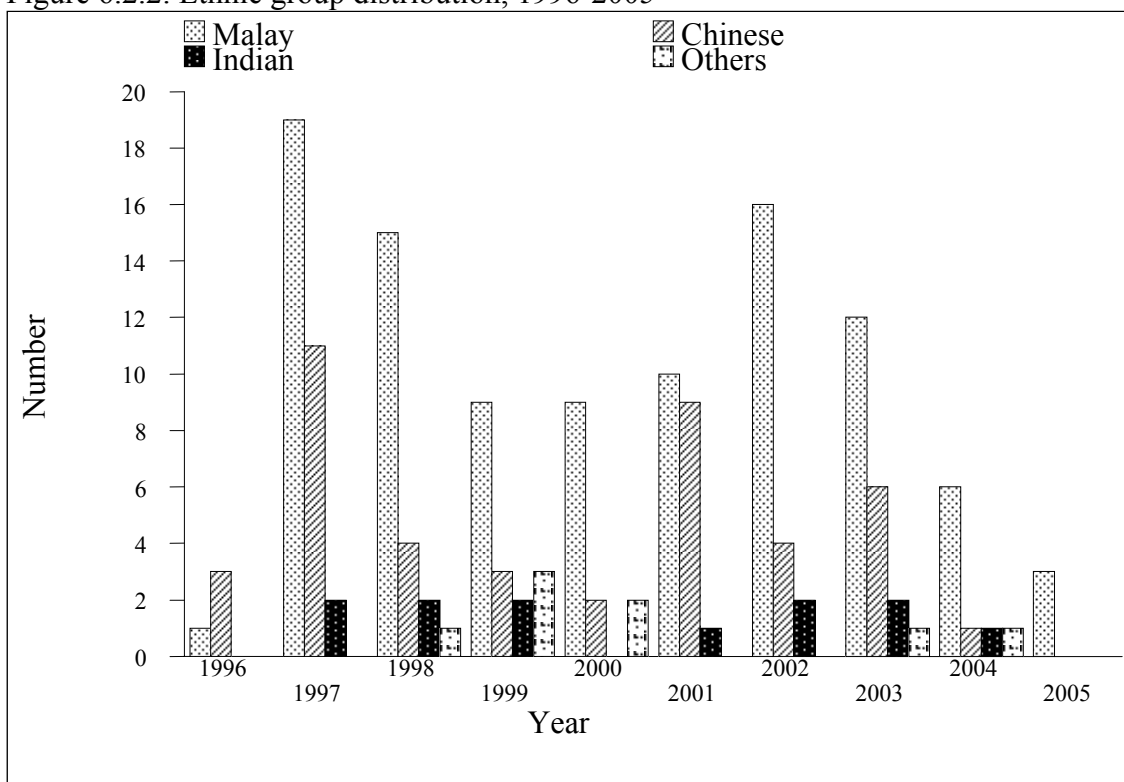
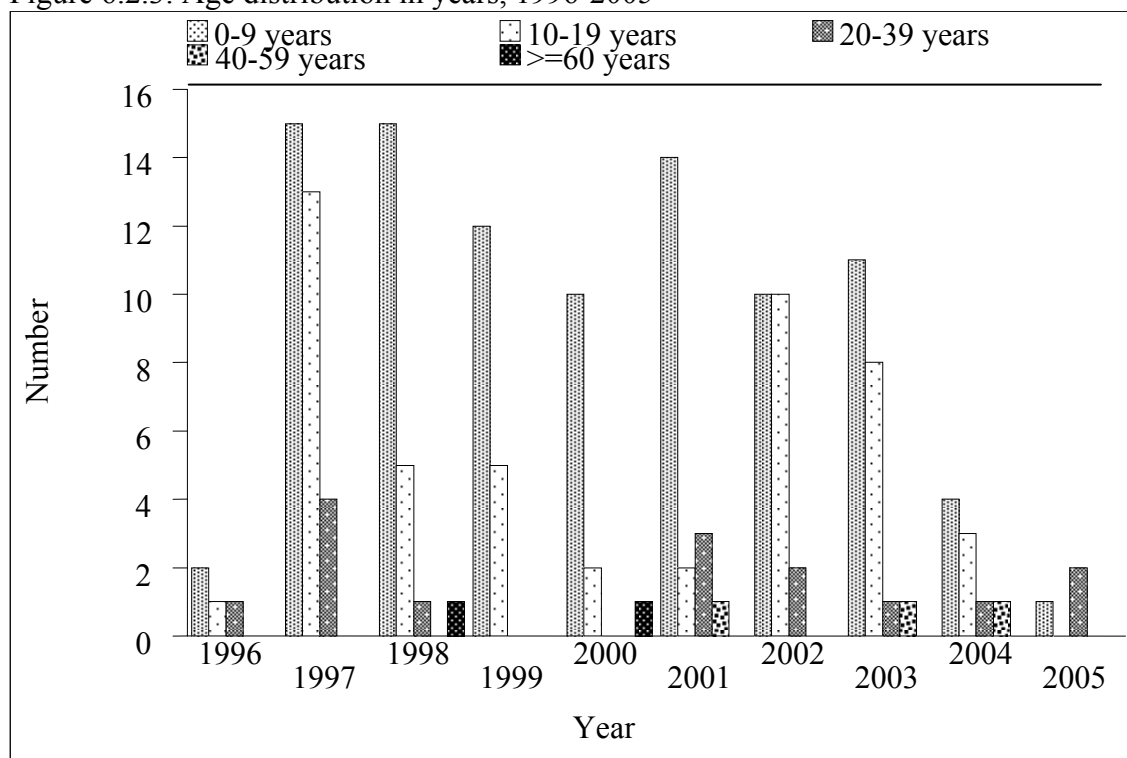


Table 6.2.3: Age distribution in years, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Age group	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
0-9	2	15	15	12	10	14	10	11	4	1	94
10-19	1	13	5	5	2	2	10	8	3	0	49
20-39	1	4	1	0	0	3	2	1	1	2	15
40-59	0	0	0	0	0	1	0	1	1	0	3
>=60	0	0	1	0	1	0	0	0	0	0	2
TOTAL	4	32	22	17	13	20	22	21	9	3	163
Mean	12	11	11	7	12	11	10	12	15	15	11
SD	7	7	15	4	17	14	6	11	11	8	11
Median	11	10	8	7	8	5	10	9	10	20	8
Min	5	3	3	1	2	5	3	2	5	6	3
Max	21	30	70	17	67	53	28	53	42	20	70

\* Age=date of implantation – date birth

Figure 6.2.3: Age distribution in years, 1996-2005



### 6.3 TRANSPLANT PRACTICES

#### 6.3.1 Donor details

Table 6.3.1: Number of valves harvested by type of homograft, 1996-2005

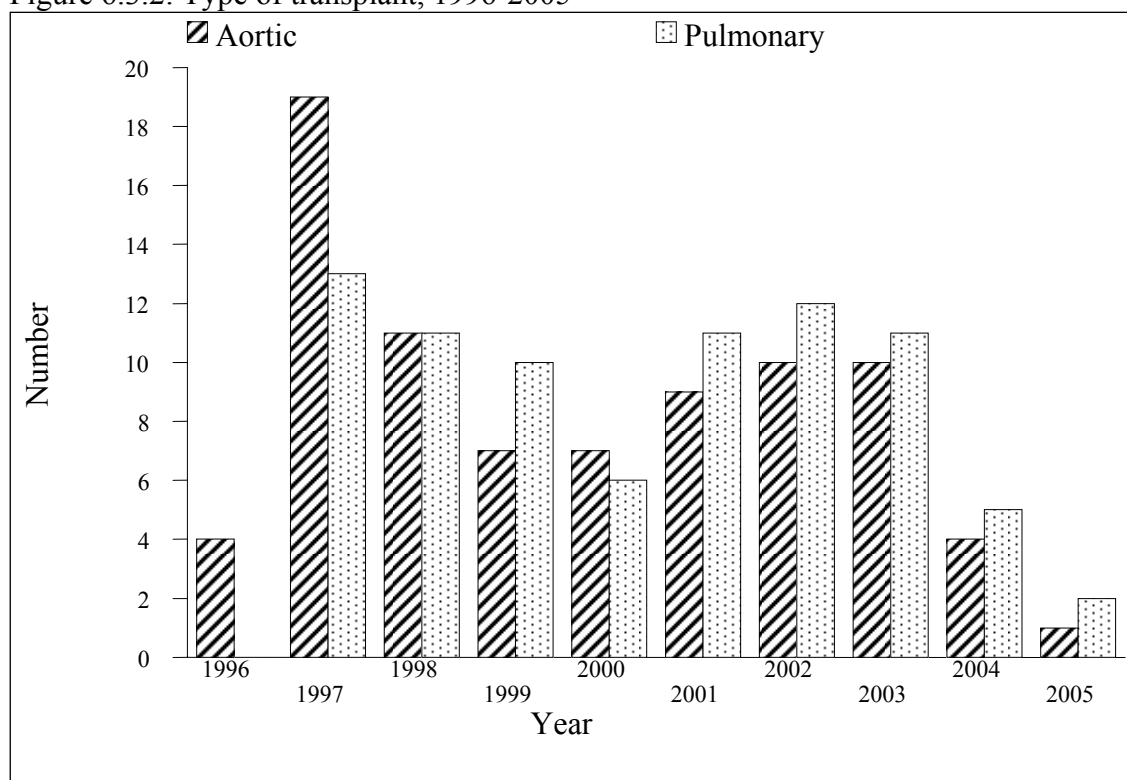
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Type of homograft	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aortic	8	17	10	8	11	14	10	8	7	4	97
Pulmonary	1	14	11	10	12	12	14	9	8	5	96
TOTAL	9	31	21	18	23	26	24	17	15	9	193

