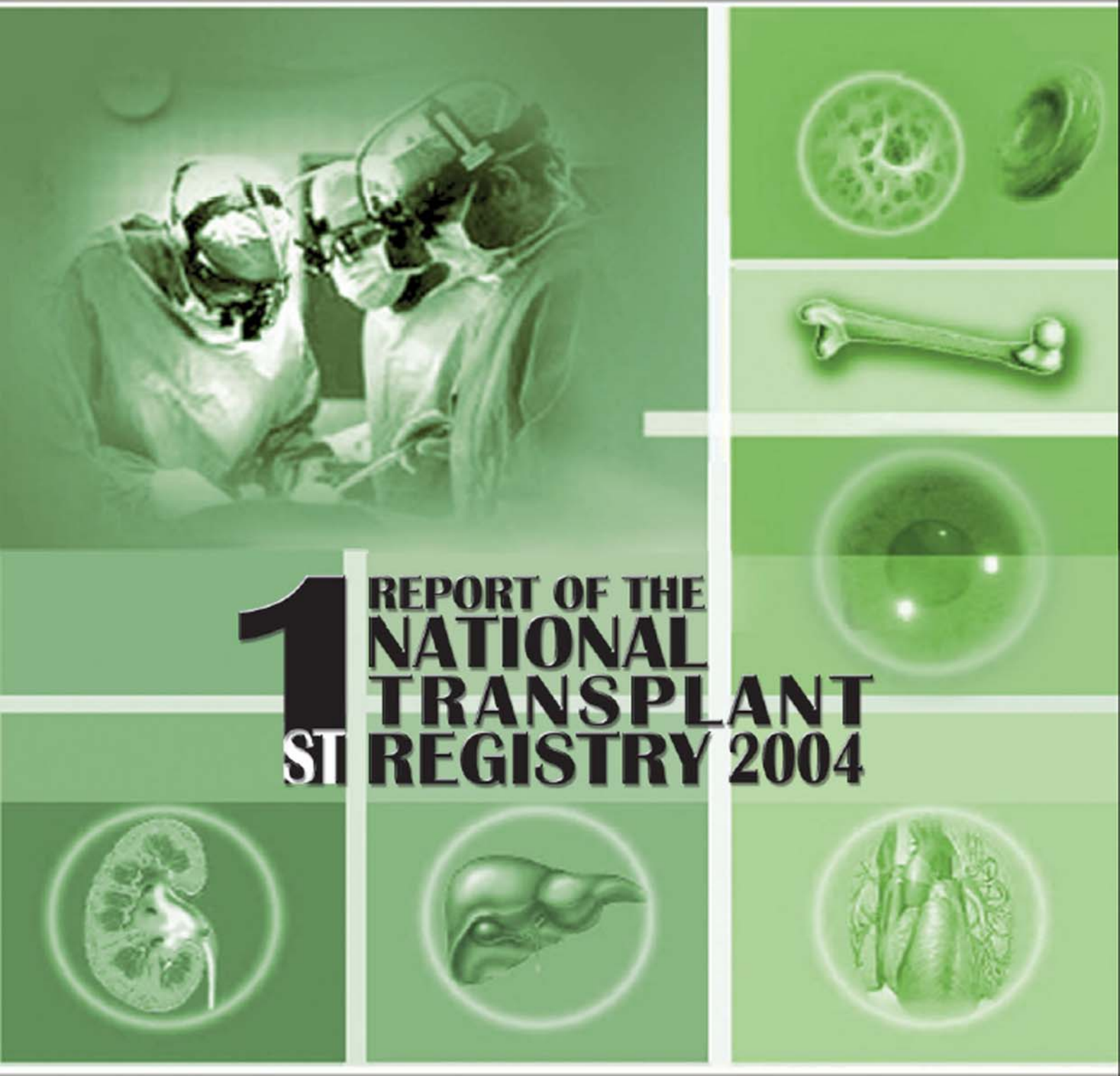
NATIONAL TRANSPLANT REGISTRY



1ST REPORT OF THE NATIONAL TRANSPLANT REGISTRY 2004

Editors

Hooi LS

Lela Yasmin Mansor

With contributions by:

Alan Teh K H, Chan L L, Shamala R, Choong YY, Michael Law SH, Mohamed Ezani, David Chew SP, Ganesalingam K, Lim CB, Tan SS, Goh BL, Hamdan Leman, Suzina Sheikh

Malaysian Society of Transplantation

Ministry of Health Malaysia

FIRST

REPORT OF THE

NATIONAL TRANSPLANT REGISTRY

2004

Editors
Hooi L.S.
Lela Yasmin Mansor

With contributions by:

Alan Teh K H, Chan L L, Shamala R, Choong YY, Michael Law SH, Mohamed Ezani, David Chew SP, Ganesalingam K, Lim CB, Tan SS, Goh BL, Hamdan Leman, Suzina Sheikh

August 2005

ISSN 1823-5719

Published by:

National Transplant Registry
2nd Floor MMA House
124, Jalan Pahang
53000 Kuala Lumpur
Malaysia

Tel : (603) 4045 5948

Fax : (603) 4044 0613

e-mail : ntr@crc.gov.my

Website: http://www.mst.org.my

FOREWORD

We are pleased to launch the first report of the National Transplant Registry (NTR). The Registry was formed in November 2003 with the primary aim of establishing a national audit to analyse and understand the demography and outcomes in the complicated field of transplantation. This first report has been made possible by the dedication, hard work and support from the various transplant source providers and data management team. Working in close collaboration with the Clinical Research Centre the NTR has made encouraging progress since its recent formation. We would like to thank the participating centres for their cooperation.

Currently the Registry collects data from all centres performing organ and tissue transplantation in this country. Heart, blood and marrow transplantation data is now reported online. It is our aim that, in future, data from all the other transplantation services namely cornea, liver and kidney may also have an online data reporting system.

The National Transplant Registry will be an on-going evaluation of the scientific and clinical status of organ and tissue transplantation in Malaysia. The amount of data will continue to expand. We look forward to the continued support from everyone involved in the transplantation service. By analysing all available data and information, we are confident we can improve the results of transplantation in this country.

Thank you.

Tan Sri Dato' Dr. Yahya Awang	Dato' Dr. Zaki Morad	Dr. Lela Yasmin Mansor
Chairperson	Co-Chair	Co-Chair
NTR	NTR	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:

Norvartis
Roche
Janssen-Cilag
Ain Medicare
Institut Jantung Negara Foundation

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

Discipline: Cornea Transplant

1. Hope Eye Centre, Gleneagles Intan Medical Centre Kuala Lumpur
2. Ophthalmology Department, 94 Hospital Angkatan Tentera Kem Terendak
3. Ophthalmology Department, Gleneagles Medical Centre
4. Ophthalmology Department, Hospital Alor Setar
5. Ophthalmology Department, Hospital Batu Pahat
6. Ophthalmology Department, Hospital Bukit Mertajam
7. Ophthalmology Department, Hospital Ipoh
8. Ophthalmology Department, Hospital Kajang
9. Ophthalmology Department, Hospital Kangar
10. Ophthalmology Department, Hospital Kota Bharu
11. Ophthalmology Department, Hospital Kuala Lipis
12. Ophthalmology Department, Hospital Kuala Lumpur
13. Ophthalmology Department, Hospital Kuala Pilah
14. Ophthalmology Department, Hospital Kuala Terengganu
15. Ophthalmology Department, Hospital Melaka
16. Ophthalmology Department, Hospital Mentakab
17. Ophthalmology Department, Hospital Miri
18. Ophthalmology Department, Hospital Pakar Sultanah Fatimah
19. Ophthalmology Department, Hospital Pantai Indah
20. Ophthalmology Department, Hospital Pulau Pinang
21. Ophthalmology Department, Hospital Putrajaya
22. Ophthalmology Department, Hospital Queen Elizabeth, Kota Kinabalu
23. Ophthalmology Department, Hospital Sandakan (Duchess of Kent)
24. Ophthalmology Department, Hospital Selayang
25. Ophthalmology Department, Hospital Seremban
26. Ophthalmology Department, Hospital Sibu
27. Ophthalmology Department, Hospital Sultan Ismail
28. Ophthalmology Department, Hospital Sultanah Aminah
29. Ophthalmology Department, Hospital Sungai Petani
30. Ophthalmology Department, Hospital Taiping
31. Ophthalmology Department, Hospital Tawau
32. Ophthalmology Department, Hospital Teluk Intan
33. Ophthalmology Department, Hospital Tengku Ampuan Afzan
34. Ophthalmology Department, Hospital Tengku Ampuan Rahimah

35. Ophthalmology Department, Hospital Umum Sarawak
36. Ophthalmology Department, Hospital Universiti Kebangsaan Malaysia
37. Ophthalmology Department, Hospital Universiti Sains Malaysia
38. Ophthalmology Department, Sri Kota Medical Centre
39. Ophthalmology Department, University of Malaya Medical Centre
40. Ophthalmology Unit, Department of Surgery, Universiti Putra Malaysia
41. Optimax Eye Specialist Centre
42. Tan Eye Specialist Centre, Sunway Medical Centre
43. 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 Surgery Department, Hospital Kuala Lumpur
4. Subang Jaya Medical Centre

Discipline: Renal Transplant

1. 96 Hospital Angkatan Tentera Kem Lumut
2. Ampang Puteri Specialist Hospital
3. Assunta Hospital
4. C.S. Loo Kidney & Medical Specialist Centre
5. Institute of Paediatrics, Hospital Kuala Lumpur
6. Mahkota Medical Centre
7. Nephrology Clinic, Hospital Melaka
8. Nephrology Clinic, Hospital Kangar
9. Nephrology Clinic, Hospital Labuan
10. Nephrology Department, Hospital Selayang
11. Nephrology Department, University of Malaya Medical Centre
12. Paediatric Transplant Unit, Hospital Sultanah Aminah
13. Renal Care, Ipoh Specialist Hospital
14. Renal Dialysis Centre Sdn. Bhd, Gleneagles Intan Medical Centre KL
15. Renal Transplant Clinic, Damai Medical & Heart Clinic
16. Renal Transplant Clinic, Hospital Alor Setar
17. Renal Transplant Clinic, Hospital Batu Pahat
18. Renal Transplant Clinic, Hospital Bintulu
19. Renal Transplant Clinic, Hospital Dungun

20. Renal Transplant Clinic, Hospital Kemaman
21. Renal Transplant Clinic, Hospital Kluang
22. Renal Transplant Clinic, Hospital Kota Bharu
23. Renal Transplant Clinic, Hospital Mentakab
24. Renal Transplant Clinic, Hospital Miri
25. Renal Transplant Clinic, Hospital Pakar Sultanah Fatimah, Muar
26. Renal Transplant Clinic, Hospital Pontian
27. Renal Transplant Clinic, Hospital Pulau Pinang
28. Renal Transplant Clinic, Hospital Queen Elizabeth, Kota Kinabalu
29. Renal Transplant Clinic, Hospital Sandakan (Duchess of Kent)
30. Renal Transplant Clinic, Hospital Segamat
31. Renal Transplant Clinic, Hospital Seremban
32. Renal Transplant Clinic, Hospital Sibu
33. Renal Transplant Clinic, Hospital Sultan Ismail Pandan
34. Renal Transplant Clinic, Hospital Sultanah Aminah
35. Renal Transplant Clinic, Hospital Taiping
36. Renal Transplant Clinic, Hospital Tanah Merah
37. Renal Transplant Clinic, Hospital Tawau
38. Renal Transplant Clinic, Hospital Teluk Intan
39. Renal Transplant Clinic, Hospital Tengku Ampuan Afzan
40. Renal Transplant Clinic, Hospital Tengku Ampuan Rahimah
41. Renal Transplant Clinic, Hospital Umum Sarawak
42. Renal Transplant Clinic, Hospital Universiti Kebangsaan Malaysia
43. Renal Transplant Clinic, Normah Medical Specialist Centre
44. Renal Transplant Clinic, Pusat Pakar Tawakal Sdn Bhd
45. Renal Transplant Clinic, Sabah Medical Centre
46. Renal Transplant Clinic, Selangor Medical Centre
47. Renal Transplant Clinic, Sri Kota Medical Centre
48. Renal Transplant Unit, Hospital Ipoh
49. Renal Transplant Unit, Hospital Kuala Lumpur
50. Renal Transplant Unit, Hospital Kuala Terengganu
51. Renal Transplant Unit, Hospital Universiti Sains Malaysia
52. Renal Transplant Unit, Klinik Pakar Dialisis (Smartcare Dialysis Centre)
53. Renal Transplant Unit, Pantai Mutiara Hospital
54. Simon Wong Medical & Kidney Clinic, Timberland Medical Centre
55. Subang Jaya Medical Centre
56. Sunway Medical Centre
57. Tan Medical Renal Clinic

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

1. Department of Orthopaedic Surgery, Hospital Alor Setar
2. Department of Orthopaedic Surgery, Hospital Taiping
3. Department of Orthopaedics & Traumatology, Hospital Kangar
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 Kota Bharu
8. Department of Orthopaedics, Hospital Kuala Terengganu
9. Department of Orthopaedics, Hospital Kuantan
10. Department of Orthopaedics, Hospital Pakar Sultanah Fatimah

11. Department of Orthopaedics, Hospital Pulau Pinang
12. Department of Orthopaedics, Hospital Seberang Jaya
13. Department of Orthopaedics, Hospital Sultanah Aminah
14. Department of Orthopaedics, Hospital Tengku Ampuan Rahimah
15. Department of Orthopaedics, Hospital Umum Sarawak
16. Department of Orthopaedics, Hospital Universiti Sains Malaysia
17. Department of Surgery, Hospital Kota Bharu
18. Institute of Orthopaedics & Traumatology, Hospital Kuala Lumpur
19. Malaysian Institute For Nuclear Technology Research
20. National Tissue Bank, Universiti Sains Malaysia
21. Department of Orthopaedics, Traumatology & Rehabilitation, International Islamic University Malaysia, Kuantan
22. Wan Orthopaedics, 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:

Name	Representation
Tan Sri Dato' Dr. Yahya Awang ***Chairperson***	Cardiothoracic Consultant, Damansara Specialist Hospital NTR Expert Panel Chairman of Heart / Lung Transplant
Dato' Dr. Zaki Morad Mohd Zaher ***Co-chair***	Head, Department of Nephrology, Hospital Kuala Lumpur NTR Expert Panel Chairman of Renal Transplant
Dr. Fadhilah Zowyah Lela Yasmin Mansor ***Co-chair***	Chairperson, Registry Subcommittee National Transplant Coordinating Committee Ministry Of Health
Dato' Dr. Tan Kai Chah	Hepatobiliary / Liver Transplant Surgeon, Subang Jaya Medical Centre
Dr. Mohd. Raili Hj. Suhaili	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
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: <u>Blood and Marrow Transplant</u>

Co-Chair (Adult)	Dr. Alan Teh Kee Hean
Co-Chair (Paeds)	Prof. Dr. Chan Lee Lee
Member	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: <u>Cornea Transplant</u>

Chairman	Dr. Shamala Retnasabapathy
Co-Chair	Dr. Choong Yean Yaw
Member	Dr. Jonathan Choon Siew Cheong
	Assoc. Prof. Dr. Cordelia Chan Mei Lan
	Dr. Chuah Kay Leong
	Dr. Michael Law Sie Haur
	Dr. Mariam Ismail
	Assoc. Prof. Dr. S C Reddy

	Dato' Dr. Veera Ramani
	Dr. Sahimi Sulaiman

Discipline: <u>Heart and Lung Transplant</u>

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

Discipline: <u>Liver Transplant</u>

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

Discipline: <u>Renal Transplant</u>

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

Discipline: <u>Heart Valve Transplant</u>

Chairman	Mr. Hamdan Leman

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

Chairman	Prof. Dr. Zulmi Wan
Member	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 Manager	Ms. Woo Li Fong
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. Sanjay Rampal
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
Webmaster	Mr. Patrick Lum See Kai
Programmer	Mr. Sebastian Thoo / Mr. John Chong
Desktop publisher	Ms. Azizah Alimat

BIOSTATISTICAL CONSULTANTS

Biostatistician	Dr. Sharon Chen Won Sun
Biostatistician	Ms. Teh Poh Geok

CONTENTS

INTRODUCTION

Organ transplantation is now well established as the best if not the only life saving therapy for patients with end-stage organ failure. It was more than half a century ago that the first successful kidney transplant was performed in Boston in 1954. This was followed by lung transplant (Mississippi) in 1963, liver transplant (Denver) and heart transplant (Cape Town) in 1967. With advances in immunosuppressive therapy and improved surgical techniques the success rate i.e. graft survival at 1 year, 5 years and 10 years post transplant have improved tremendously. Transplant surgery has become commonplace and is being performed on patients who would have been deemed unsuitable for transplant in the past.