#### 6.3.2 Transplant details

Table 6.3.2: Type of transplant, 1996-2005

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	TOTAL
Type of transplant	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aortic	4	19	11	7	7	9	10	10	4	1	82
Pulmonary	0	13	11	10	6	11	12	11	5	2	81
TOTAL	4	32	22	17	13	20	22	21	9	3	163

Figure 6.3.2: Type of transplant, 1996-2005



**6.4 TRANSPLANT OUTCOMES**

Table 6.4.1: Patient survival by gender, 1996-2005

Interval (years)	Male		Female	
	% Survival	SE	% Survival	SE
1	91	3	93	3
3	89	4	91	3
5	89	4	91	3

SE=standard error

Figure 6.4.1: Patient survival by gender, 1996-2005

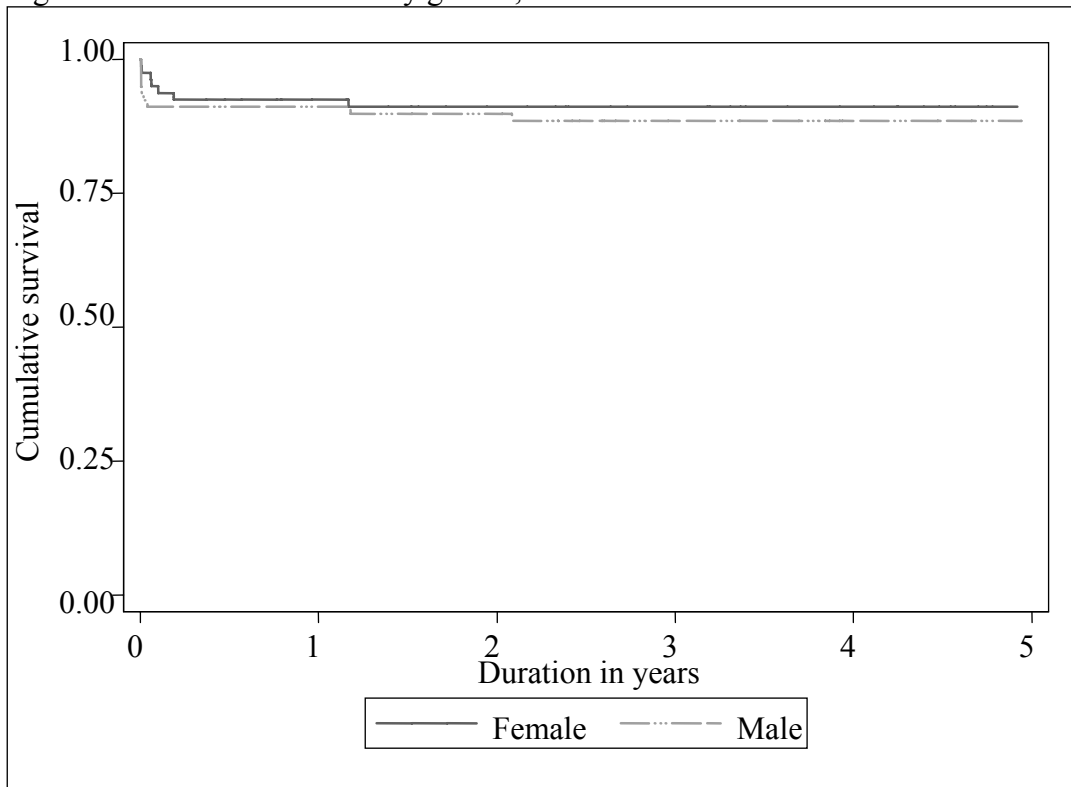


Table 6.4.2: Patient survival by age group, 1996-2005

Age group Interval (months)	0-9 years		10-19 years		≥20 years	
	% Survival	SE	% Survival	SE	% Survival	SE
1	89	3	96	3	95	5
3	88	3	92	4	95	5
5	88	3	92	4	95	5