Lack of organs remain the major issue globally, with demand exceeding the availability of organs. Other than from brain dead donors, organs are increasingly sourced from living donors (both related and unrelated), the practice of which is wrought with ethical concerns. Use of marginal organs is increasing, with acceptable success rate, including those from non-heart beating donors.

Organ Transplantation Activities in Malaysia

Organ transplantation

The first organ transplant in the country was a living related renal transplant that took place in Hospital Kuala Lumpur on 15th December 1975. This was followed six months later by the first cadaveric renal transplant on 1st June 1976. Since then a total of 1050 kidney transplants have been carried out in Malaysia of which more than 82% of the kidneys were from living related donors (including emotionally related) and the rest from cadaveric donors. Renal transplants have been mainly done in HKL, UMMC (since 1991) and Selayang Hospital (since 2000) with the exception of a few cases in the private sector.

On average about 40 to 60 kidney transplants are done locally annually (2 per million population per year) and this has not changed since the 1980s. On the other hand the number of renal failure patients going on to dialysis therapy has increased from 33 pmp in 1995 to 101 pmp in 2003. Many patients resort to having their transplants done commercially overseas such as in India (commercial living unrelated) or China (commercial cadaveric transplants). Currently there are more than 11,000 patients on the dialysis program nationwide with more than half of them being suitable for renal transplantation. The waiting list grows longer as every year about 2,500 new patients develop end stage renal failure.

Heart transplantation is done exclusively in Institut Jantung Negara (IJN) with the first transplant performed on 18th December 1997. To date 15 heart transplants have been carried out while 31 patients have died while waiting for a suitable donor. Since 2004 IJN together with Institut Perubatan Respiratori (IPR) of the Ministry of Health, has been preparing to perform lung transplantation as well as heart-lung transplant but none has been carried out to date. This is due to the lack of cadaveric organs.

The liver transplant program started in 1995 in Subang Jaya Medical Centre, which only does living donor paediatric liver transplants. Selayang Hospital, which has been designated as a Transplant Hospital, started its liver transplant service in April 2002 with a living related transplant, which was immediately followed by the first cadaveric liver transplant in the country. A total of 61 liver transplants have been done in Malaysia thus far, 51 in SJMC and 10 in Selayang Hospital.

To date there is no pancreas transplant program in the country.

In May 2000 the Hand Team at Selayang Hospital successfully carried out a cadaveric arm and hand transplant between 2 identical twin babies, the donor being brain dead from severe congenital brain abnormality. This transplant was the first of its kind in the world involving young children and created history in Malaysia.

Tissue transplantation

Cornea transplantation in Malaysia dates back to the early 1970's with corneas obtained from Sri Lanka. The LIONS eye bank was established in HKL on 9th May 2000. Today corneal graft surgeries are widely performed by ophthalmologists throughout the country both in the government and private sectors utilising corneas sourced from Sri Lanka or USA (either through the LIONS eye bank or obtained directly) or more recently from an increasing number of local cadaveric donors.

The bone marrow transplant service first started in University Hospital, Kuala Lumpur (UHKL) in 1987, initially for paediatric patients, and later for adults as well. This was followed by bone marrow transplantation in HKL in 1994 and subsequently in HUKM and SJMC. Today haematopoietic stem cells can be harvested from blood as well bone marrow for transplantation.

The National Tissue Bank was established in July 1991 at the School of Medical Sciences, Universiti Sains Malaysia Health Campus, Kubang Kerian, Kelantan. The bank, which was set up in collaboration with the Malaysian Institute for Nuclear Technology Research (MINT) and International Atomic Energy Agency (IAEA), collects, processes, stores and distributes tissues such as bone, skin, and amnion from both human and animal sources, to be used by surgeons nationwide as biomaterial or tissue grafts to replace diseased tissues. There are also bone banks established in HKL and UMMC. Plans are proposed for a larger and centrally located Tissue Bank as the needs for tissue grafts and the volume of tissues donated have increased tremendously in recent years.

The use of cardiovascular tissue homografts has become routine, especially in paediatric cardiac surgery for repair of congenital heart defects. There is an increasing demand for homografts because of growing paediatric cardiac surgery practice. Because of the escalating cost of imported homografts IJN has established a cardiovascular tissue bank since 1995. IJN has successfully retrieved and prepared cardiac homografts that have been implanted in more than a hundred patients.

National Transplant Registry

The evidence suggests that transplant activity is fairly common in the country. However, there has been no centralised register in the past that collects data on these activities. Although individual centres that perform the transplant may have audited their performance and monitored outcomes on their own, this information is not shared with the rest of the transplant community. It is difficult to assess the true situation about the transplant program in Malaysia, in particular survival rate and rate of complications and compare it to the rest of the world. Efforts have been made to monitor the outcomes of renal transplant patients and this is reported annually as part of the National Renal Registry which is maintained by the Malaysian Society of Nephrology. The bone marrow registry has been maintained online since 1999.

Any serious effort to improve transplant services requires information on its occurrence, distribution and outcomes. The National Transplant Registry was established in November 2003 under the aegis of the Malaysian Society of Transplantation in collaboration with CRC, supported by a grant from the Ministry of Health and with financial contributions from various interested parties. The registry collects data from various organ and tissue transplant groups namely Blood and Marrow Transplant, Cornea Transplant, Heart/Lung Transplant, Liver Transplant, Kidney Transplant, Heart Valve Transplant and Bone and Tissue Transplant. The hard work by everyone involved, from source data producers, members of the various expert panel, staff of the registry and CRC have culminated in the publication of this first report. It is hoped that the registry will continue to be maintained.

Dr. Lela Yasmin Mansor
Co-Chair
National Transplant Registry

REPORT SUMMARY

1. BLOOD AND MARROW TRANSPLANTATION

There were a total of 896 haematopoietic stem cell transplantations reported to the Registry between 1987 and 2004; 595 were functioning at the end of 2004.

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 133 new transplantations done in Malaysia in 2004 with 9 centres of follow-up for transplant recipients.

Mean age of new transplant patients in 2004 was 23 $\pm$ 15 years; 59% were male, 44% Chinese. Autologous transplants accounted for 35%. Seventy-one percent of the transplant source was from peripheral blood stem cells and 92% were from HLA identical donors.

In 2004, 40 of prevalent transplant recipients died. Underlying disease, infection and GVHD were the commonest causes of death accounting for 53%, 23% and 23% respectively.

2. CORNEAL TRANSPLANTATION

There were a total of 1130 cornea transplantations reported to the Registry between 1998 and 2004. Cornea transplantation has been performed in Malaysia since the 1970's. The number of successful cornea transplantation performed has increased greatly in recent years due to an increased availability of good cornea tissues and more trained ophthalmologists, improvements in surgical technique and medical knowledge, and better healthcare facilities.

There were 43 centres which agreed to provide cornea transplantation data.

One hundred and seventy-four new cornea transplantations were reported in Malaysia in 2004, with complete data available on 138 cases.

Mean age of new transplant recipients in 2004 was 45 $\pm$ 21 years. Of these, 60% were male. 37% of recipients were Malay, 30% Chinese, 23% Indian and 9% other races.

The primary diagnoses for cornea transplantation recipients in 2004 were microbial keratitis (20%), keratoconus (18%), cornea perforation (16%), cornea scars (14%), other (non-pseudophakic) bullous keratopathy (9%), pseudophakic bullous keratopathy (10%) and failed previous cornea grafts (7%).

Eighty-two percent recipients were legally blind before their transplant surgery.

In 2004, 69% of donated corneas were from the USA, 16% from Sri Lanka and 15% from local sources. The mean age of the donors was 57 $\pm$ 15 years.

The commonest cornea transplantation surgery performed was penetrating keratoplasty (87%) i.e. transplantation of a full thickness cornea tissue.

3. HEART TRANSPLANTATION

There were a total of 15 heart transplantations reported to the Registry between 1997 and 2003; 6 grafts were functioning at the end of 2004 and all were followed up in Institut Jantung Negara. There were no transplantations done in 2004.

Two thirds of the recipients were males and 60% were Indians. The mean age of recipients was 37 $\pm$ 16 years. Ischaemic cardiomyopathy was the commonest primary diagnosis (8/15) followed by dilated cardiomyopathy (5/15).

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 38% at 1 year and 3 years respectively.

4. LIVER TRANSPLANTATION

There were a total of 75 liver transplantations reported to the Registry between 1993 and 2004; 44 grafts were functioning at the end of 2004.

There were 14 new liver transplantations done in Malaysia in 2004 and 2 done overseas.

There were 4 centres of follow-up for liver transplant recipients in 2004.

Mean age of all transplant patients was 7 $\pm$ 14 years (range 4 months to 74 years); 56% were male, 53% Chinese, 76% were for biliary atresia. A majority was living donor liver transplantations (85%).

At the time of transplantation the main immunosuppressive drugs used were tacrolimus (73%) and steroids (52%).

Transplant patient survival rate for the cohort 1993 to 1998 was 71% at 1 year; survival rate for the cohort 1999 to 2004 was 66% at 1 year.

5. RENAL TRANSPLANTATION

There were a total of 2650 renal transplantations reported to the Registry between 1975 and 2004.

There were 57 centres of follow-up for renal transplant recipients in 2004.

The kidney transplant program was initiated in Malaysia after the first successful living related renal transplantation was carried out in Hospital Kuala Lumpur (HKL) on 15th December 1975.

The transplant program in Malaysia was almost exclusively a living related program until 1987 when many patients sought commercial living unrelated/cadaveric transplantation overseas.

In the early years, the local transplant program used an immunosuppressive protocol combining azathioprine and corticosteroids until 1992 when CsA based triple therapy was introduced.

New renal transplants showed a modest increase from about 30 new transplants per year in 1980 to 174 per year in 2004.

By 2004, the number of functioning renal transplants has increased steadily from 54 in 1980 to 1587.

Incident rates for renal transplantation showed modest increase from about 2-3 per million population in the early 80's to between 5-7 per million since 1990.

Transplant prevalence rates have also increased steadily from 4 per million population in 1980 to 62 per million in 2004.

The mean age for new transplant recipients has increased from 31$\pm$6 years in 1980 to 41$\pm$13 years in 2004.

Since 1975, men are in the majority among renal transplant recipients. However, the percentage has reduced from 70-80% in the early 1980's to 55-65% for the last 10 years.

Over the years, the proportion of diabetic transplant recipients have also increased, from hardly any in the early 1980's to 10-20% in the last decade,

In 2004, 61% were male, 19% diabetic, 6% HbsAg positive and 8% anti-HCV positive at the time of transplantation.

In 2004, 98% of prevalent renal transplant recipients were on prednisolone, 80% cyclosporine, 12% tacrolimus, 43% azathioprine and 36% mycophenolate mofetil.

In 2004, 32 (2%) of prevalent transplant recipients died and 43 (3%) lost their grafts. Infection and cancer were the commonest causes of death accounting for 29% and 17% respectively. Cardiovascular disease was the third commonest cause at 11%. Renal allograft rejection accounted for 70% of graft loss.

The overall transplant patient survival rates were 95%, 92%, 89% and 80% at 1 year, 3 years, 5 years and 10 years respectively, while the overall graft survival rates were 97%, 93%, 88% and 78% respectively (these survival rates are comparable to the USRDS data).

6. HEART VALVE TRANSPLANTATION

There were a total of 160 heart valve homografts reported to the Registry between 1996 and 2004; 141 grafts were functioning at the end of 2004. Eighty-one were aortic and 79 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, 59% Malay.

7. BONE AND TISSUE TRANSPLANTATION

In 2004, 108 bone allografts and 1128 amniotic membranes were supplied by 3 bone and tissue banks in Malaysia.

Sixteen hospitals used the bone grafts and 10 centres used the amniotic membranes.

CHAPTER 1

BLOOD AND MARROW TRANSPLANTATION

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

Expert Panel:
Dr. Alan Teh Kee Hean (Chair – Adult)
Prof. Dr. Chan Lee Lee (Chair – Paediatric)
Prof. Dr. Cheong Soon Keng
Dr. Chang Kian Meng
Dr. Gan Gin Gin
Dr. Hishamshah Mohd Ibrahim
Dr. Jameela Sathar
Prof. Dr. Lin Hai Peng
Dr. Mahfuzah Mohamed
Dr. Ng Soo Chin
Dr. Visalachy Purushothaman
Dr. Vijaya Sangkar

Contents

List of Tables

List of Figures

1.0 INTRODUCTION

The first bone marrow transplantation in Malaysia was conducted on a paediatric patient in 1987 at University Hospital Kuala Lumpur. Since then other bone marrow transplant centres in Malaysia have been set up. The idea of a common registry was mooted in the late 1990's and the Malaysian Bone Marrow Transplant Recipient Registry was formed in 1999 by the mutual agreement to merge existing transplant databases. The data was maintained online to the best of the group's ability until 2004, when the National Transplant Registry officially took over. Today haematopoietic stem cells can be harvested from blood as well as bone marrow and hence the name has been changed to Blood and Marrow Transplant Registry.

We continue to believe that a registry is an important entity as it not only is a record of national transplant activity, it will be important to provide better data (as larger numbers give greater statistical meaning) to guide clinicians towards future directions in stem cell transplantation.

We believe that a registry is 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

The total number of haematopoietic stem cell transplants performed is 896. At the time of the first NTR report a total of 9 haematopoietic stem cell transplant centres have contributed data to the registry.

Table 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2004

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	4	6	1	2	9	5	16
Lost to follow up	0	0	0	0	0	0	0	0	0
Alive at 31st December	7	12	30	29	40	59	69	89	103

Year	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**
New transplant patients	28	33	49	62	94	107	114	128	133
Deaths	11	15	17	15	31	47	30	50	40
Lost to follow up	0	0	0	0	0	0	0	0	0
Alive at 31st December	120	138	170	217	280	340	424	502	595*

*Out of the 896 patients who were transplanted, there were 38 patients with early death before day 30 of transplant

Figure 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2004

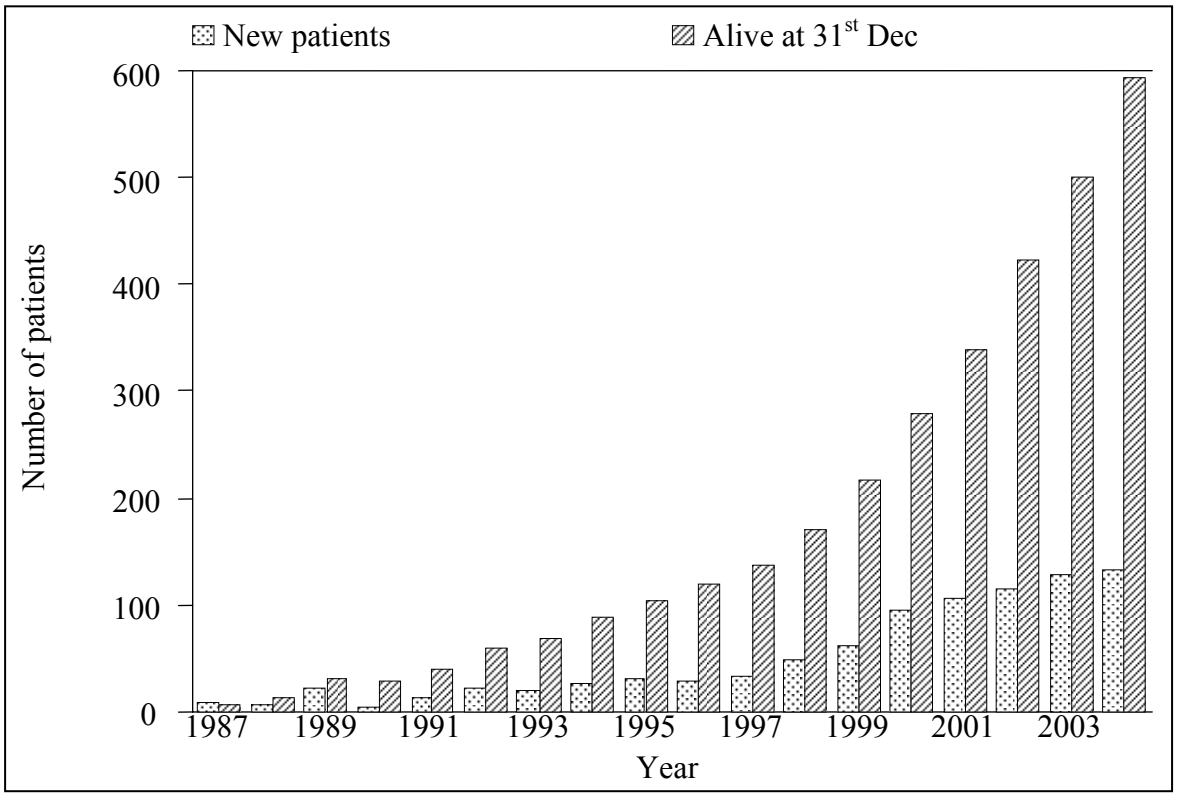


Table 1.1.2: New Transplant Rate per million population (pmp), 1987-2004

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**
New transplant patients	28	33	49	62	94	107	114	128	133
New transplant rate pmp	1	2	2	3	4	4	5	5	5

Figure 1.1.2: New Transplant Rate per million population (pmp), 1987-2004

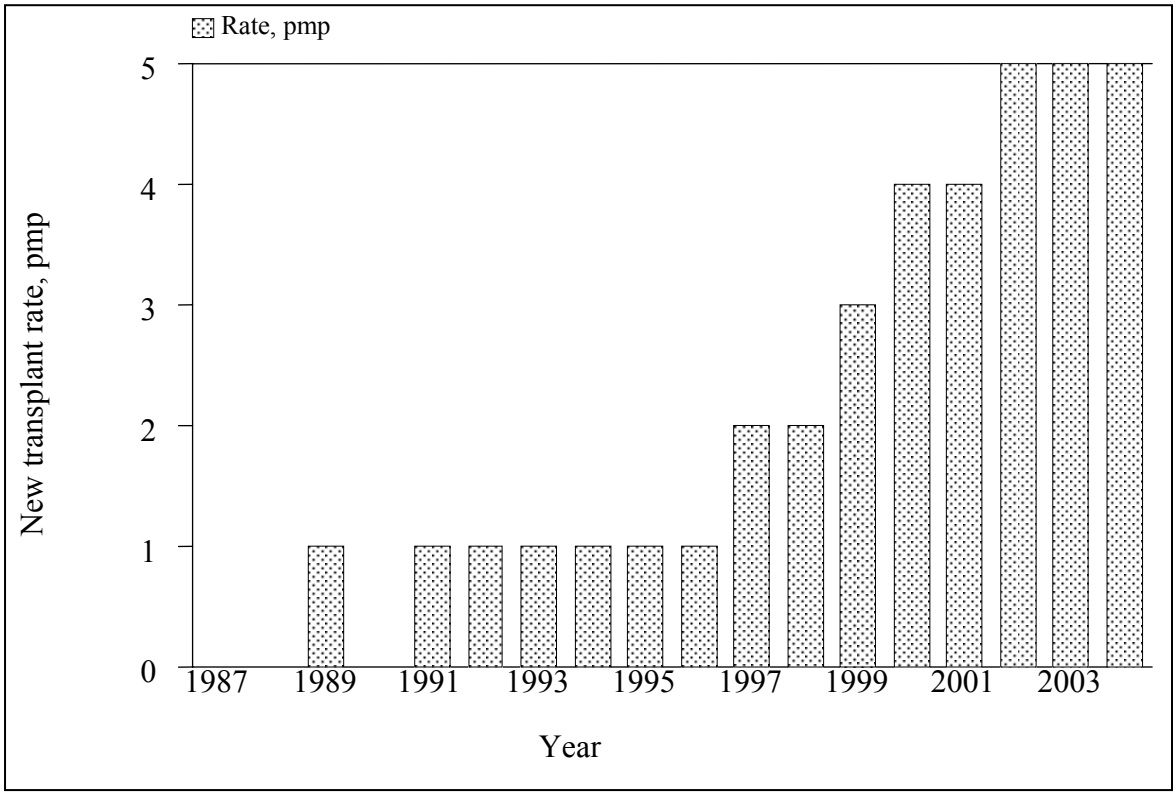


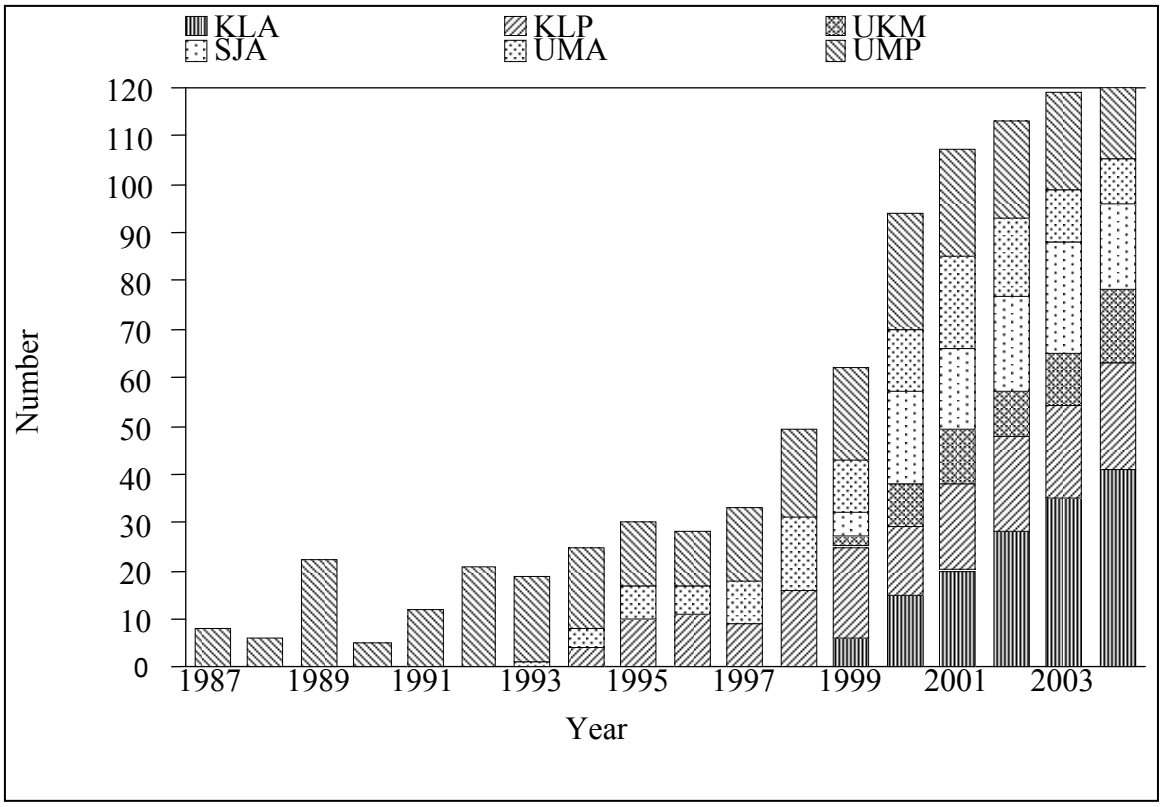
Table 1.1.3: Centre distribution (SDP), 1987-2004

Year	1987		1988		1989		1990		1991		1992		1993	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0		0		0		0		0		0		0	
KLP	0		0		0		0		0		0		0	
UKM	0		0		0		0		0		0		0	
SJA	0		0		0		0		0		0		0	
UMA	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	
LWE	0		0		0		0		0		0		0	
SJP	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		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		2	3	9	10
SJA	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	
LWE	0		0		0		0		0		0		0	
SJP	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		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	20	19	28	25	35	27	41	31	145	16
KLP	18	17	20	18	19	15	22	17	162	18
UKM	11	10	9	8	11	9	15	11	57	6
SJA	17	16	20	18	23	18	18	14	102	11
UMA	19	18	16	14	11	9	9	7	121	14
UMP	22	21	20	18	20	16	15	11	286	32
GMC	0		0		0		2	2	2	0
LWE	0		0		0		5	4	5	1
SJP	0		1	1	9	7	6	5	16	2
TOTAL	107	100	114	100	128	100	133	100	896	100

Figure 1.1.3: Centre distribution (SDP), 1987-2004



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 male preponderance (58% males, 42% 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).

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

Table 1.2.1: Gender distribution, 1987-2004

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

Year	**1994**		**1995**		**1996**		**1997**		**1998**		**1999**	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	16	64	11	37	15	54	18	55	33	67	36	58
Female	9	36	19	63	13	46	15	45	16	33	26	42
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100

Year	**2000**		**2001**		**2002**		**2003**		**2004**		**TOTAL**	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	54	57	66	62	62	54	71	55	79	59	520	58
Female	40	43	41	38	52	46	57	45	54	41	376	42
TOTAL	94	100	107	100	114	100	128	100	133	100	896	100

Figure 1.2.1: Gender distribution, 1987-2004

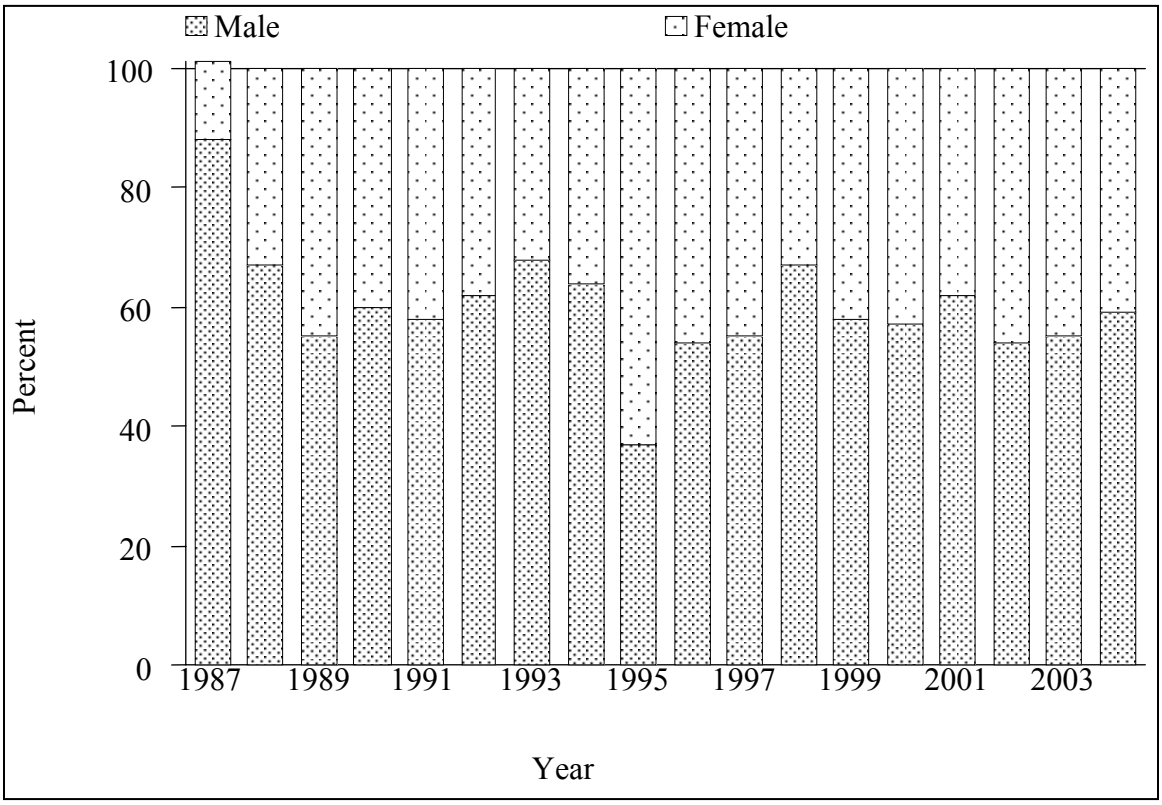


Table 1.2.2: Ethnic group distribution, 1987-2004

Year	1987		1988		1989		1990		1991		1992		1993	
Race	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
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	
Race	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
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	2	7	0	0	0	0	0	0	0	0
Others	0	0	5	17	1	4	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		TOTAL	
Race	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	46	43	37	32	46	36	50	38	328	37
Chinese	48	45	65	57	65	51	59	44	437	49
Indian	8	7	8	7	6	5	8	6	61	7
Bumiputra Sabah	1	1	1	1	4	3	8	6	29	3
Bumiputra Sarawak	1	1	1	1	4	3	7	5	17	2
Others	3	3	2	2	3	2	1	1	24	3
TOTAL	107	100	114	100	128	100	133	100	896	100

Figure 1.2.2: Ethnic group distribution, 1987-2004

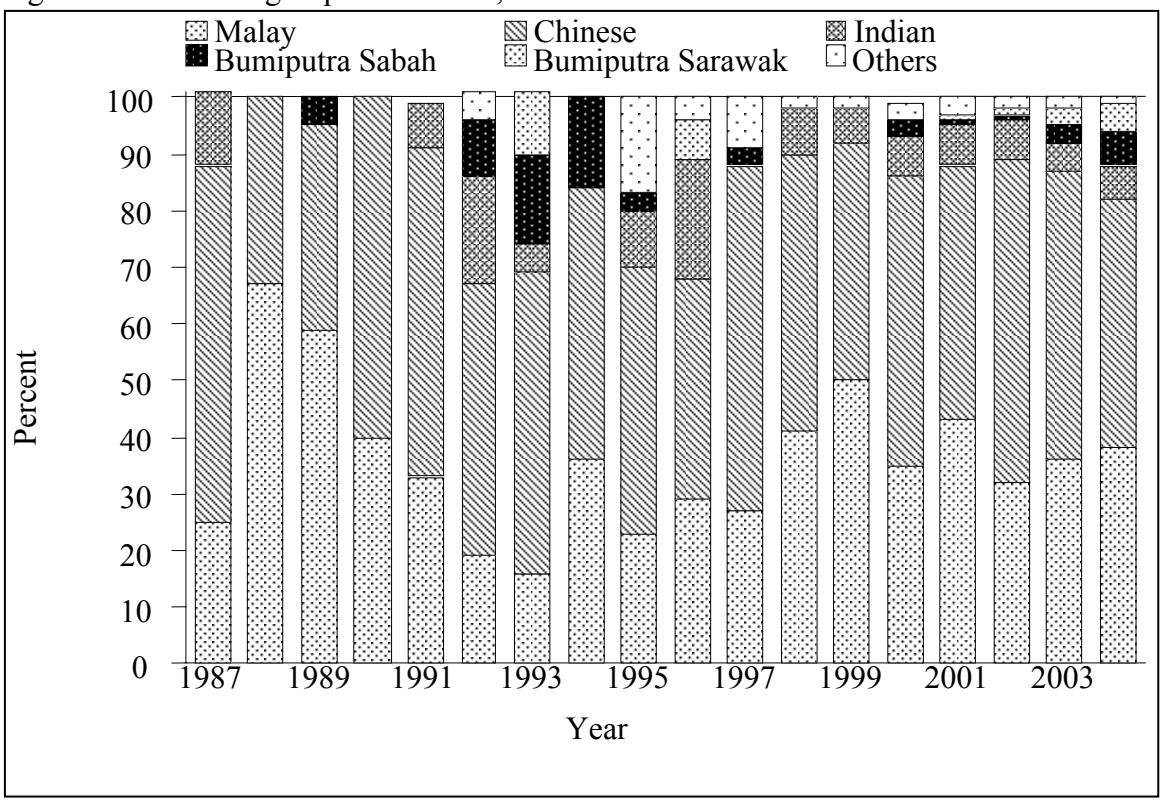


Table 1.2.3: Age distribution, 1987-2004

Year	1987		1988		1989		1990		1991		1992		1993	
Age group (years)	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	
Age group (years)	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		12		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		TOTAL	
Age group (years)	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	23	21	30	26	42	33	26	20	316	35
10-19	28	26	25	22	18	14	40	30	242	27
20-39	39	36	36	32	47	37	48	36	228	25
40-59	16	15	23	20	21	16	18	14	107	12
>=60	1	1	0	0	0	0	1	1	3	0
TOTAL	107	100	114	100	128	100	133	100	896	100
Mean	23		23		22		23		19	
SD	16		16		15		15		15	
Median	22		22		23		20		14	
Minimum	1 month		1		5 months		1		1 month	
Maximum	64		55		52		61		64	