SE=standard error

Figure 6.4.2: Patient survival by age group, 1996-2005

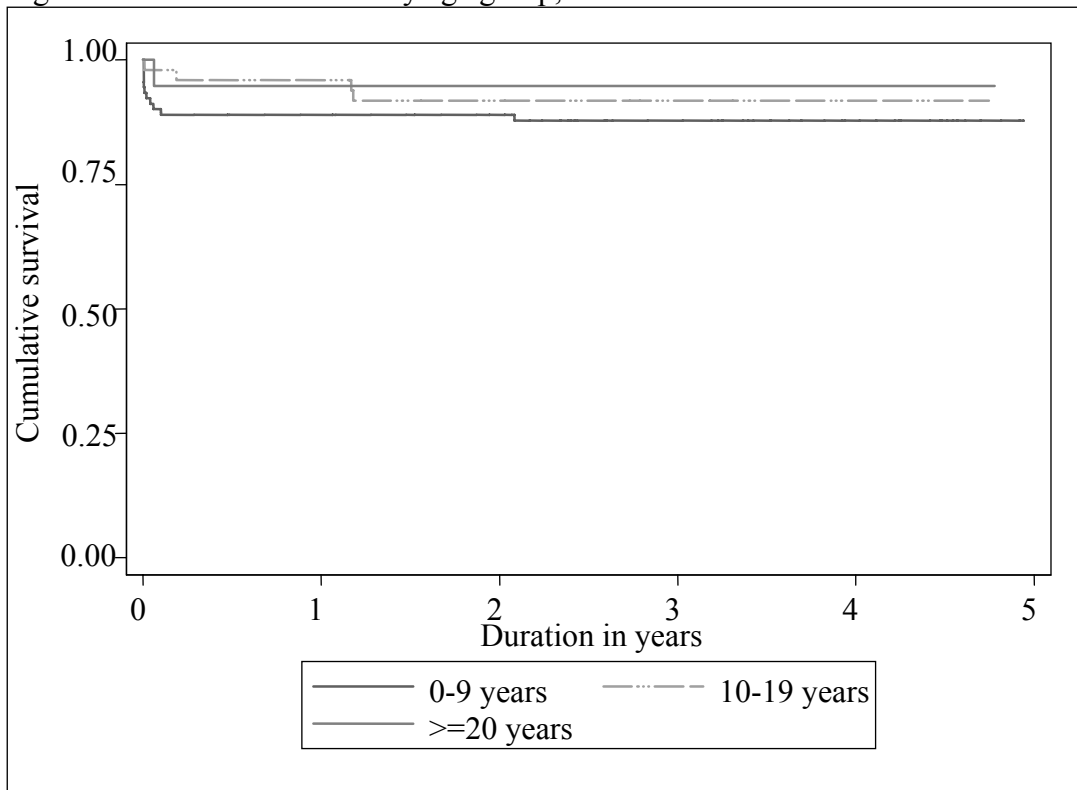


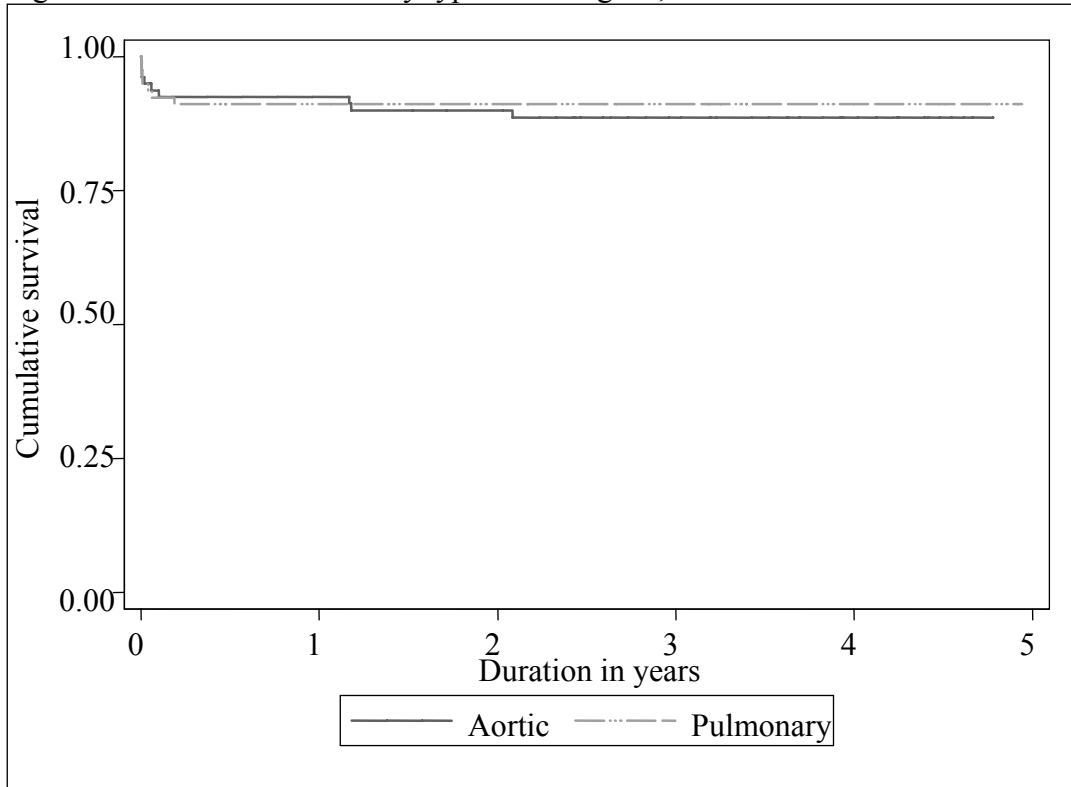


Table 6.4.3: Patient survival by type of homograft, 1996-2005

Type of homograft Interval (years)	Aortic		Pulmonary	
	% Survival	SE	% Survival	SE
1	93	3	91	3
3	89	4	91	3
5	89	4	91	3

SE=standard error

Figure 6.4.3: Patient survival by type of homograft, 1996-2005



## **CHAPTER 7**

### **BONE AND TISSUE TRANSPLANTATION**

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## 7.0 INTRODUCTION

This chapter presents data provided by National Tissue Bank, Universiti Sains Malaysia (USM). Bone and tissues procured by National Tissue Bank were distributed to various government and private hospitals throughout the country. However, bone allografts procured by Bone Bank HKL were used within HKL. Bone Bank University Malaya Medical Centre (UMMC) was non operational in 2005 due to storage unavailability.

Even though bone and tissue allograft transplantation are widely performed, data on recipients is still lacking. Thus, the information available could not allow us to estimate the magnitude of bone and tissue transplant activity in the country in 2005. Aggressive effort has to be made to ensure that all cases of bone and tissue allograft transplantation are reported.

**7.1 STOCK OF BONE AND AMNIOTIC MEMBRANE ALLOGRAFTS**

Table 7.1: The types of tissue/bone allografts supplied by National Tissue Bank, USM in 2005

	<b>Tissue/Bone Bank</b>
Types of Tissue/Bone Allograft	National Tissue Bank, USM
	No. (pieces)
DF Knee slices	0
DF Femur	7
DF Femoral head	88
DF Humerus	3
DF Tibia	6
DF Radius	2
DF Ulna	3
DF Patella	1
FD Cancellous	19
FD Cortical	0
FD Cortico-cancellous	2
Amniotic membranes	64
<b>TOTAL</b>	<b>195</b>

DF – Deep-frozen

FD – Freeze-dried

## 7.2 HOSPITALS WHERE BONE AND TISSUES ARE UTILISED

Table 7.2: The names of hospitals/other sectors using bone allografts in 2005

	<b>Tissue/Bone Bank</b>
	National Tissue Bank, USM
	No. (pieces)
<b>MOH</b>	
Hospital Raja Perempuan Zainab II, Kota Bharu	2
Hospital Sultanah Aminah, Johor Bahru	19
Hospital Tengku Ampuan Afzan, Kuantan	1
Hospital Tengku Ampuan Rahimah, Klang	5
Hospital Alor Setar	10
Hospital Umum Sarawak	13
Hospital Ipoh	4
Hospital Pulau Pinang	1
Hospital Seremban	2
Hospital Seberang Jaya	2
<b>TOTAL</b>	<b>59</b>
<b>University</b>	
HUKM	2
HUSM	23
UMMC	3
<b>TOTAL</b>	<b>28</b>
<b>Private and other sectors</b>	
Hospital Fatimah Ipoh	12
Hospital Tung Shin	2
Mahkota Specialist Centre	2
Sentosa Medical Centre	1
Stryker	4
Syarikat Kemajuan Abadi	10
Teo Orthopaedic Clinic, Kuala Lumpur	10
Zimmer	3
<b>TOTAL</b>	<b>44</b>

Table 7.3: The names of hospitals/other sectors using amniotic membranes in 2005

	<b>Tissue/Bone Bank</b>
	National Tissue Bank, USM
	No. (pieces)
<b>MOH</b>	
Hospital Kuala Lumpur	15
Hospital Umum Sarawak	10
Hospital Melaka	5
Hospital Tengku Ampuan Rahimah, Klang	5
Hospital Sultanah Aminah, Johor Bahru	0
Hospital Tengku Ampuan Afzan, Kuantan	6
Hospital Raja Perempuan Zainab II, Kota Bharu	5
Hospital Kuala Terengganu	1
<b>TOTAL</b>	<b>47</b>
<b>University</b>	
HUSM	1
UMMC	0
HUKM	0
<b>TOTAL</b>	<b>1</b>
<b>Private</b>	
Gleneagles Medical Centre, Penang	4
Klinik Iman, Seremban	1
Hospital Mata Tun Hussein Onn	4
Puteri Specialist Hospital, Johor Bharu	5
Sri Kota Medical Centre	2
<b>TOTAL</b>	<b>16</b>

\*Only National Tissue Bank, USM supplied the amniotic membranes

## **CHAPTER 8**

### **CADAVERIC ORGAN AND TISSUE DONATION**

*Editor:*

Datin Dr. Lela Yasmin Mansor



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## 8.0 INTRODUCTION

The year 2005 saw a decline in the number of potential donor referrals made to the National Transplant Procurement and Management Unit and subsequent actual number of organ and tissue donations. From a total of 62 potential donor referrals there were 13 actual donors, of which only 5 were brain dead multi-organ and tissue donors while 8 were post cardiac death tissue donors. This represented a rate of 0.53 donations per million population. Although generally the number of the various organs and tissues decreased, we had our first lung donor in December 2005 (Table 8.1) who successfully donated for a double lung transplant.

Compared to previously, the donors came from the older age group, with mean age  $46.4 \pm 24.8$  years. The youngest was a Malay three year old child who donated liver, kidneys, heart valves and eyes, while the oldest was an 81 year old eye donor (Table 8.2). All the donors were Malaysians, of whom more than half were Indians (7 donors) followed by Chinese (5 donors) and the sole Malay boy. There were more male donors than female (62% versus 38 %) (Table 8.3–8.6).

More than half of the donors came from Selangor (7 donors) with 3 of the donations taking place in Selayang hospital (Table 8.7). 10 of the donations were initiated by the next of kin including for the only 3 donors who carried the donor pledge card. Majority of the donors deaths in 2005 were due to medical causes, with only 3 being due to road accident deaths and there was one homicide case (Table 8.10). More than half of the procurements took place in the bigger state general hospitals but there were increased number of donations (5 out of 13) from private hospitals (Table 8.12).

Table 8.1: Number of procurement by year, 1997-2005

<b>Number of procurement by year</b>									
<b>Total=137</b>									
<b>Year</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Number of donors	5	7	4	13	24	30	25	16	13
Rate of procurement (per million population)	0.25	0.34	0.19	0.59	1.07	1.31	1.07	0.67	0.53
<b>Organs procured</b>									
Cornea	4	10	6	18	34	48	40	20	22
Heart	1	3	2	3	4		2		1
Liver			2	1	1	2	1	3	3
Kidney	8	10	6	22	38	25	16	18	8
Heart valve		1	2	8	11	11	10	20	6
Bone		1		3	2	6	5	5	2
Skin				2	2	3		1	-
Lung									1

Table 8.2: Donor's age, 1997-2005

Donor's age	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	Total N=137
Age (year)										
<1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	1 (1)
1-9	1 (20)	0 (0)	0 (0)	1 (8)	1 (4)	1 (3)	1 (4)	1 (6)	1 (8)	7 (5)
10-19	0 (0)	1 (14)	2 (50)	7 (54)	2 (8)	3 (10)	4 (16)	3 (19)	1 (8)	23 (17)
20-29	1 (20)	3 (43)	2 (50)	1 (8)	6 (25)	6 (20)	4 (16)	3 (19)	2 (15)	28 (20)
30-39	1 (20)	0 (0)	0 (0)	0 (0)	5 (21)	1 (3)	2 (8)	2 (13)	1 (8)	12 (9)
40-49	0 (0)	1 (14)	0 (0)	2 (15)	4 (17)	8 (27)	4 (16)	4 (25)	2 (15)	25 (18)
50-59	1 (20)	2 (29)	0 (0)	1 (8)	4 (17)	7 (23)	3 (12)	3 (19)	1 (8)	22 (16)
60-69	0 (0)	0 (0)	0 (0)	1 (8)	2 (8)	1 (3)	3 (12)	0 (0)	3 (23)	10 (7)
70-79	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (10)	3 (12)	0 (0)	1 (8)	7 (5)
80-89	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8)	1 (1)
No data	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Total	5	7	4	13	24	30	25	16	13	137
Mean	27.3	34.4	20.5	25.2	36.8	41.9	39.4	32.5	46.4	36.8
SD	21.1	17.1	4.4	18.7	15.7	18.9	22.3	15.6	24.8	19.6
Median	28	25	21	17	37	46	40	31.5	48	38
Minimum	2	16	15	5	8	4	<1*	8	3	<1*
Maximum	21	57	25	60	66	79	77	55	81**	81**

\* The youngest tissue donor was 37 days old (donated heart valves); the youngest organ donor was 2.5 years old (donated kidneys and eyes)

\*\* The oldest tissue donor was 81 years old (donated eyes); the oldest organ donor was 65 years old (donated kidneys)

Table 8.3: Donor's gender, 1997-2005

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	Total N=137
Male	3 (60)	7 (100)	3 (75)	11 (85)	20 (83)	27 (90)	21 (84)	12 (75)	8 (62)	112 (82)
Female	2 (40)	0 (0)	1 (25)	2 (15)	4 (17)	3 (10)	4 (16)	4 (25)	5 (38)	25 (18)

Table 8.4: Donor's ethnic group, 1997-2005

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	2004 N=16	2005 N=13	Total N=137
Malay	1 (20)	0 (0)	0 (0)	2 (15)	1 (4)	0 (0)	0 (0)	1 (6)	1 (8)	6 (4)
Chinese	3 (60)	4 (57)	4 (100)	7 (54)	17 (71)	13 (43)	14 (56)	14 (88)	5 (38)	81 (59)
Indian	1 (20)	3 (43)	0 (0)	3 (23)	4 (17)	15 (50)	9 (36)	1 (6)	7 (54)	43 (31)
Others*	0 (0)	0 (0)	0 (0)	1 (8)	2 (8)	2 (7)	2 (8)	0 (0)	0 (0)	7 (5)

\* This category included one Orang Asli donor

Table 8.5: Donor's religion, 1997-2005

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	2004 N=16	2005 N=13	Total N=137
Islam	1 (20)	0 (0)	0 (0)	2 (15)	1 (4)	0 (0)	1 (4)	2 (13)	1 (8)	8 (6)
Buddhism	3 (60)	3 (43)	0 (0)	0 (0)	1 (4)	5 (17)	15 (60)	14 (88)	5 (38)	46 (34)
Hinduism	1 (20)	3 (43)	0 (0)	3 (23)	3 (13)	13 (43)	8 (32)	0 (0)	5 (38)	36 (26)
Christianity	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)	1 (3)	1 (4)	0 (0)	0 (0)	3 (2)
Others*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (15)	2 (1)
Unknown**	0 (0)	1 (14)	4 (100)	7 (54)	19 (79)	11 (37)	0 (0)	0 (0)	0 (0)	42 (31)

\* This category included one Sikhism and one Sinhalese

\*\* For 42 Chinese donors the religion was not stated

Table 8.6: Donor's nationality, 1997-2005

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	Total N=137
Malaysian	5 (100)	7 (100)	4 (100)	13 (100)	21 (88)	29 (97)	24 (96)	16 (100)	13 (100)	132 (96)
Non-Malaysian	0 (0)	0 (0)	0 (0)	0 (0)	3 (13)	1 (3)	1 (4)	0 (0)	0 (0)	5 (4)

Table 8.7: Donor's state of residence, 1997-2005

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	2004 N=16	2005 N=13	Total N=137
Johor	0 (0)	0 (0)	0 (0)	3 (23)	0 (0)	2 (7)	3 (12)	1 (6)	1 (8)	10 (7)
Malacca	0 (0)	1 (14)	1 (25)	0 (0)	0 (0)	1 (3)	2 (8)	0 (0)	1 (8)	6 (4)
Negeri Sembilan	0 (0)	1 (14)	0 (0)	1 (8)	0 (0)	1 (3)	4 (16)	0 (0)	1 (8)	8 (6)
Selangor	2 (40)	1 (14)	0 (0)	0 (0)	3 (13)	9 (30)	6 (24)	6 (38)	7 (54)	34 (25)
WP Kuala Lumpur	1 (20)	1 (14)	2 (50)	0 (0)	0 (0)	5 (17)	2 (8)	3 (19)	2 (15)	16 (12)
WP Putrajaya	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Perak	1 (20)	2 (29)	1 (25)	3 (23)	0 (0)	4 (13)	0 (0)	2 (13)	1 (8)	14 (10)
Kedah	0 (0)	0 (0)	0 (0)	2 (15)	3 (13)	1 (3)	0 (0)	1 (6)	0 (0)	7 (5)
Perlis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pulau Pinang	0 (0)	0 (0)	0 (0)	1 (8)	3 (13)	1 (3)	3 (12)	2 (13)	0 (0)	10 (7)
Pahang	0 (0)	1 (14)	0 (0)	0 (0)	3 (13)	2 (7)	2 (8)	0 (0)	0 (0)	8 (6)
Terengganu	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Kelantan	0 (0)	0 (0)	0 (0)	1 (8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Sabah	0 (0)	0 (0)	0 (0)	2 (15)	1 (4)	0 (0)	1 (4)	1 (7)	0 (0)	5 (4)
Sarawak	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Labuan	0 (0)	0 (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)	1 (4)	0 (0)	0 (0)	1 (1)
Unknown	1 (20)	0 (0)	0 (0)	0 (0)	10 (42)	3 (10)	1 (4)	0 (0)	0 (0)	15 (11)

\*State of residence according to home address

\*\*One donor in year 2003 came from Yangon, Myanmar

Table 8.8: Donor's status, 1997-2005

Donor's 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	Total N=137
Pledged	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (17)	6 (24)	2 (13)	3 (23)	16 (12)
Non-pledged	5 (100)	7 (100)	4 (100)	13 (100)	24 (100)	25 (83)	19 (76)	14 (88)	10 (77)	121 (88)

Table 8.9: Type of donors, 1997-2005

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	Total N=137
Brain death	4 (80)	6 (86)	4 (100)	11 (85)	20 (83)	17 (57)	8 (32)	10 (63)	5 (38)	85 (62)
Cardiac death	1 (20)	1 (14)	0 (0)	2 (15)	4 (17)	13 (43)	17 (68)	6 (38)	8 (62)	52 (38)

Table 8.10: Blood group, 1997-2005

Blood group	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	Total N=137
A positive	1 (20)	1 (14)	0 (0)	1 (8)	6 (25)	5 (17)	7 (28)	3 (19)	2 (15)	26 (19)
B positive	0 (0)	1 (14)	1 (25)	5 (38)	4 (17)	4 (13)	5 (20)	5 (31)	3 (23)	28 (20)
AB positive	1 (20)	1 (14)	0 (0)	0 (0)	1 (4)	0 (0)	0 (0)	0 (0)	0 (0)	3 (2)
O positive	2 (40)	2 (29)	3 (75)	5 (38)	12 (50)	8 (27)	2 (8)	5 (31)	3 (23)	42 (31)
Not done*	1 (20)	2 (29)	0 (0)	2 (15)	1 (4)	13 (43)	11 (44)	3 (19)	5 (38)	38 (28)