*Age=date of transplant – date of birth

Figure 1.2.3: Age distribution, 1987-2004

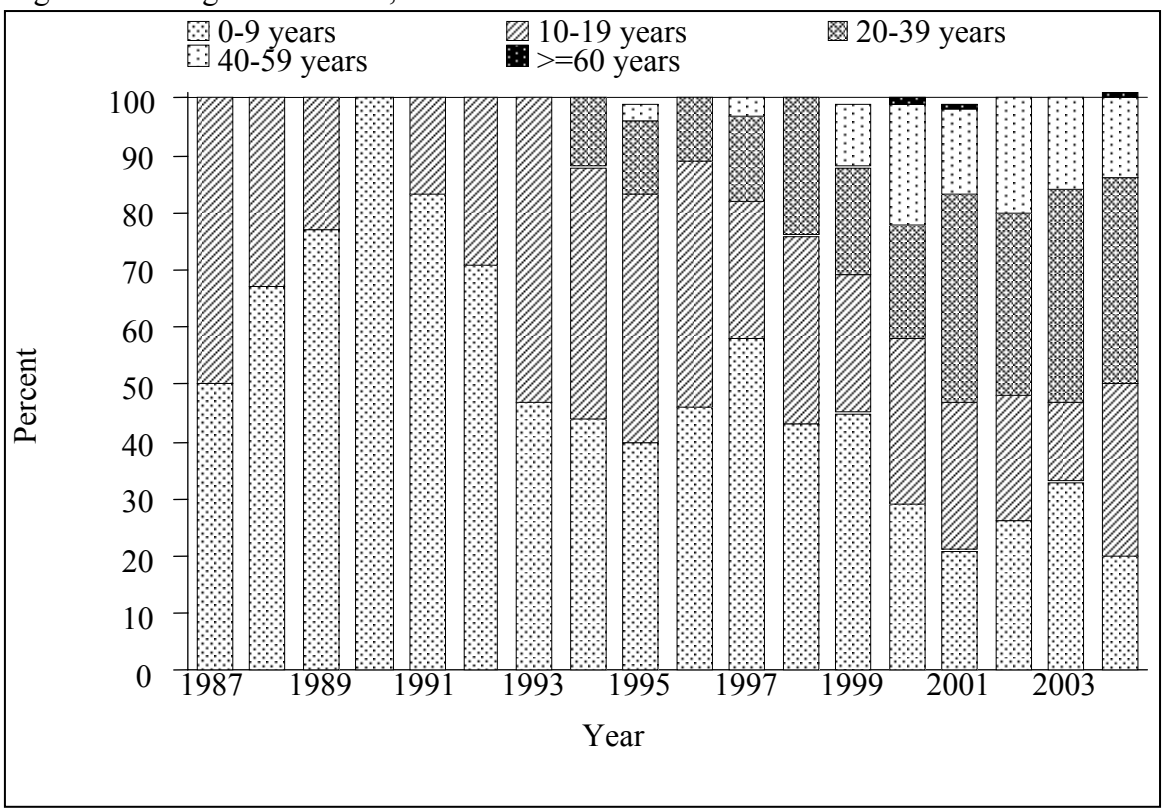


Table 1.2.4: Primary Diagnosis, 1987-2004

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

Year	1993		1994		1995		1996		1997		1998	
Diagnosis	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	6	32	8	32	10	33	13	46	11	33	23	47
Chronic leukaemia	2	11	4	16	5	17	5	18	6	18	7	14
Hypoplastic anaemia	4	21	5	20	8	27	4	14	5	15	4	8
Erythrocytic disorders	0	0	0	0	0	0	1	4	0	0	0	0
Lymphoma	0	0	0	0	0	0	0	0	2	6	5	10
Solid tumors	1	5	1	4	1	3	0	0	1	3	2	4
Myelodysplasia	1	5	2	8	0	0	0	0	0	0	1	2
Haemoglobinopathy	2	11	5	20	5	17	5	18	6	18	2	4
Multiple myeloma	0	0	0	0	0	0	0	0	0	0	0	0
Others	3	16	0	0	1	3	0	0	2	6	5	10
TOTAL	19	100	25	100	30	100	28	100	33	100	49	100

Year	1999		2000		2001		2002		2003		2004		TOTAL	
Diagnosis	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	28	45	37	39	48	45	48	42	42	33	44	33	342	38
Chronic leukaemia	7	11	13	14	17	16	19	17	19	15	21	16	132	15
Hypoplastic anaemia	5	8	11	12	7	7	4	4	5	4	12	9	89	10
Erythrocytic disorders	0	0	0	0	0	0	1	1	2	2	0	0	8	1
Lymphoma	6	10	19	20	23	21	20	18	28	22	33	25	136	15
Solid tumors	5	8	2	2	0	0	3	3	2	2	0	0	21	2
Myelodysplasia	0	0	1	1	4	4	4	4	3	2	6	5	22	2
Haemoglobinopathy	4	6	7	7	4	4	8	7	17	13	8	6	92	10
Multiple myeloma	3	5	1	1	1	1	4	4	4	3	3	2	16	2
Others	4	6	3	3	3	3	3	3	6	5	6	5	38	4
TOTAL	62	100	94	100	107	100	114	100	128	100	133	100	896	100

Diagnosis list in the web-application

#	**Diagnosis**	**Categorise as:**
1.	Acute leukaemia, unclassified	Acute leukaemia
2.	Acute undifferentiated leukaemia	
3.	ALL	
4.	AML denovo	
5.	AML post-chemotherapy	
6.	AML post-MDS	
7.	Chronic lymphocytic leukaemia	Chronic leukaemia
8.	Chronic myeloid leukaemia	
9.	Aplastic anaemia	Hypoplastic anaemia
10.	Fanconi's anaemia	
11.	Diamond-Blackfan anaemia	Erythrocytic Disorders
12.	Congenital Dyserythropoeitic Anaemia (CDA)	
13.	Hodgkin's lymphoma	Lymphoma
14.	Non-Hodgkin's lymphoma, Aggressive	
15.	Non-Hodgkin's lymphoma, Indolent	
16.	Carcinoma, breast	Solid tumors
17.	Carcinoma, ovary	
18.	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.	Myelodyplastic syndrome (MDS)	
30.	Myelofibrosis	
31.	Thalassaemia major	Haemoglobinopathy
32.	Sickle Cell Anaemia	
33.	Multiple myeloma	Multiple myeloma
34.	Haemophagocytic Lymphohistiocytosis Syndrome	Others
35.	Congenital Immunodeficiencies	
36.	Osteopetrosis	
37.	Others	

1.3 TRANSPLANT PRACTICES

Autologous transplants started later (in 1997) and hence there currently are more allogeneic stem cell transplants (72%) compared with autologous transplants (28%) though the latter are increasing at a faster rate in the past 7 years (Table 1.3.2). Autologous transplantations have been initially conducted using bone marrow as the stem cell source but increasingly peripheral blood stem cells have been used as the preferred source (Table 1.3.4).

Almost all the allogeneic transplants are sibling related transplants and the majority of these are HLA identical transplants though of late there have been more 1 or 2 antigen mismatched transplants (Table 1.3.5). Unrelated donor transplants started in 1997 with the use of cord blood obtained from overseas cord blood banks but these higher risk transplants are only carried out on a small scale. Unrelated bone marrow transplantation has been performed in 2004 for paediatric patients (Table 1.3.6).

Table 1.3.1: Graft number, 1987-2004

Year	**1987**		**1988**		**1989**		**1990**		**1991**		**1992**		**1993**	
Graft number	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**	
Graft number	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**		**TOTAL**	
Graft number	No.	%	No.	%	No.	%	No.	%	No.	%
1	103	96	113	99	125	98	128	98	864	97
2	4	4	1	1	3	2	3	2	28	3
3	0	0	0	0	0	0	0	0	2	0
TOTAL	107	100	114	100	128	100	131	100	894	100

Figure 1.3.1: Graft number, 1987-2004

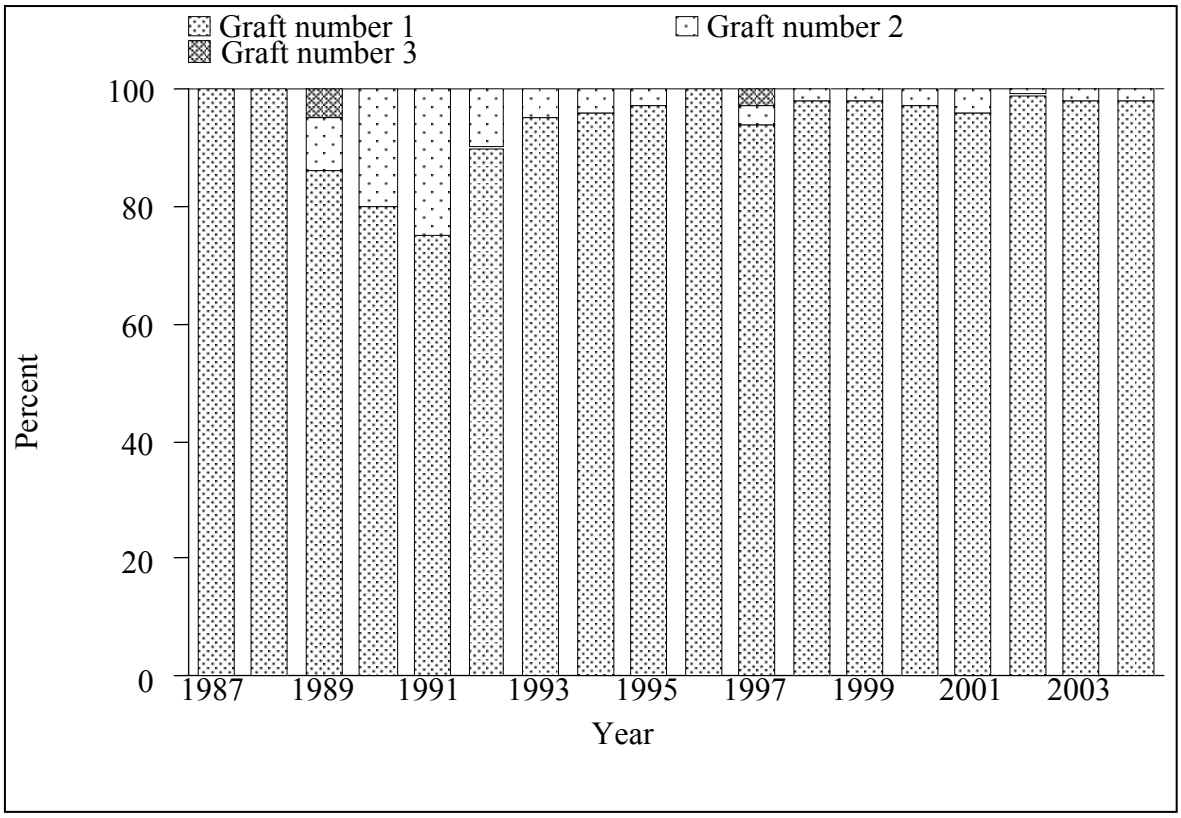


Table 1.3.2: Type of transplant, 1987-2004

Year	1987		1988		1989		1990		1991		1992	
Type of transplant	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	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	18	95	24	96	29	97	26	93	27	82	32	65
Autologous	1	5	1	4	1	3	2	7	6	18	17	35
TOTAL	19	100	25	100	30	100	28	100	33	100	49	100

Year	1999		2000		2001		2002		2003		2004		TOTAL	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	44	71	56	60	74	69	75	66	84	66	87	65	648	72
Autologous	18	29	38	40	33	31	39	34	44	34	46	35	248	28
TOTAL	62	100	94	100	107	100	114	100	128	100	133	100	896	100

*6 patients with syngeneic type of transplant

Figure 1.3.2: Type of transplant, 1987-2004

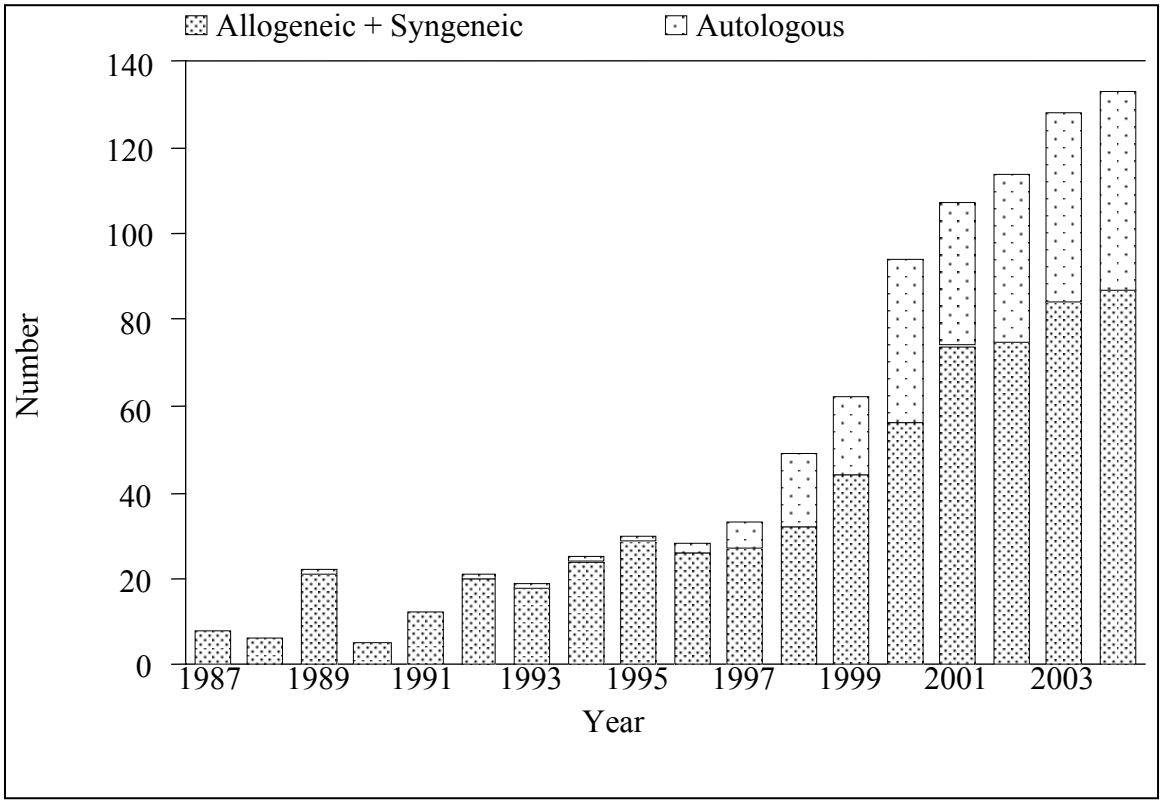


Table 1.3.3: Type of transplant by Centre, 1987-2004

Type of transplant	**Allogeneic + Syngeneic**		**Autologous**		**TOTAL**	
Centre	No.	%	No.	%	No.	%
KLA	78	12	67	27	145	16
KLP	135	21	27	11	162	18
UKM	36	6	21	8	57	6
SJA	35	5	67	27	102	11
UMA	85	13	36	15	121	14
UMP	261	40	25	10	286	32
GMC	0	0	2	1	2	0
LWE	5	1	0	0	5	1
SJP	13	2	3	1	16	2
TOTAL	648	100	248	100	896	100