\* Blood group not required for post cardiac death tissue donors

Table 8.11: Causes of death, 1997-2005

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



Table 8.11: Causes of death, 1997-2005

Causes of death	No. (%)											
	2002 N=30		2003 N=25		2004 N=16		2005 N=13		Total N=137			
	Brain dead organ donors N=17	Cardiac death tissue donors N=13	Brain dead organ donors N=8	Cardiac death donors N=17	Brain dead organ donors N=	Cardiac death tissue donors N=	Brain dead organ donors N=5	Cardiac death tissue donors N=8	Brain dead organ donors N=85	Cardiac death tissue donors N=52		
Injury from MVA	10 (59)	7 (54)	6 (75)	3 (18)	2 (20)	3 (50)	1 (20)	2 (25)	44 (52)	17 (33)		
Injury from fall	0 (0)	0 (0)	1 (13)	0 (0)	2 (20)	0 (0)	0 (0)	0 (0)	4 (5)	0 (0)		
Injury from assault	0 (0)	0 (0)	0 (0)	0 (0)	1 (10)	1 (17)	1 (20)	0 (0)	4 (5)	1 (2)		
Injury from industrial accident	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)		
Spontaneous hypertensive intracranial bleed	1 (6)	0 (0)	0 (0)	1 (6)	1 (10)	2 (33)	1 (20)	0 (0)	10 (12)	4 (8)		
Spontaneous AVM / Aneurysm intracranial bleed	2 (12)	0 (0)	0 (0)	1 (6)	3 (30)	0 (0)	0 (0)	0 (0)	7 (8)	1 (2)		
Brain anoxia	1 (6)	0 (0)	0 (0)	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1 (2)		
Brain tumour	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)		
Thromboembolic brain infarct	1 (6)	0 (0)	1 (13)	0 (0)	0 (0)	0 (0)	1 (20)	0 (0)	4 (5)	2 (4)		
Cardiac disease	0 (0)	5 (38)	0 (0)	7 (41)	1 (10)	0 (0)	1 (20)	3 (38)	2 (2)	15 (29)		
Drowning	0 (0)	0 (0)	0 (0)	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)		
Others	0 (0)	1 (8)	0 (0)	3 (18)	0 (0)	0 (0)	0 (0)	3 (38)	1 (1)	8 (15)		
Unknown	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (6)	2 (4)		

Table 8.12a: Procurement details on type of institution where donor came from, 1997-2005

Procurement details	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	Total N=137
Type of institution where donor came from										
MOH state/ general hospitals	2 (40)	5 (71)	1 (25)	10 (77)	16 (67)	19 (63)	15 (60)	12 (75)	7 (54)	87 (64)
MOH district hospitals	0 (0)	0 (0)	0 (0)	2 (15)	0 (0)	2 (7)	4 (16)	2 (13)	0 (0)	10 (7)
University hospitals	1 (20)	1 (14)	0 (0)	0 (0)	6 (25)	4 (13)	3 (12)	1 (6)	1 (8)	17 (12)
Private hospitals	1 (20)	1 (14)	3 (75)	1 (8)	2 (8)	4 (13)	3 (12)	1 (6)	5 (38)	21 (15)
Home	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	2 (1)

Table 8.12b: Procurement details on location where donor was referred from, 1997-2005

Procurement details	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	Total N=137
Location where donor was referred from										
ICU	1 (20)	0 (0)	0 (0)	1 (8)	14 (58)	16 (53)	13 (52)	12 (75)	8 (62)	65 (47)
Ward	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	3 (12)	1 (6)	3 (23)	8 (6)
Emergency department	0 (0)	0 (0)	0 (0)	0 (0)	3 (13)	4 (13)	1 (4)	0 (0)	0 (0)	8 (6)
Mortuary	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (10)	6 (24)	3 (19)	1 (8)	13 (9)
Home	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	1 (1)
Not available	4 (80)	7 (100)	4 (100)	12 (92)	7 (29)	5 (17)	2 (8)	0 (0)	1 (8)	42 (31)

Table 8.12c: Procurement details on location where procurement was done, 1997-2005

Procurement details	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	Total N=137
Location where procurement was done										
Operation theatre	4 (80)	6 (86)	4 (100)	11 (85)	20 (83)	14 (47)	8 (32)	9 (56)	5 (38)	81 (59)
Mortuary	0 (0)	1 (14)	0 (0)	2 (15)	3 (13)	14 (47)	14 (56)	7 (44)	5 (38)	46 (34)
Ward	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	1 (3)	3 (12)	0 (0)	2 (15)	7 (5)
Home	1 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	2 (1)
Not available	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8)	1 (1)

**APPENDIX A**

**DATA MANAGEMENT**

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.

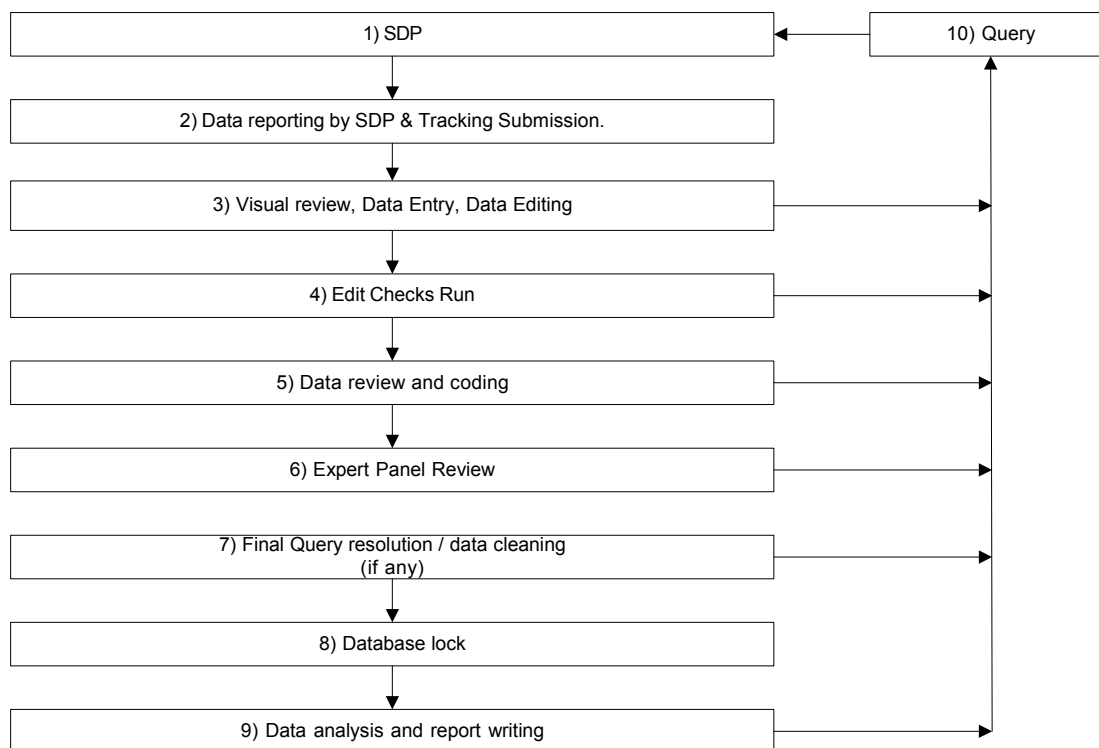
**Data sources**

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, 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 discrepancies that were resolved were then entered into the system.

#### **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 Advisory Board before data can be released.

**Distribution of report**

The MST has made a grant towards the cost of running the registry and report printing to allow distribution to all members of the association and the source data producers. The report will also be distributed to Health Authorities and international registries.

Further copies of the report can be made available with a donation of RM60.00 to offset the cost of printing.

## 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 second 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
AML	Acute Myelogenous Leukaemia
ARDS	Adult Respiratory Distress Syndrome
AVM	Arterio-venous Malformation
BMI	Body Mass Index
BMT	Blood and Marrow Transplantation
BP	Blood Pressure
CF	Counting Fingers
CKD	Chronic Kidney Disease
CMV	Cytomegalovirus
CRC	Clinical Research Centre
CsA	Cyclosporin A
DBP	Diastolic Blood Pressure
DIVC	Disseminated Intravascular Coagulopathy
ESRF	End Stage Renal Failure
FK506	Tacrolimus
GCT	Germ Cell Tumour
GFR	Glomerular Filtration Rate
GMC	Gleneagles Medical Centre
GS	Gentamicin and Streptomycin
GVHD	Graft Versus Host Disease
Hb	Haemoglobin
HbsAg	Hepatitis B surface Antigen
HCV	Hepatitis C Virus
HDL	High Density Lipoprotein
HKL	Hospital Kuala Lumpur
HLA	Human Leukocyte Antigen
HM	Hand Movement
HUKM	Hospital Universiti Kebangsaan Malaysia
HUSM	Hospital Universiti Sains Malaysia
ICU	Intensive Care Unit
IHD	Ischaemic Heart Disease
IJN	Institut Jantung Negara (National Heart Institute)
IL2R	Interleukin 2 Receptor
IOL	Intraocular Lens
IT	Information Technology
JNC	Joint National Committee
KLA	HKL, Adult
KLP	HKL, Paediatric
LDL	Low Density Lipoprotein

WE	Lam Wah Ee Hospital
MDS	Myelodysplastic Syndrome
MK	McCarey and Kaufman
Mm	millimetres
MMA	Malaysian Medical Association
MMF	Mycophenolate Mofetil
MOH	Ministry of Health, Malaysia
MS ISO	Malaysian Standard International Organisation for Standardisation
MST	Malaysian Society of Transplantation
MVA	Motor Vehicle Accident
NA	Not Available
NET	Neuroectodermal Tumour
NGO	Non-Governmental Organisation
NPL	No Perception of Light
NRR	National Renal Registry
NTR	National Transplant Registry
Paeds	Paediatrics
PBSC	Peripheral Blood Stem Cells
PL	Perception of Light
pmp	per million population
PRA	Panel Reactive Antibody
RMS	Rhabdomyosarcoma
SBP	Systolic Blood Pressure
SD	Standard Deviation
SDP	Source Data Provider
SJA	SJMC, Adult
SJMC	Subang Jaya Medical Centre
SJP	SJMC, Paediatric
SQL	Structured Query Language
TRU	Transplant Registry Unit
UK	United Kingdom
UKM	Universiti Kebangsaan Malaysia
UMA	UMMC, Adult
UMMC	University Malaya Medical Centre
UMP	UMMC, Paediatric
USA	United States of America
USM	Universiti Sains Malaysia
USRDS	United States Renal Data System
VA	Visual Acuity
VAD	Ventricular Assist Device
VOD	Veno-Occlusive Disease
WHO	World Health Organisation



## APPENDIX D

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10450 Penang  
Pulau Pinang  
Tel : (04)2205527 Ext.:  
Fax : (04)2267989

**Normah Medical Specialist Centre**

P.O Box 3298  
93764 Kuching  
Sarawak  
Tel : (082)440055 Ext.:  
Fax : (082)442600

**Seremban Specialist Hospital  
Wan Orthopaedic, Trauma & Sports Injury Centre  
(WOTSIC)**

Suite 17, ,  
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 Ext.:  
Fax : (03)33736888

**Timberland Medical Centre**

Lorong 2, 2 1/2 miles Rock Road  
93250 Kuching  
Sarawak  
Tel : (082)234466 Ext.:  
Fax :

**UNIVERSITY****Hospital Universiti Sains Malaysia  
Orthopaedics Department**

16150 Kota Bharu  
Kelantan Darul Naim  
Tel : (09) 7664509 Ext.:  
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 Ext.:  
Fax : (09)5151518

**University of Malaya Medical Centre  
Department of Orthopaedics Surgery**

Jalan Universiti  
59100 Kuala Lumpur  
Wilayah Persekutuan  
Tel : (03)79502061 Ext.:  
Fax : (03)79535642

**Bone and Tissue Transplant Services**

**TISSUE BANK**

**Universiti Sains Malaysia**

**National Tissue Bank**

Health Campus

16150 Kota Bharu

Kelantan Darul Naim

Tel : (09)7664344      Ext.:

Fax : (09)7653307

**BONE BANK**

**Hospital Kuala Lumpur**

Joint Replacement & Bone Banking Unit

Institut Ortopedik & Traumatologi

Hospital Kuala Lumpur

Jalan Pahang

50586 Kuala Lumpur

Wilayah Persekutuan

Tel : (03)2615 5534      Ext.:

Fax : (03)2692 7281

**University of Malaya Medical Centre**

Bank Tulang

Jabatan Surgeri Ortopedik

Pusat Perubatan Universiti Malaya

Lembah Pantai

59100 Kuala Lumpur

Wilayah Persekutuan

Tel : (603)79502863      Ext.:

Fax : (603)79535642

**IRRADIATION CENTRE**

**Malaysian Institute For Nuclear Technology  
Research**

Kompleks MINT, Jalan Dengkil

Bangi

43000 Kajang

Selangor Darul Ehsan

Tel : (03) 89250510      Ext.:

Fax : (03) 89282956

<b>Cornea Transplant Services</b>
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<b>MOH</b>
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**Hospital Alor Setar  
Ophthalmology Department**

05100 Alor Setar  
Kedah Darul Aman

Tel : (04)7002248      Ext.:  
Fax : (04)7323770

**Hospital Batu Pahat  
Ophthalmology Department**

83000 Batu Pahat  
Johor Darul Takzim

Tel : (07)4341999      Ext.:  
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 Ipoh  
Ophthalmology Department**

Jalan Hospital  
30990 Ipoh  
Perak Darul Ridzuan

Tel : (05)5222034      Ext.:  
Fax : (05)2531541

**Hospital Kajang  
Ophthalmology Department**

Jalan Semenyih  
43000 Kajang  
Selangor Darul Ehsan

Tel : (03)87363333      Ext.: 144 / 319  
Fax : (03)87367527

**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)312 1787

**Hospital Kuala Lumpur  
Ophthalmology Department**

Jalan Pahang  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)26155555      Ext.:  
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 Kuala Terengganu  
Ophthalmology Department**

Jalan Sultan Mahmud  
20400 Kuala Terengganu  
Terengganu Darul Iman

Tel : (09)6212121      Ext.: 2727 / 2024  
Fax : (09)6317871

**Cornea Transplant Services**

**MOH**

**Hospital Melaka  
Ophthalmology Department**

Jalan Mufti Haji Khalil  
75400 Melaka  
Melaka

Tel : (06)2707215      Ext.:  
Fax : (06)2837500

**Hospital Mentakab  
Ophthalmology Department**

Jalan Maran  
28900 Temerloh  
Pahang Darul Makmur

Tel : (09)2955333      Ext.: 1570  
Fax : (09)2972468

**Hospital Miri  
Ophthalmology Department**

Jalan Cahaya  
98000 Miri  
Sarawak

Tel : (085)420033      Ext.: 148  
Fax : (085)416514

**Hospital Pakar Sultanah Fatimah  
Ophthalmology Department**

Jalan Salleh  
84000 Muar  
Johor Darul Takzim

Tel : (07)9521901      Ext.: 147 / 227  
Fax :

**Hospital Pulau Pinang  
Eye Clinic**

Jalan Resideni  
10990 Georgetown  
Pulau Pinang

Tel : (04)2002283      Ext.:  
Fax : (04)2281737

**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 Queen Elizabeth, Kota Kinabalu  
Ophthalmology Department**

88586 Kota Kinabalu  
Sabah

Tel : (088)206153      Ext.:  
Fax : (088)252827

**Hospital Raja Perempuan Zainab II  
Ophthalmology Department**

Jalan Hospital  
15586 Kota Bharu  
Kelantan Darul Naim

Tel : (09)7485533      Ext.: 2254  
Fax : (09)7502236

**Hospital Sandakan (Duchess of Kent)  
Ophthalmology Department**

KM 3.2 Jalan Utara  
90000 Sandakan  
Sabah

Tel : (089)212111      Ext.:  
Fax : (089)213607

**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



<b>Cornea Transplant Services</b>
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<b>MOH</b>
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**Hospital Seremban  
Ophthalmology Department**

Jalan Rasah  
70300 Seremban  
Negeri Sembilan Darul Khusus

Tel : (06)7623333      Ext.: 4726  
Fax : (06)7625771

**Hospital Sibu  
Ophthalmology Department**

Batu 5 1/2 Jalan Ulu Oya  
96000 Sibul  
Sarawak

Tel : (084) 343333      Ext.: 1008  
Fax : (084)337354

**Hospital Sultan Ismail  
Ophthalmology Department**

Jalan Persiaran Mutiara Emas Utama  
81100 Johor Bahru  
Johor Darul Takzim

Tel : (07)3565000      Ext.:  
Fax : (07)3565034

**Hospital Sultanah Aminah  
Ophthalmology Department**

80100 Johor Bahru  
Johor Darul Takzim

Tel : (07)2231666      Ext.: 2690  
Fax : (07)2242694

**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  
Fax : (03)33729089

**Cornea Transplant Services**

**MOH**

**Hospital Umum Sarawak  
Ophthalmology Department**  
Jalan Tun Ahmad Zaidi Adruce  
93586 Kuching  
Sarawak  
Tel : (082)276513      Ext.:  
Fax : (082)419495

**ARMED FORCES**

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

**PRIVATE**

**Gleneagles Intan Medical Centre KL  
Hope Eye Centre**  
Suite 618  
282, Jalan Ampang  
50450 Kuala Lumpur  
Wilayah Persekutuan  
Tel : (03)42578112      Ext.:  
Fax : (03)42576112

**Hospital Pantai Indah  
Ophthalmology Department**  
Jalan Perubatan 1  
Pandan Indah  
55100 Kuala Lumpur  
Wilayah Persekutuan  
Tel : (03)42892947      Ext.:  
Fax :

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

**Gleneagles Medical Centre, Penang  
Ophthalmology Department**  
Pulau Pinang Clinic Sdn Bhd  
1, Jalan Pangkor  
10050 Pulau Pinang  
Pulau Pinang  
Tel : (04)2202127      Ext.:  
Fax : (04)2272498