Figure 1.3.3: Type of transplant by Centre, 1987-2004

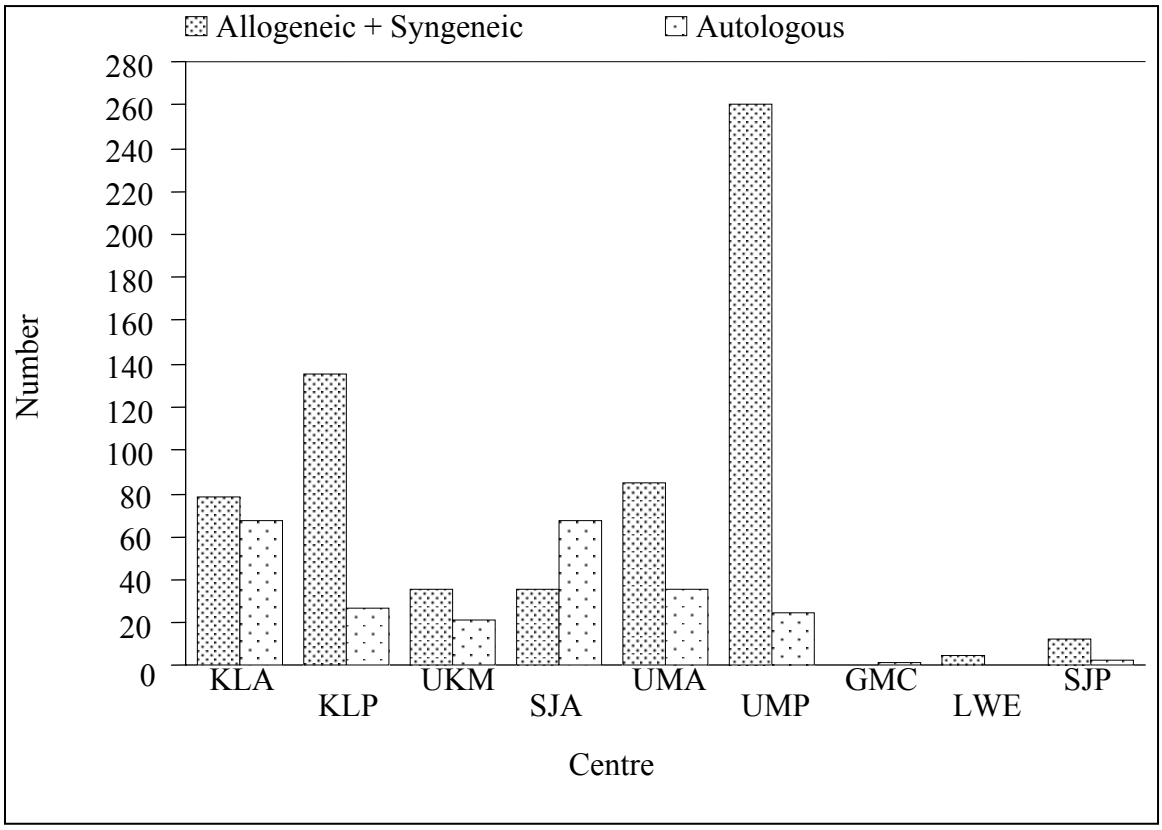


Table 1.3.4: Transplant source, 1987-2004

Year	**1987**		**1988**		**1989**		**1990**		**1991**	
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**	
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**	
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	24	73	25	51	37	60	31	33	30	28
PBSC / Marrow + PBSC	7	21	23	47	23	37	57	61	73	68
Cord blood / Marrow + cord	2	6	1	2	2	3	6	6	4	4
TOTAL	33	100	49	100	62	100	94	100	107	100

Year	**2002**		**2003**		**2004**		**TOTAL**	
Transplant source	No.	%	No.	%	No.	%	No.	%
Marrow	31	27	44	34	30	23	428	48
PBSC / Marrow + PBSC	79	69	79	62	95	71	436	49
Cord blood / Marrow + cord	4	4	5	4	8	6	32	4
TOTAL	114	100	128	100	133	100	896	100

Figure 1.3.4: Transplant source, 1987-2004

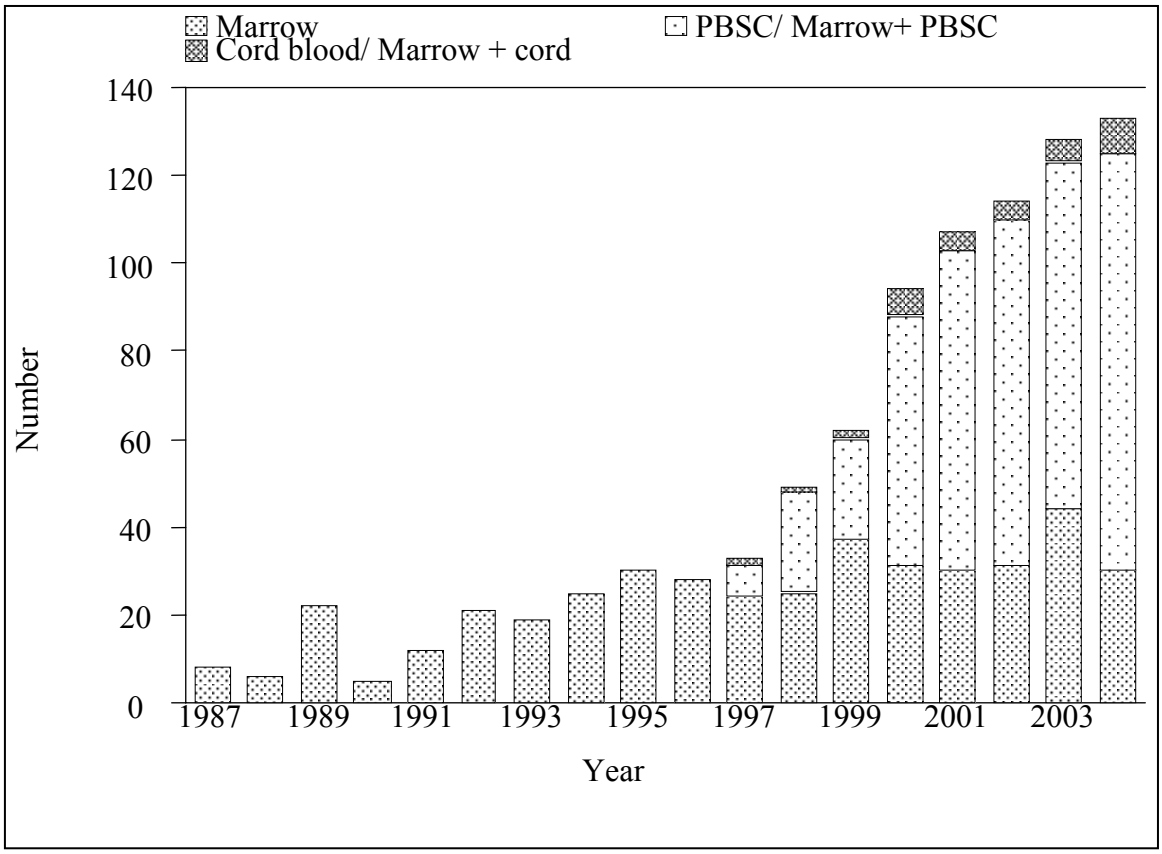


Table 1.3.5: HLA Match, 1987-2004

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

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

Year	1997		1998		1999		2000		2001	
HLA Match	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	25	93	31	97	40	91	52	93	68	92
1 AG	2	7	0	0	3	7	0	0	4	5
2 AG	0	0	1	3	1	2	4	7	1	1
>=3 AG Disparate	0	0	0	0	0	0	0	0	1	1
TOTAL	27	100	32	100	44	100	56	100	74	100

Year	2002		2003		2004		TOTAL	
HLA Match	No.	%	No.	%	No.	%	No.	%
Identical	70	93	79	94	80	92	613	95
1 AG	3	4	3	4	3	3	19	3
2 AG	2	3	2	2	4	5	15	2
>=3 AG Disparate	0	0	0	0	0	0	1	0
TOTAL	75	100	84	100	87	100	648	100

*excluding autologous

Table 1.3.6: Allogeneic Donor Relationship, 1987-2004

Year	**1987**		**1988**		**1989**		**1990**		**1991**	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	8	100	6	100	21	100	5	100	11	92
Unrelated	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	1	8
TOTAL	8	100	6	100	21	100	5	100	12	100

Year	**1992**		**1993**		**1994**		**1995**		**1996**	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	20	100	18	100	22	92	29	100	26	100
Unrelated	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	2	8	0	0	0	0
TOTAL	20	100	18	100	24	100	29	100	26	100

Year	**1997**		**1998**		**1999**		**2000**		**2001**	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	26	96	32	100	44	100	55	98	71	96
Unrelated	1	4	0	0	0	0	1	2	3	4
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	27	100	32	100	44	100	56	100	74	100

Year	**2002**		**2003**		**2004**		**TOTAL**	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%
Sibling	71	95	81	96	78	90	624	96
Unrelated	4	5	3	4	9	10	21	3
Others	0	0	0	0	0	0	3	0
TOTAL	75	100	84	100	87	100	648	100

*excluding autologous, including syngeneic

1.4 TRANSPLANT OUTCOMES

The major cause of death appears to be relapse/underlying disease with sepsis being the second commonest cause of death (Table 1.4.1). The probability of survival post-transplant is demonstrated in the Kaplan-Meier survival curves (Figures 1.4.2 – 1.4.5).

Table 1.4.1: Cause of Death, 1987-2004

Year	**1987**		**1988**		**1989**		**1990**		**1991**	
Cause of death	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	1	100	0	0	0	0	0	0	1	100
GVHD	0	0	0	0	0	0	1	17	0	0
Underlying disease	0	0	0	0	4	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
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	4	100	6	100	1	100

Year	**1992**		**1993**		**1994**		**1995**		**1996**	
Cause of death	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	1	50	2	22	1	20	4	25	6	55
GVHD	0	0	0	0	0	0	3	19	0	0
Underlying disease	0	0	6	67	3	60	3	19	3	27
Haemorrhage	0	0	1	11	0	0	2	13	1	9
VOD	0	0	0	0	0	0	1	6	1	9
Others	1	50	0	0	1	20	3	19	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**	
Cause of death	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	5	33	2	12	6	40	3	10	6	13
GVHD	0	0	2	12	1	7	2	6	4	9
Underlying disease	9	60	11	65	7	47	22	71	33	70
Haemorrhage	0	0	1	6	0	0	3	10	2	4
VOD	0	0	1	6	0	0	1	3	2	4
Others	1	7	0	0	1	7	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
TOTAL	15	100	17	100	15	100	31	100	47	100

Year	**2002**		**2003**		**2004**		**TOTAL**	
Cause of death	No.	%	No.	%	No.	%	No.	%
Sepsis	4	13	15	30	9	23	66	22
GVHD	3	10	5	10	9	23	30	10
Underlying disease	18	60	26	52	21	53	171	57
Haemorrhage	0	0	0	0	1	3	12	4
VOD	0	0	0	0	0	0	6	2
Others	4	13	3	6	0	0	14	5
Unknown	1	3	1	2	0	0	2	1
TOTAL	30	100	50	100	40	100	301	100