**Klinik Pakar Mata Centre For Sight**  
No.88, Jalan Bandar Rawang 1  
Pusat Bandar Rawang  
48000 Rawang  
Selangor Darul Ehsan  
Tel : (03)60931051      Ext.:  
Fax : (03)60931052

**Optimax Eye Specialist Centre**  
2-2-1, Bangunan AHP  
Jalan Tun Mohd Fuad 3  
Taman Tun Dr Ismail  
60000 Kuala Lumpur  
Wilayah Persekutuan  
Tel : (03)77223177      Ext.: 236 / 237  
Fax : (03)77260207

<b>Cornea Transplant Services</b>
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<b>PRIVATE</b>
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**Puteri Specialist Hospital**

33, Jalan Tun Abdul Razak Susur 5  
80350 Johor Bahru  
Johor Darul Takzim

Tel : (07)223 3377      Ext.:  
Fax : (07)223 8833

**Sri Kota Medical Centre  
Ophthalmology Department**

Jalan Mohet  
41000 Klang  
Selangor Darul Ehsan

Tel : (03)33733636      Ext.:  
Fax : (03)33736888

**Sunway Medical Centre  
Tan Eye Specialist 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)76561511      Ext.:  
Fax : (03)79576128

<b>UNIVERSITY</b>
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**Hospital Universiti Kebangsaan Malaysia  
Ophthalmology Department, Faculty of Medicine**

Jalan Yaacob Latif,  
Bandar Tun Razak, Cheras  
56000 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)91702497      Ext.:  
Fax : (03)91737836

**Hospital Universiti Sains Malaysia  
Ophthalmology Department**

16150 Kubang Kerian  
Kelantan Darul Naim

Tel : (09)7664370      Ext.:  
Fax : (09)7653370

**Universiti Putra Malaysia  
Ophthalmology Unit, Department of Surgery**

Faculty of Medicine & Health Sciences  
Jalan Masjid  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03) 20501000      Ext.: 219  
Fax : (03) 20501076

**University of Malaya Medical Centre  
Ophthalmology Department**

Faculty of Medicine, University of Malaya  
59100 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03) 79502060      Ext.:  
Fax : (03) 79535635

**Heart and Lung Transplant Services**

**MOH**

**Hospital Kuala Lumpur  
Institut Perubatan Respiratori**

Jalan Pahang  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)40232966      Ext.:  
Fax : (03)40218807

**Institute Jantung Negara  
Cardiothoracic Department**

145, Jalan Tun Razak  
50400 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)26178200      Ext.:  
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  
Wilayah Persekutuan  
Tel : (03)2617 8200      Ext.:  
Fax : (03)2692 8418

**Kidney Transplant Services**

**MOH**

**Hospital Alor Setar  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

06550 Alor Setar  
Kedah Darul Aman

Tel : (04)7303333      Ext.: 169 / 167  
Fax : (04)7323770

**Hospital Batu Pahat  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

83000 Batu Pahat  
Johor Darul Takzim

Tel : (07)4341999      Ext.: 149  
Fax : (07)4322544

**Hospital Bintulu  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Nyabau  
97000 Bintulu  
Sarawak

Tel : (086)255899      Ext.:  
Fax : (086)255866

**Hospital Dungun  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

23000 Dungun  
Terengganu Darul Iman

Tel : (09)8483333      Ext.: 261  
Fax : (09)8481976

**Hospital Ipoh  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Hospital  
30990 Ipoh  
Perak Darul Ridzuan

Tel : (05)5222372      Ext.:  
Fax : (05)2531541

**Hospital Kangar  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Kolam  
01000 Kangar  
Perlis Indera Kayangan

Tel : (04)9763333      Ext.: 2165  
Fax : (04)9767237

**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  
86000 Kluang  
Johor Darul Takzim

Tel : (07)7723333      Ext.: 266/313  
Fax : (07)7734498

**Hospital Kuala Lumpur  
Renal Transplant Clinic (Paediatrics)**

Institute Paediatric  
c/o Ward KK1  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)26921044      Ext.: 6021  
Fax : (03)26948187

**Hospital Kuala Lumpur  
Renal Transplant Clinic**

Jalan Pahang  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)26155555      Ext.: 6715  
Fax : (03)26938953

**Kidney Transplant Services****MOH**

**Hospital Kuala Terengganu**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
20400 Kuala Terengganu  
Terengganu Darul Iman

Tel : (09)6212121      Ext.: 2755 / 2054  
Fax : (09)6221820

**Hospital Melaka**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
Jalan Pringgit  
70060 Melaka  
Melaka

Tel : (06)2707648      Ext.:  
Fax : (06)2813240

**Hospital Miri**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
98000 Miri  
Sarawak

Tel : (085)420033      Ext.: 251  
Fax : (085)416514

**Hospital Pontian**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
Jalan Alfagoff  
82000 Pontian  
Johor Darul Takzim

Tel : (07)6873333      Ext.: 154  
Fax : (07)6876211

**Hospital Queen Elizabeth, Kota Kinabalu**  
**Renal Transplant Clinic**  
**c/o CAPD Unit**  
88586 Kota Kinabalu  
Sabah

Tel : (088)218166      Ext.: 284  
Fax : (088)211999

**Hospital Labuan**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
Peti Surat 6  
87008 Labuan  
Wilayah Persekutuan

Tel : (087)423919      Ext.: 274  
Fax : (087)423928

**Hospital Mentakab**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
Jalan Karak  
28400 Mentakab  
Pahang Darul Makmur

Tel : (09)2771333      Ext.: 298 / 2  
Fax : (09)2772873

**Hospital Pakar Sultanah Fatimah, Muar**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
84000 Muar  
Johor Darul Takzim

Tel : (06)9521901      Ext.: 116  
Fax : (06)9526003

**Hospital Pulau Pinang**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
Jalan Resideni  
10990 Georgetown  
Pulau Pinang

Tel : (04)2293333      Ext.: 2397  
Fax : (04)2281737

**Hospital Raja Perempuan Zainab II**  
**Renal Transplant Clinic**  
**c/o Haemodialysis Unit**  
15590 Kota Bharu  
Kelantan Darul Naim

Tel : (09)7485533      Ext.: 2367  
Fax : (09)7486951

**Kidney Transplant Services**

**MOH**

**Hospital Sandakan (Duchess of Kent)**

**Renal Transplant Clinic  
c/o Haemodialysis Unit**

KM3.2, Jalan Utara  
90007 Sandakan  
Sabah

Tel : (089)212111      Ext.: 5190  
Fax : (089)213607

**Hospital Segamat  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

KM 6 Jalan Genuang  
85000 Segamat  
Johor Darul Takzim

Tel : (07)9433333      Ext.: 147  
Fax : (07)9434641

**Hospital Selayang  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Lebuhraya Selayang-Kepong  
68100 Batu Caves  
Selangor Darul Ehsan

Tel : (03)61203233      Ext.: 7017 / 7018  
Fax : (03)61207564

**Hospital Serdang  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Puchong  
43000 Kajang  
Selangor Darul Ehsan

Tel : (03)89475555      Ext.: 1256  
Fax : (03)89475050

**Hospital Seremban  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Rasah  
70300 Seremban  
Negeri Sembilan Darul Khusus

Tel : (06)7623333      Ext.: 4743  
Fax : (06)7625771

**Hospital Sibul  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

96000 Sibul  
Sarawak

Tel : (084)343333      Ext.: 2102  
Fax : (084)337354

**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  
Fax : (07)3565034

**Hospital Sultanah Aminah  
Renal Transplant Clinic (Paediatrics)**

Paediatric Ward  
80590 Johor Bahru  
Johor Darul Takzim

Tel : (07)2257121      Ext.:  
Fax : (07)2276146

**Hospital Sultanah Aminah  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Bangunan Bakawali  
80590 Johor Bahru  
Johor Darul Takzim

Tel : (07)2231666      Ext.: 2055 / 2033  
Fax : (07)2242694

**Hospital Taiping  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Taming Sari  
34000 Taiping  
Perak Darul Ridzuan

Tel : (05)8083333      Ext.: 8185  
Fax : (05)8073894



<b>Kidney Transplant Services</b>
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<b>MOH</b>
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**Hospital Tanah Merah  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

17500 Tanah Merah  
Kelantan Darul Naim

Tel : (09)9557333      Ext.: 2156  
Fax : (09)9557929

**Hospital Teluk Intan  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

36000 Teluk Intan  
Perak Darul Ridzuan

Tel : (05)6213333      Ext.: 1120  
Fax : (05)6212415

**Hospital Tengku Ampuan Afzan  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

25100 Kuantan  
Pahang Darul Makmur

Tel : (09)5133333      Ext.:  
Fax : (09)5164272

**Hospital Umum Sarawak  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Tun Ahmad Zaidi Adruce  
93586 Kuching  
Sarawak

Tel : (082)276800      Ext.: 5125 / 5216  
Fax : (082)240767

**Hospital Tawau  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

91007 Tawau  
Sabah

Tel : (089)773183      Ext.:  
Fax : (089)778626

**Hospital Temerloh  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Maran  
28000 Temerloh  
Pahang Darul Makmur

Tel : (09)2955333      Ext.:  
Fax :

**Hospital Tengku Ampuan Rahimah  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Langat  
41200 Klang  
Selangor Darul Ehsan

Tel : (03)33757000      Ext.: 1448  
Fax : (03)33729089

<b>NGO</b>
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**MAA-Medicare Charity Dialysis Centre**

280-282 Batu 2 3/4, Jalan Cheras  
56100 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)92003323      Ext.:  
Fax : (03)92003324

**National Kidney Foundation Dialysis Centre  
(Taiping)**

18, Jalan Berhala  
34000 Taiping  
Perak Darul Ridzuan

Tel : (05)8041633      Ext.:  
Fax : (05)8041671

## Kidney Transplant Services

### NGO

#### Rotary Haemodialysis Centre, Johor Bharu

The Rotary Haemodialysis Centre  
Rotary Club of Johor Bahru Foundation  
4N, Susur 3, Jalan Tun Abdul Razak  
80250 Johor Bahru  
Johor Darul Takzim  
Tel : (07)2222433      Ext.:  
Fax : (07)2222443

#### Yayasan Kebajikan SSL Haemodialisis

Yayasan Kebajikan SSL Hemodialisis  
No. 9, Jalan 1/5  
46000 Petaling Jaya  
Selangor Darul Ehsan  
Tel : (03)77824092      Ext.:  
Fax : (03)77337842

### ARMED FORCES

#### 96 Hospital Angkatan Tentera Kem Lumut

Pengkalan TLDM  
32100 Lumut  
Perak Darul Ridzuan  
Tel : (05)6837090      Ext.: 4014 / 4046  
Fax : (05)6837169

### PRIVATE

#### Ampang Puteri Specialist Hospital

Suite 1-7, First Floor  
Jalan Mamanda 9, Tmn Dato'Ahmad Razali  
68000 Ampang  
Selangor Darul Ehsan  
Tel : (03)42722500      Ext.: 1250  
Fax : (03)42702443

#### Assunta Hospital

Jalan Templer  
46990 Petaling Jaya  
Selangor Darul Ehsan  
Tel : (03)77823433      Ext.: 254  
Fax : (03)77814933

#### C.S. Loo Kidney & Medical Specialist Centre

227, Jalan Kampar  
30250 Ipoh  
Perak Darul Ridzuan  
Tel : (05)2458918      Ext.: 118  
Fax : (05)2429324

#### Damai Medical & Heart Clinic

49-N, Jalan Ong Kim Wee  
75300 Melaka  
Melaka  
Tel : (06)2841205      Ext.: 211  
Fax : (06)2844805

#### Gleneagles Intan Medical Centre KL

Suite 7.01, 7th Floor, Medical Office Building  
282, Jalan Ampang  
50450 Kuala Lumpur  
Wilayah Persekutuan  
Tel : (03)42578822      Ext.:  
Fax : (03)42523823

#### Tan Medical Renal Clinic

No. 41, Tingkat 1  
Jalan 6/31  
46300 Petaling Jaya  
Selangor Darul Ehsan  
Tel : (03)77836423      Ext.:  
Fax : (03)77836422

**Kidney Transplant Services****PRIVATE****Renal Care (Ipoh Specialist Hospital)**

26, Jalan Raja Dihilir Tambun  
30350 Ipoh  
Perak Darul Ridzuan

Tel : (05)2418777 Ext.: 275  
Fax : (05)2413128

**Klinik Pakar Dialisis (Smartcare Dialysis Centre)**

52G, Jalan USJ 10/1B  
47620 Subang Jaya  
Selangor Darul Ehsan

Tel : (03)56337618 Ext.:  
Fax : (03)56330618

**Klinik Pakar Dialisis (Smartcare Dialysis Centre)**

46, Jalan Cerdas, Taman Connaught  
56100 Cheras, Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)91003657 Ext.:  
Fax : (03)91003658

**Lam Wah Ee Hospital**

Jalan Tan Sri Teh Ewe Lim  
11600 Pulau Pinang  
Pulau Pinang

Tel : (04)6571888 Ext.:  
Fax :

**Mahkota Medical Centre**

3, Mahkota Melaka, Jalan Merdeka  
75000 Melaka  
Melaka

Tel : (06)2818222 Ext.: 3309  
Fax : (06)2810560

**Normah Medical Specialist Centre**

P.O. Box 3298  
93764 Kuching  
Sarawak

Tel : (082)440055 Ext.: 260 / 2  
Fax : (082)443787

**Pantai Mutiara Hospital**

No. 82, Jalan Tengah, Bayan Baru  
11900 Bayan Lepas  
Pulau Pinang

Tel : (04)6433888 Ext.: 155  
Fax : (04)6432888

**Pusat Pakar Tawakal Sdn Bhd**

198A-208A, Jalan Pahang  
53000 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)40233599 Ext.: 312  
Fax : (03)40228063

**S.P. Menon Dialysis Centre**

No. 5, Jalan Rengas  
Southern Park  
41200 Klang  
Selangor Darul Ehsan

Tel : (03)33738122 Ext.:  
Fax : (03)33716475

**Sabah Medical Centre**

P.O. Box 13393  
88838 Kota Kinabalu  
Sabah

Tel : (088)424333 Ext.:  
Fax : (088)424340

**Selangor Medical Centre**

Lot. 1, Jalan Singa 20/1, Seksyen 20  
40300 Shah Alam  
Selangor Darul Ehsan

Tel : (03)55431111 Ext.: 4533 / 4464  
Fax : (03)55431722

**Sri Kota Medical Centre**

Jalan Mohet  
41000 Klang  
Selangor Darul Ehsan

Tel : (03)33733636 Ext.: 7106  
Fax : (03)33736888

**Kidney Transplant Services**

**PRIVATE**

**Subang Jaya Medical Centre**

1, Jalan SS 12/1A  
47500 Subang Jaya  
Selangor Darul Ehsan

Tel : (03)56306194 Ext.:  
Fax : (03)56335910

**Sunway Medical Centre**

Suite A1-28, First Floor  
No 5, Jln Lagoon Selatan, Bandar Sunway  
46150 Petaling Jaya  
Selangor Darul Ehsan

Tel : (03)74919191 Ext.: 7784  
Fax : (03)74918181

**Timberland Medical Centre  
Simon Wong Medical & Kidney Clinic**

Lot 5160, Ground Floor  
Lorong 2, 2 1/2 miles Rock Road  
93250 Kuching  
Sarawak

Tel : (082)241242 Ext.:  
Fax : (082)254242

**Tung Shin Hospital**

102, Jalan Pudu  
55100 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)20721655 Ext.:  
Fax :

**UNIVERSITY**

**Hospital Universiti Kebangsaan Malaysia  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

Jalan Yaacob Latif,  
Bandar Tun Razak, Cheras  
56000 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)91733333 Ext.: 2630  
Fax : (03)91735316

**Hospital Universiti Sains Malaysia  
Renal Transplant Clinic  
c/o Haemodialysis Unit**

16150 Kubang Kerian  
Kelantan Darul Naim

Tel : (09)7663000 Ext.: 4657 / 4660  
Fax : (09)7652198

**University of Malaya Medical Centre  
Nephrology Department**

8th Floor,  
Jalan Universiti  
59100 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)79502747 Ext.:  
Fax : (03)79568822

**Liver Transplant Services****MOH****Hospital Kuala Lumpur  
Institute Paediatric, Surgery Department**

Jalan Pahang  
50586 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)26906211      Ext.:  
Fax : (03)26913815

**Hospital Selayang  
Department of Hepatobiliary**

Lebuhraya Selayang-Kepong  
Batu Caves  
68100 Bandar Baru Selayang  
Selangor Darul Ehsan

Tel : (03)61203233      Ext.: 3314  
Fax : (03)61207564

**PRIVATE****Subang Jaya Medical Centre**

1, Jalan SS 12/1A  
47500 Subang Jaya  
Selangor Darul Ehsan

Tel : (03)56306193      Ext.:  
Fax : (03)56306209

**UNIVERSITY****University of Malaya Medical Centre  
Department of Paediatrics**

Jalan Universiti  
59100 Kuala Lumpur  
Wilayah Persekutuan

Tel : (03)79502065      Ext.:  
Fax : (03)79556114