Figure 1.4.2: Patient survival by year of transplant, 1987-2004

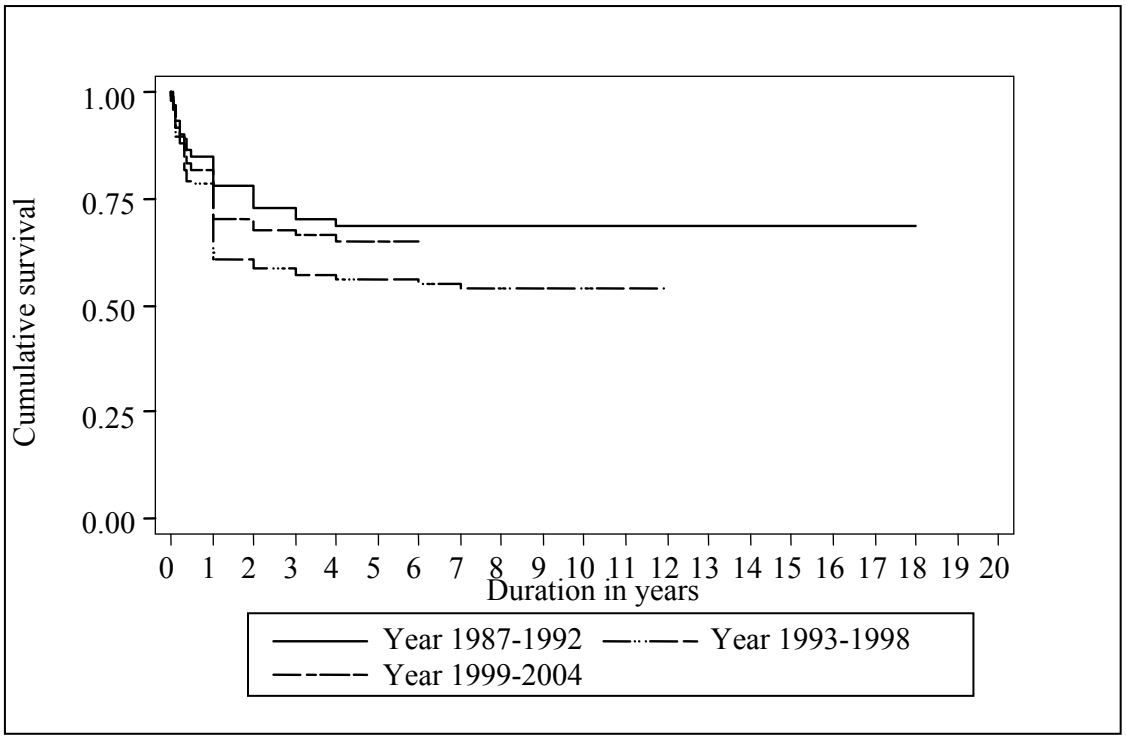


Figure 1.4.3: Patient survival by gender, 1987-2004

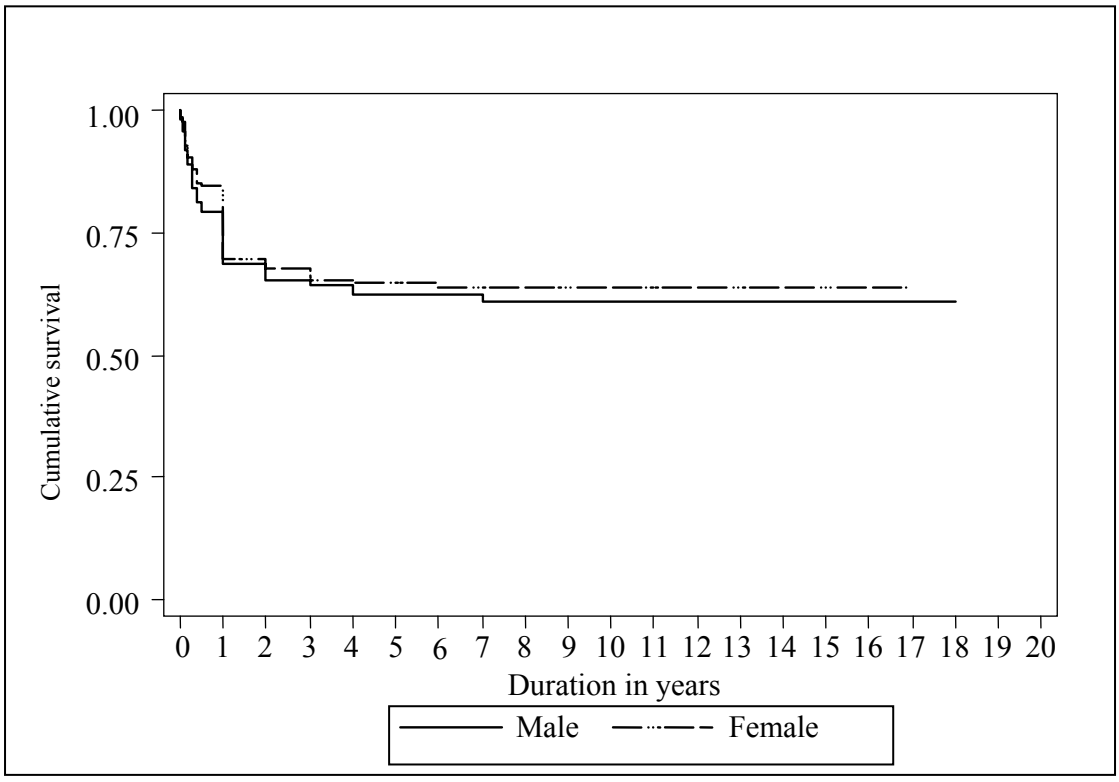


Figure 1.4.4: Patient survival by age group, 1987-2004

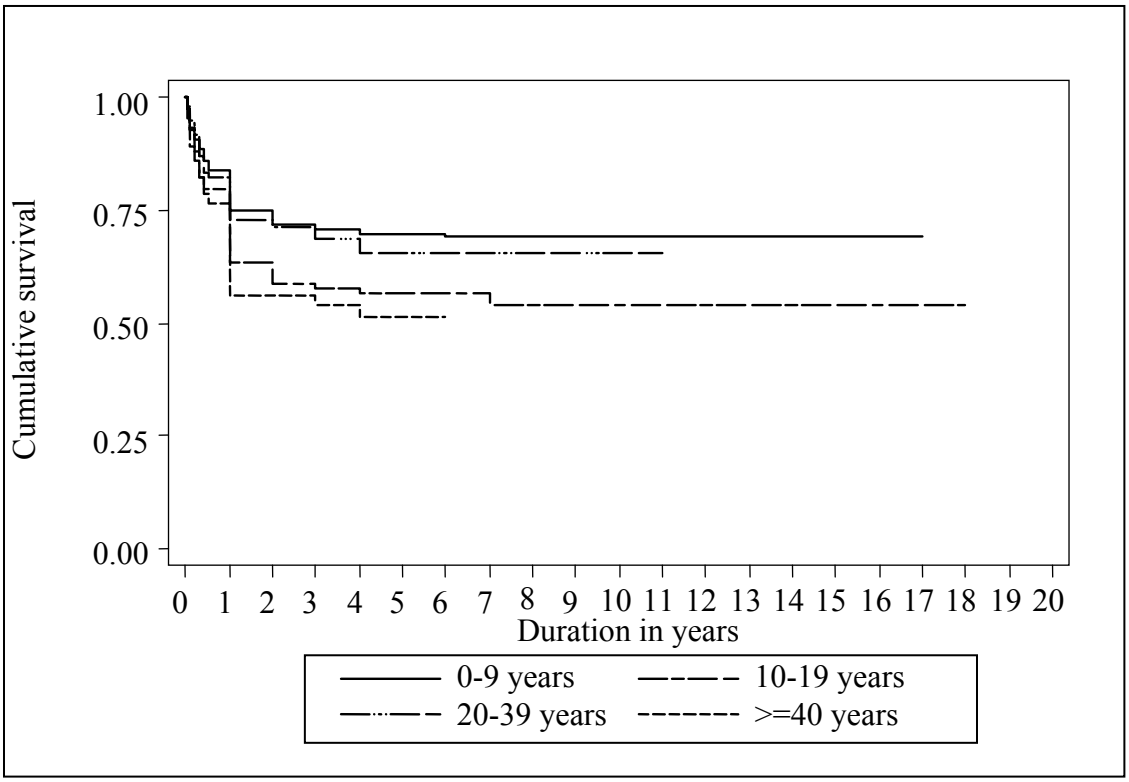


Figure 1.4.5: Patient survival by type of transplant, 1987-2004

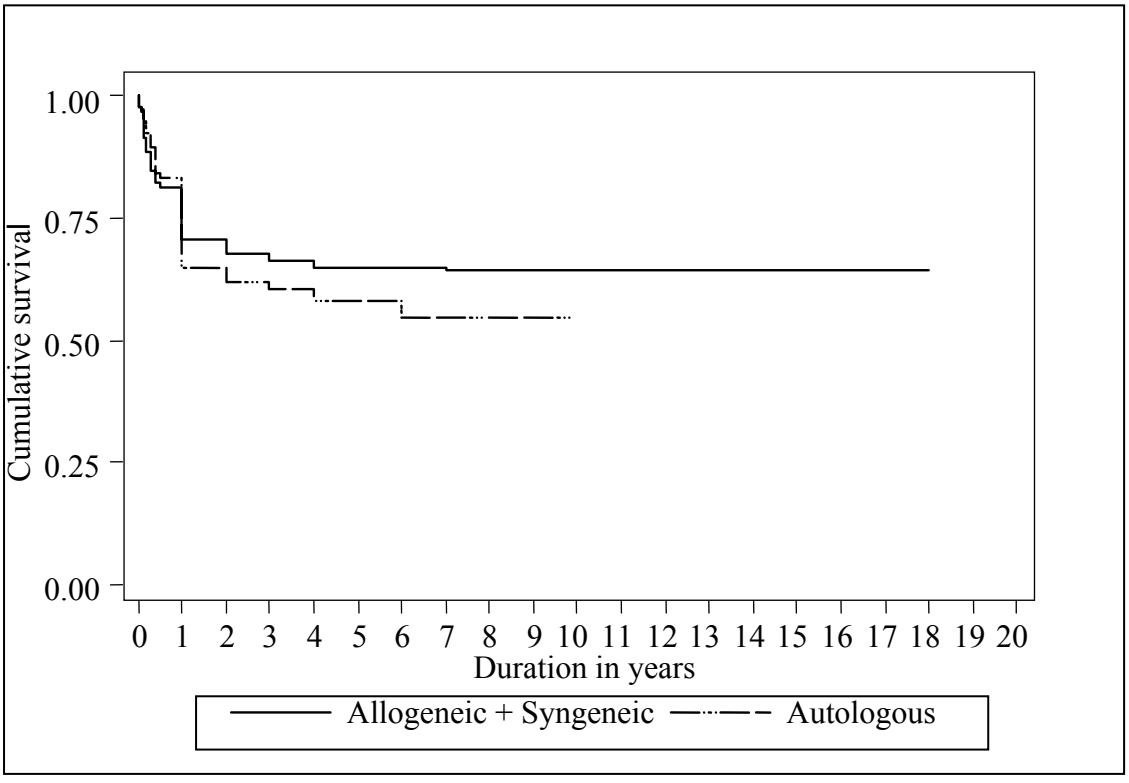


Figure 1.4.2: Patient survival by year of transplant, 1987-2004

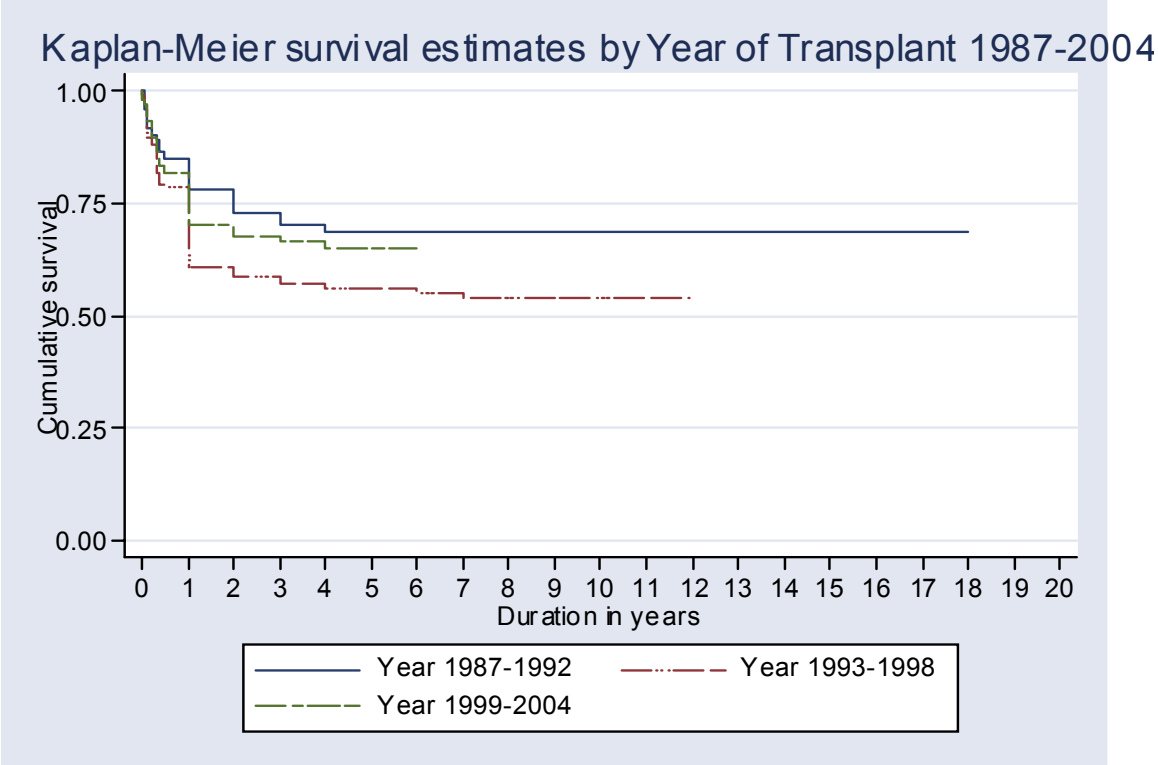


Figure 1.4.3: Patient survival by gender, 1987-2004

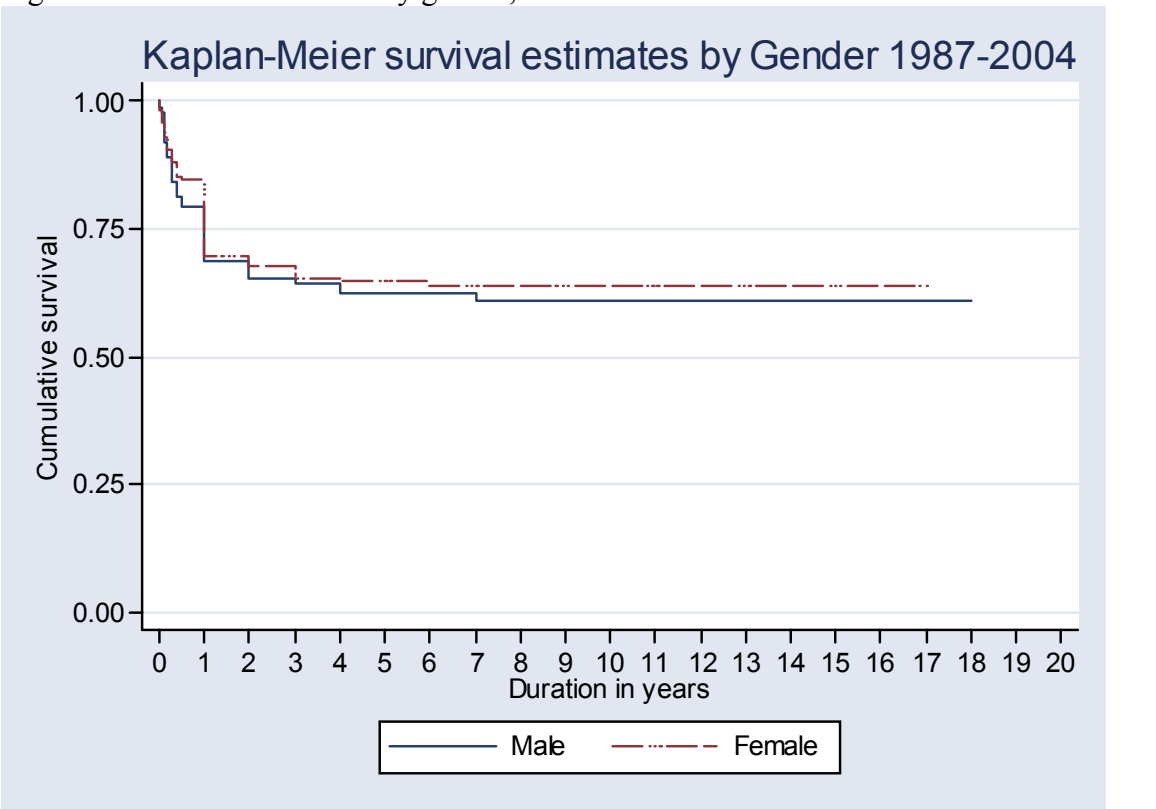


Figure 1.4.4: Patient survival by age group, 1987-2004

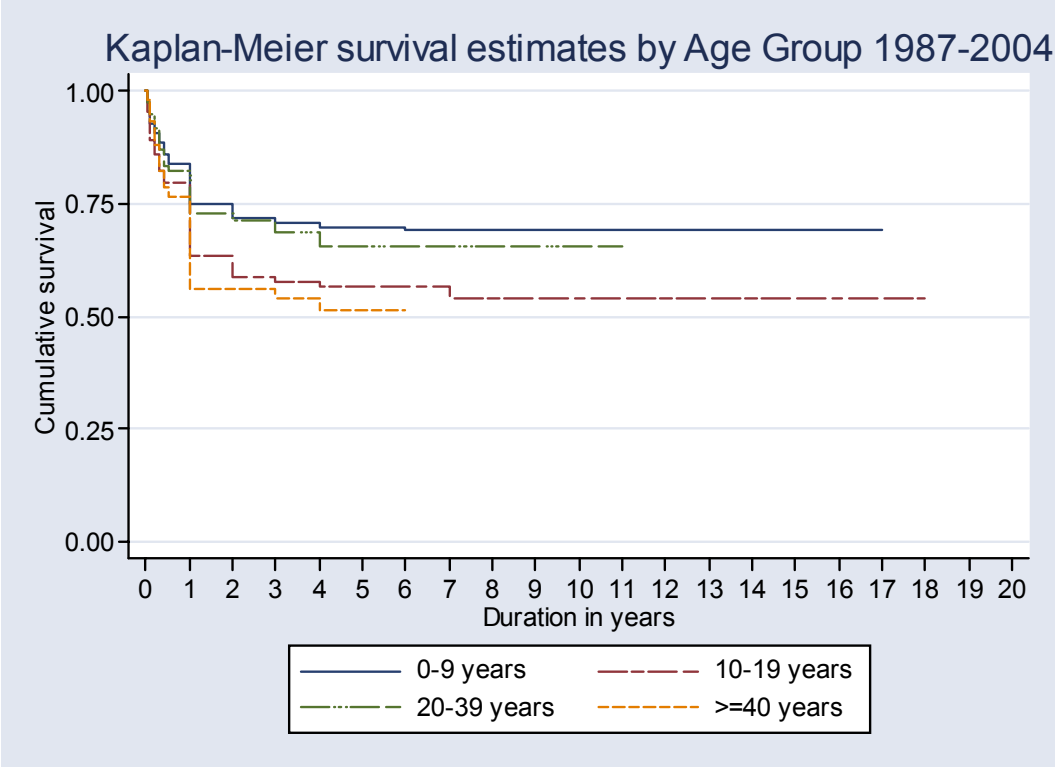
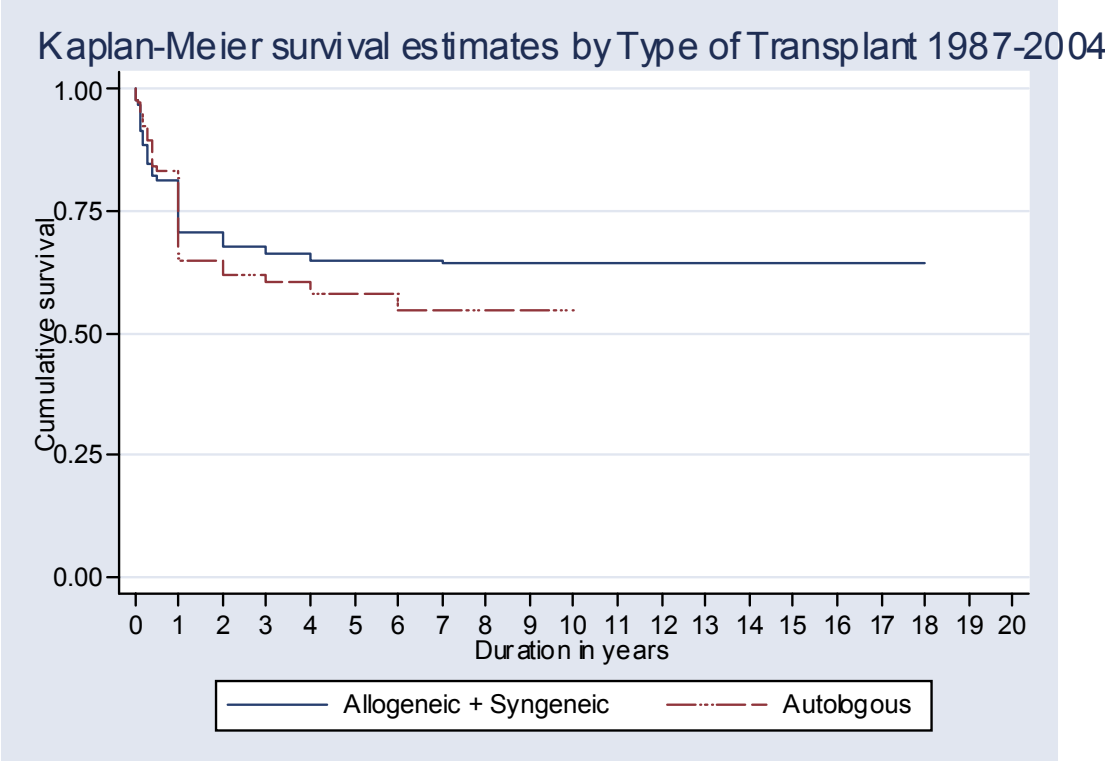


Figure 1.4.5: Patient survival by type of transplant, 1987-2004



CHAPTER 2

CORNEAL TRANSPLANTATION

Editors:
Dr. Shamala Retnasabapathy
Dr. Choong Yean Yaw
Dr. Michael Law Sie Haur

Expert Panel:
Dr. Shamala Retnasabapathy (Chair)
Dr. Choong Yean Yaw (Co-chair)
Dr. Jonathan Choon Siew Cheong
Assoc. Prof. Dr. Cordelia Chan Mei Lan
Dr. Chuah Kay Leong
Dr. Michael Law Sie Haur
Dr. Mariam Ismail
Assoc. Prof. S C Reddy
Dato' Dr. Veera Ramani
Dr. Sahimi Sulaiman

Contents

List of Tables

List of Figures

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 November 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 43 centres registered and agreed to provide information on retrospective and prospective cornea transplant activities. A total of 30 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**. 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 i) **Cornea Transplant Notification Form** is completed at the time of surgery and the ii) **Cornea Transplant Outcome Form** is completed at the end of 12 months and annually thereafter. Most surgeons sent a complete data set in 2004 as required in the prospective Cornea Transplant Notification Forms. Some surgeons chose to provide only minimal data set as per the retrospective cornea transplant notification forms.

The Corneal section of the NTR will be discussed under **3** sections.

Section 2.1 and *Section 2.2* will cover data over 7 years from 1998 to 2004. 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.

Section 2.3 will only cover prospective data (*from 2004*) from surgeons who sent a complete data set.

2.1 CORNEA TRANSPLANT ACTIVITIES AND TRENDS (1998 – 2004)

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 and 2004 (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– 2004

Year	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
New transplant	119	122	126	221	203	165	174
New transplant rate pmp	5	5	5	9	8	7	7

Figure 2.1.1: New Transplant Rate per million population (pmp), 1998-2004

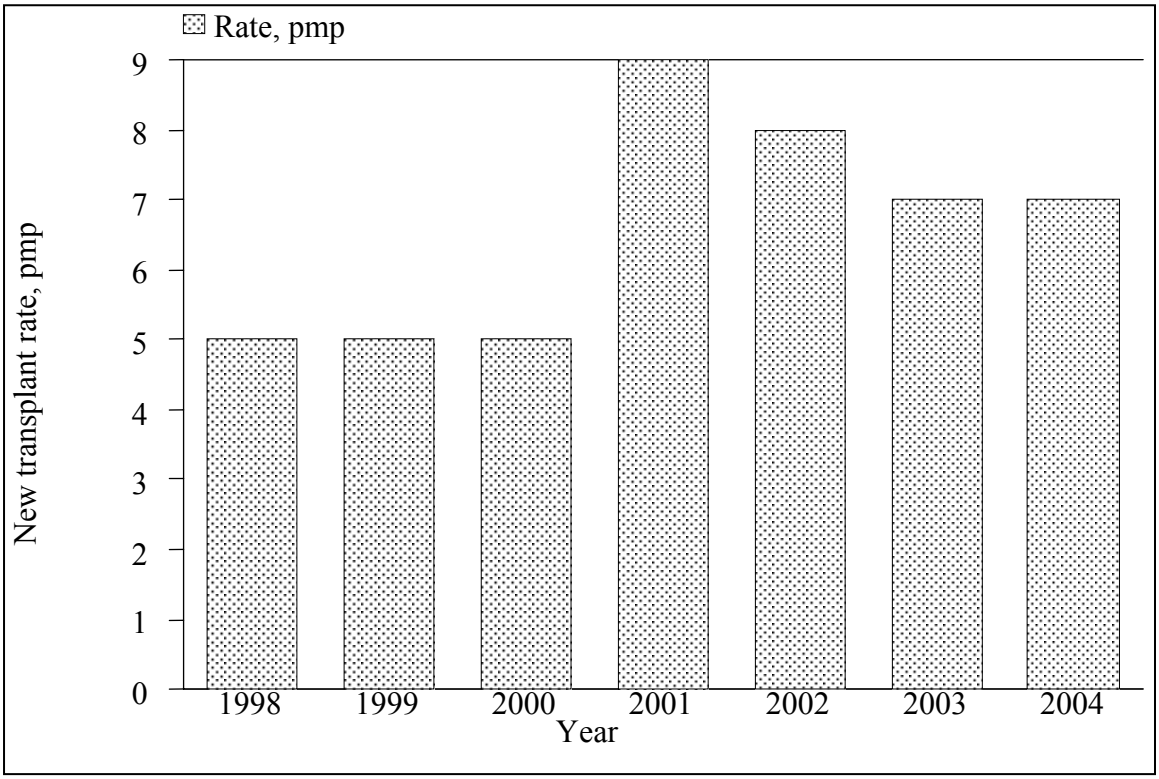


Table 2.1.2: Types of Cornea Transplant, 1998-2004

Year	**1998**		**1999**		**2000**		**2001**	
	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	114	96	116	95	120	95	206	93
Lamellar Keratoplasty	1	1	5	4	4	3	14	6
Others	0	0	1	1	1	1	1	1
No data	4	3	0	0	1	1	0	0
TOTAL	119	100	122	100	126	100	221	100

Year	**2002**		**2003**		**2004**		**TOTAL**	
	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	196	97	156	95	156	90	1064	94
Lamellar Keratoplasty	5	2	8	5	10	6	47	4
Others	0	0	1	0	8	4	12	1
No data	2	1	0	0	0	0	7	1
TOTAL	203	100	165	100	174	100	1130	100

2.2 RECIPIENTS' CHARACTERISTICS

There was a preponderance of male recipients each year and this ranged from 60% to 69% (Table 2.2.1, Figure 2.2.1).

Ethnic Chinese (39%) were the predominant race undergoing cornea transplant surgery followed by Malays (32%) and Indians (23%) (Table 2.2.2, Figure 2.2.2).

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

The primary indications for surgery were cornea scars (17%), keratoconus (16%), microbial keratitis (16%), other (non-pseudophakic) bullous keratopathy (14%), cornea perforation (11%), pseudophakic bullous keratopathy (10%) and failed previous cornea grafts (9%). Corneal dystrophy (5%) and congenital opacity (1%) were the least common indications (Table 2.2.4, Figure 2.2.4).

Table 2.2.1: Gender distribution, 1998-2004

Year	**1998**		**1999**		**2000**		**2001**		**2002**		**2003**		**2004**		**TOTAL**	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	78	66	80	66	81	64	143	65	122	60	114	69	105	60	723	64
Female	41	34	42	34	45	36	78	35	81	40	51	31	69	40	407	36
TOTAL	119	100	122	100	126	100	221	100	203	100	165	100	174	100	1130	100

Figure 2.2.1: Gender distribution, 1998-2004

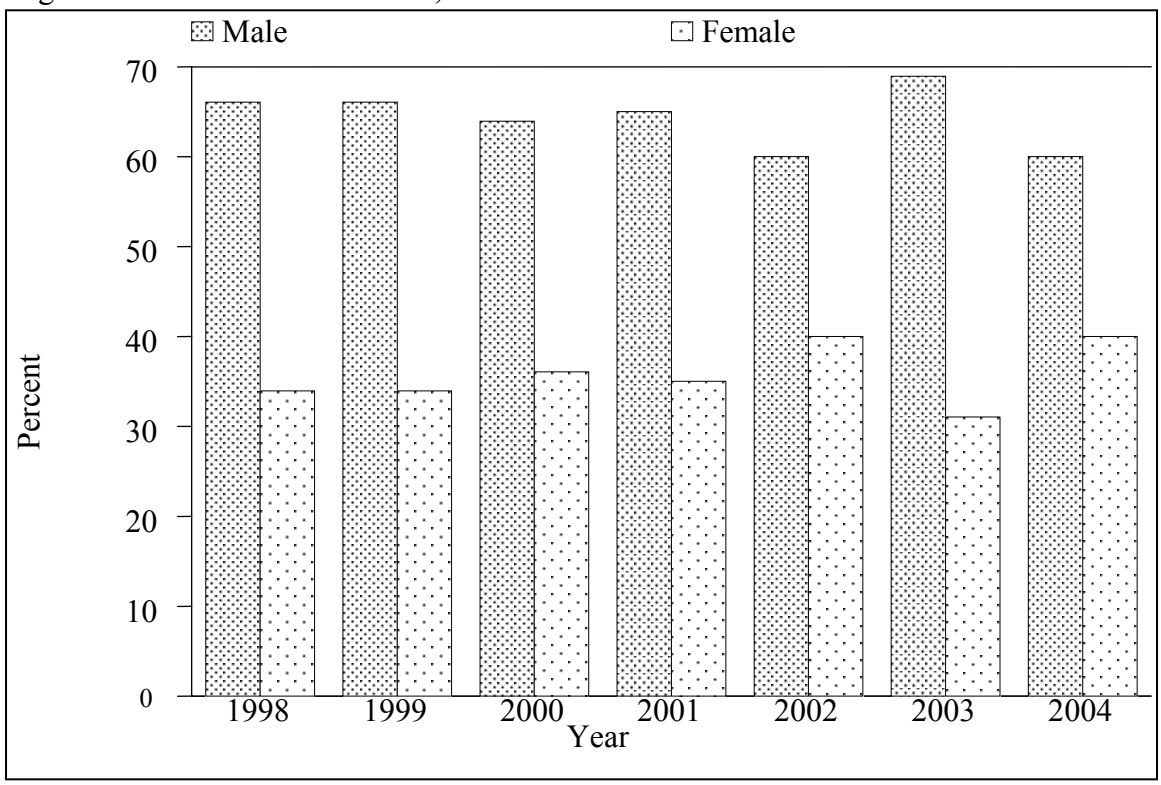


Table 2.2.2: Ethnic distribution, 1998-2004

Year	1998		1999		2000		2001	
Ethnic group	No.	%	No.	%	No.	%	No.	%
Malay	28	24	34	28	41	32	70	32
Chinese	47	39	46	38	50	40	92	42
Indian	36	30	35	28	28	22	49	22
Bumiputra Sabah	0	0	0	0	0	0	0	0
Bumiputra Sarawak	0	0	0	0	0	0	1	0
Others*	8	7	7	6	6	5	5	2
No data	0	0	0	0	1	1	4	2
TOTAL	119	100	122	100	126	100	221	100

Year	2002		2003		2004		TOTAL	
Ethnic group	No.	%	No.	%	No.	%	No.	%
Malay	74	36	52	31	65	37	364	32
Chinese	83	41	67	40	52	30	437	39
Indian	35	17	34	21	40	23	257	23
Bumiputra Sabah	0	0	0	0	1	1	1	0
Bumiputra Sarawak	0	0	0	0	4	2	5	0
Others*	9	5	11	7	10	6	56	5
No data	2	1	1	1	2	1	10	1
TOTAL	203	100	165	100	174	100	1130	100

*Others: Non Malaysian

Figure 2.2.2: Ethnic distribution, 1998-2004

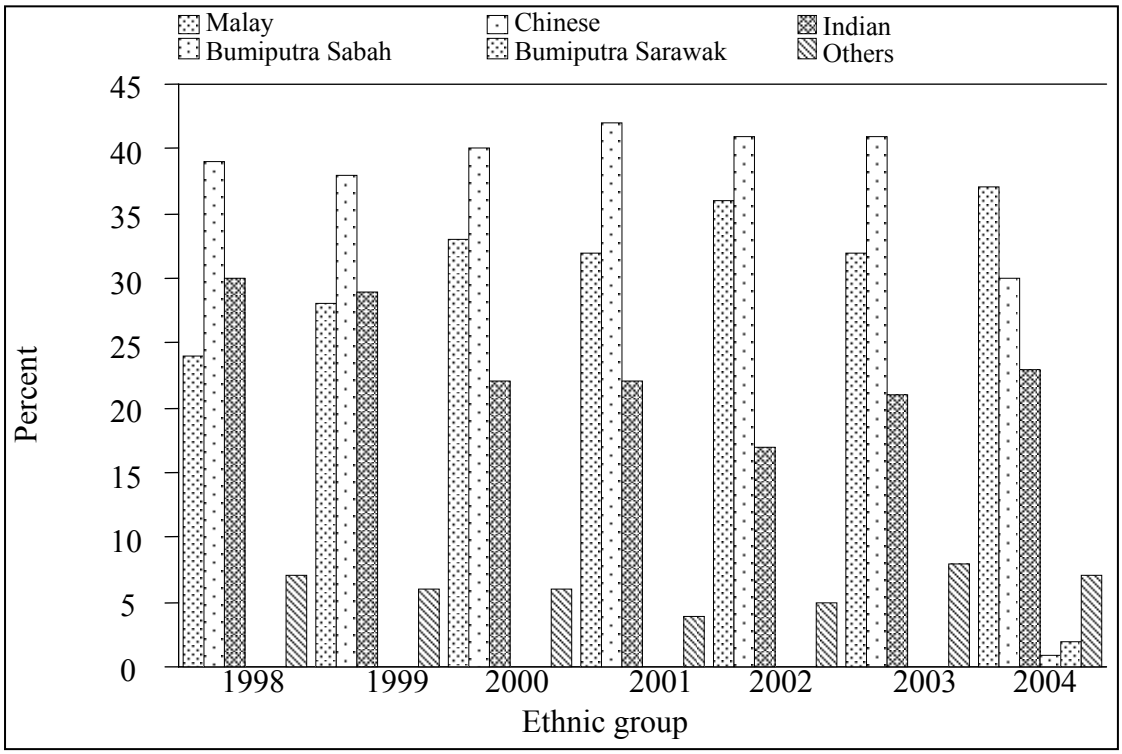


Table 2.2.3: Age distribution of cornea transplant recipient patients, 1998-2004

Year	**1998**		**1999**		**2000**		**2001**		**2002**		**2003**		**2004**		**TOTAL**	
Age group (years)	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	4	3	5	4	9	4	6	4	6	3	44	4	6	5	8	4
10-19	13	11	17	14	16	8	21	13	14	8	119	11	9	7	29	13
20-39	28	24	34	28	53	26	36	22	51	29	285	25	34	27	49	22
40-59	38	32	32	26	57	28	51	31	50	29	329	29	40	32	61	28
>=60	36	30	34	28	68	34	51	31	53	31	353	31	37	29	74	33
TOTAL	119	100	122	100	203	100	165	100	174	100	1130	100	126	100	221	100
Mean	45		43		44		45		46		45		45		45	
SD	21		22		20		21		21		21		21		21	
Median	45		43		45		50		46		46		45		45	
Minimum	4 months		5		3 months		5 months		1		5 months		2 months		2 months	
Maximum	82		92		86		85		86		84		86		92	

*Age=date of transplant - date of birth

Figure 2.2.3: Age distribution of cornea transplant recipient patients, 1998-2004

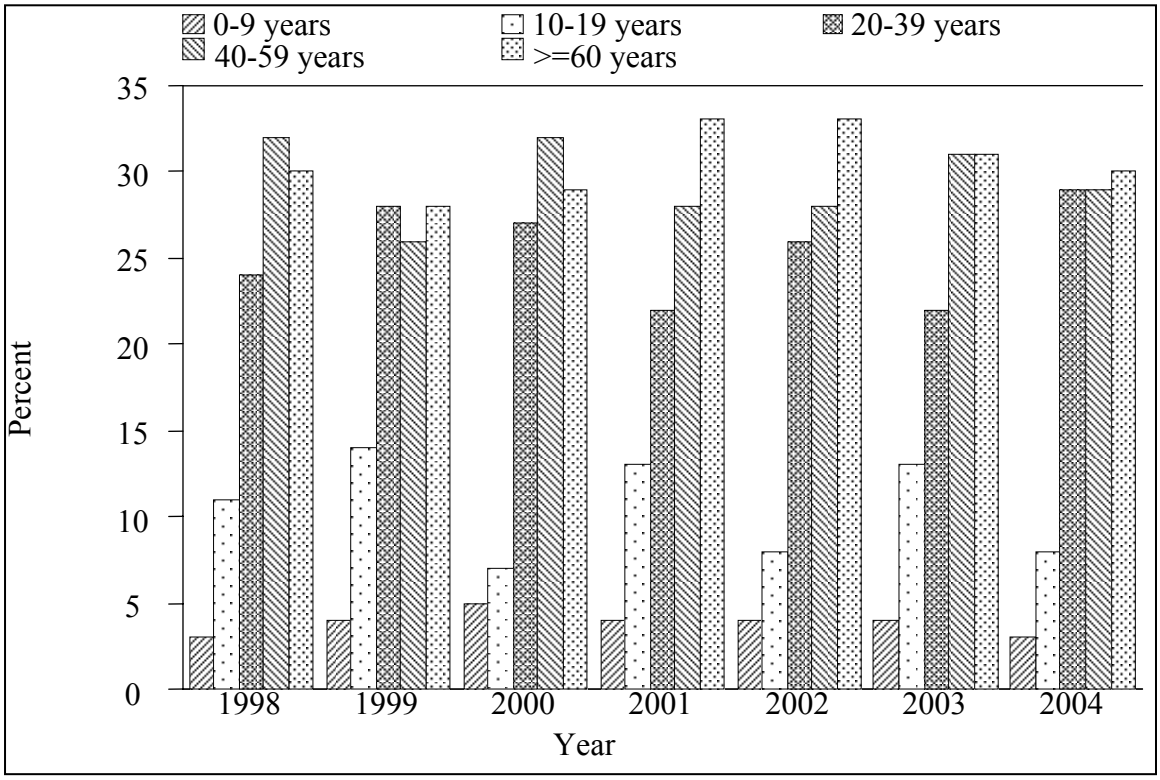


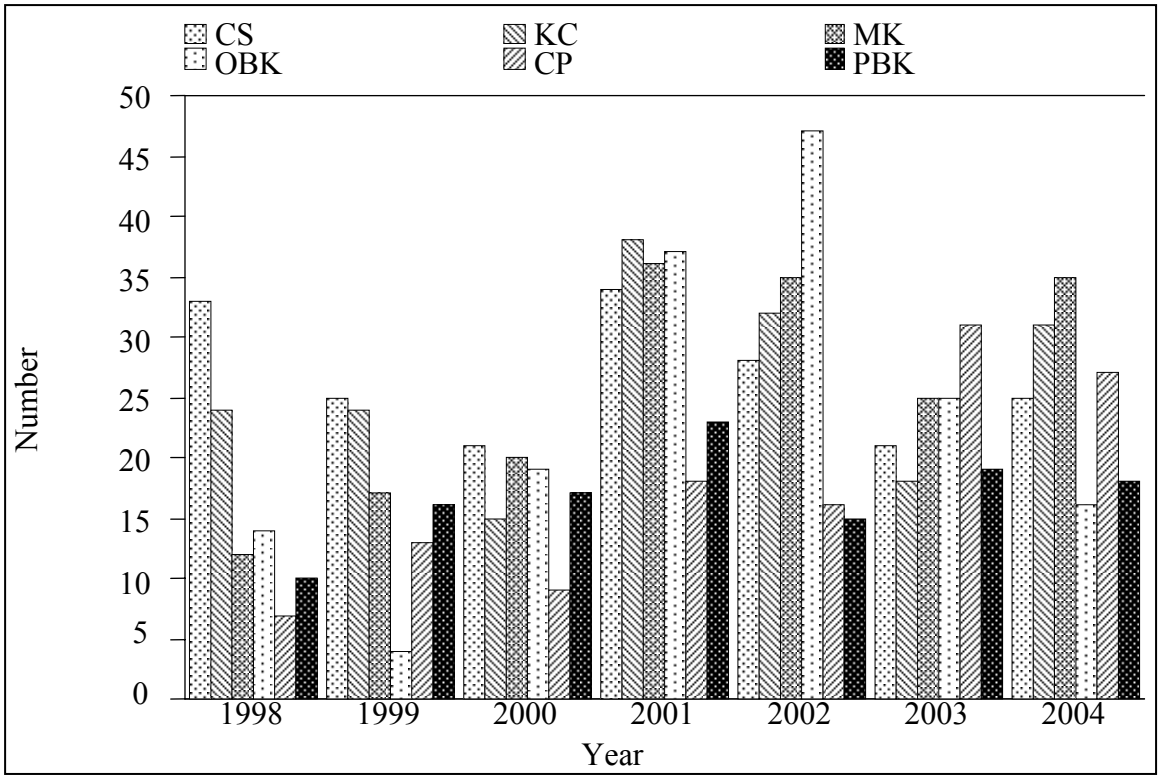
Table 2.2.4: Primary diagnosis, 1998-2004

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)	
Primary Diagnosis	No.	%	No.	%	No.	%	No.	%
Corneal scar	33	28	25	20	21	17	34	15
Keratoconus	24	20	24	20	15	12	38	17
Microbial keratitis	12	10	17	14	20	16	36	16
Other (non pseudophakic) bullous keratopathy	14	12	4	3	19	15	37	17
Corneal perforation	7	6	13	11	9	7	18	8
Pseudophakic bullous keratopathy	10	8	16	13	17	13	23	10
Failed previous graft	14	12	12	10	13	10	17	8
Corneal dystrophy	5	4	6	5	5	4	12	5
Congenital opacity	1	1	1	1	1	1	1	0
Others	3	3	8	7	7	6	15	7
No data	0	0	2	2	1	1	1	0

Year	2002 (N=203)		2003 (N=165)		2004 (N=174)		TOTAL (N=1130*)	
Primary Diagnosis	No.	%	No.	%	No.	%	No.	%
Corneal scar	28	14	21	13	25	14	187	17
Keratoconus	32	16	18	11	31	18	182	16
Microbial keratitis	35	17	25	15	35	20	180	16
Other (non pseudophakic) bullous keratopathy	47	23	25	15	16	9	162	14
Corneal perforation	16	8	31	19	27	16	121	11
Pseudophakic bullous keratopathy	15	7	19	12	18	10	118	10
Failed previous graft	15	7	14	8	12	7	97	9
Corneal dystrophy	9	4	7	4	8	5	52	5
Congenital opacity	0	0	1	1	8	5	13	1
Others	14	7	10	6	29	17	86	8
No data	0	0	0	0	1	1	5	0

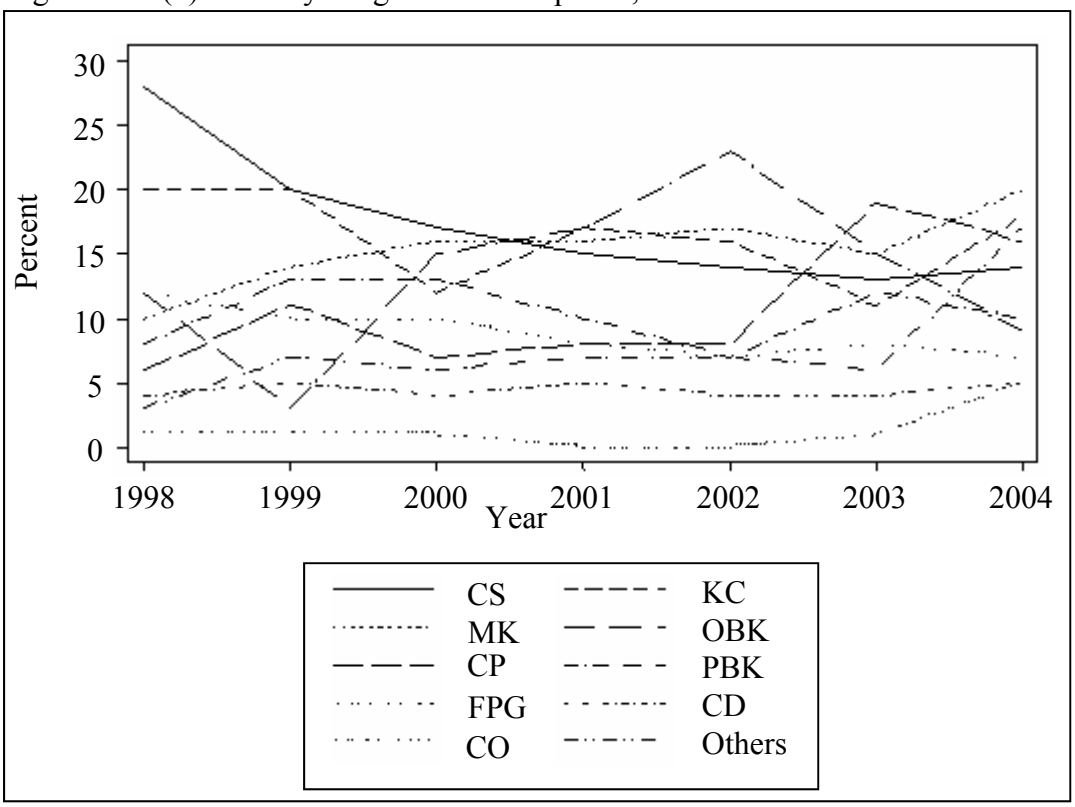
*1053 patients have 1 primary diagnosis, 71 have 2 primary diagnoses, 1 patient had 3 diagnoses

Figure 2.2.4(a): Primary Diagnosis in Recipients, 1998-2004



CS=Corneal Scar
KC=Keratoconus
MK=Microbial keratitis
OBK=Other (non pseudophakic) bullous keratopathy
CP=Corneal perforation
PBK=Pseudophakic bulluos keratopathy

Figure 2.2.4(b): Primary Diagnosis in Recipients, 1998-2004



CS=Corneal Scar
KC=Keratoconus
MK=Microbial keratitis
OBK=Other (non pseudophakic) bullous keratopathy
CP=Corneal perforation
PBK=Pseudophakic bullous keratopathy
FPG=Failed previous graft
CD=Congenital opacity
CO=Corneal dystrophy

2.3 TRANSPLANT DATA 2004

There were a total of 174 cornea transplants performed in the year 2004. This section reports a total of 138 cases (cases that provided a complete data set).

2.3.1: Pre - transplant data

There may be one or more indications for cornea transplant surgery. The most frequent indication was ***optical*** (62%), followed by ***tectonic*** (26%) and/or ***therapeutic*** indications (25%) (Table 2.3.1.1). *Re-grafts* were performed in 11% of cases (Table 2.3.1.2). *Corneal vascularisation* (57%) was the most frequently encountered pre-operative ocular co-morbidity. *Glaucoma (raised intraocular pressure)* was present in 22% of cases preoperatively. 30% of eyes had ocular inflammation at the time of surgery and 1% had a known history of prior blood transfusion (Table 2.3.1.3). *82% of cases were legally blind* (vision 3/60 or worse) prior to cornea transplantation (Table 2.3.1.4).

Table 2.3.1.1: Indications of cornea transplant, 2004

Indication of transplant	**No.**	**%**
Optical	85	62
Tectonic	36	26
Therapeutic	34	25

*121 patients have 1 indication for transplant, 17 patients have 2 indications

Figure 2.3.1.1: Indications of cornea transplant, 2004

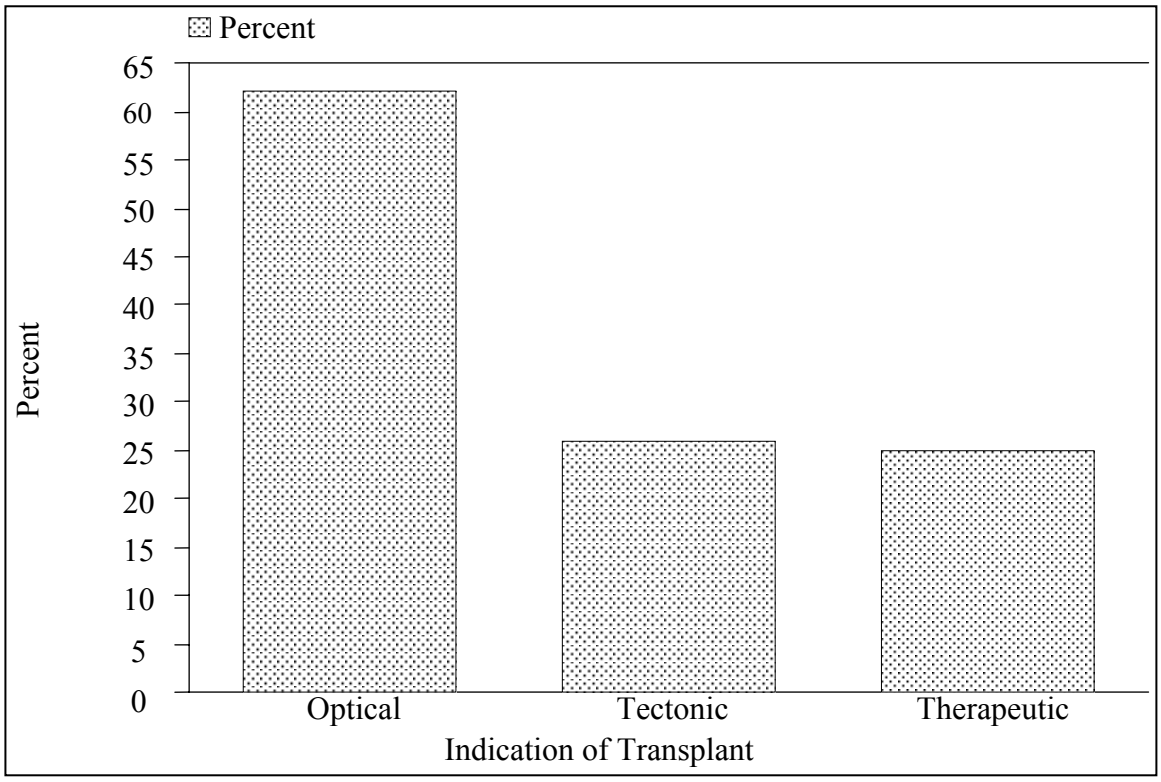


Table 2.3.1.2: Number of previous grafts in grafted eye, 2004

Graft Number (N=138)	No.	%
0	123	89.1
1	11	8.0
2	3	2.2
3	0	0.0
4	1	0.7

Figure 2.3.1.2: Number of previous grafts in grafted eye, 2004

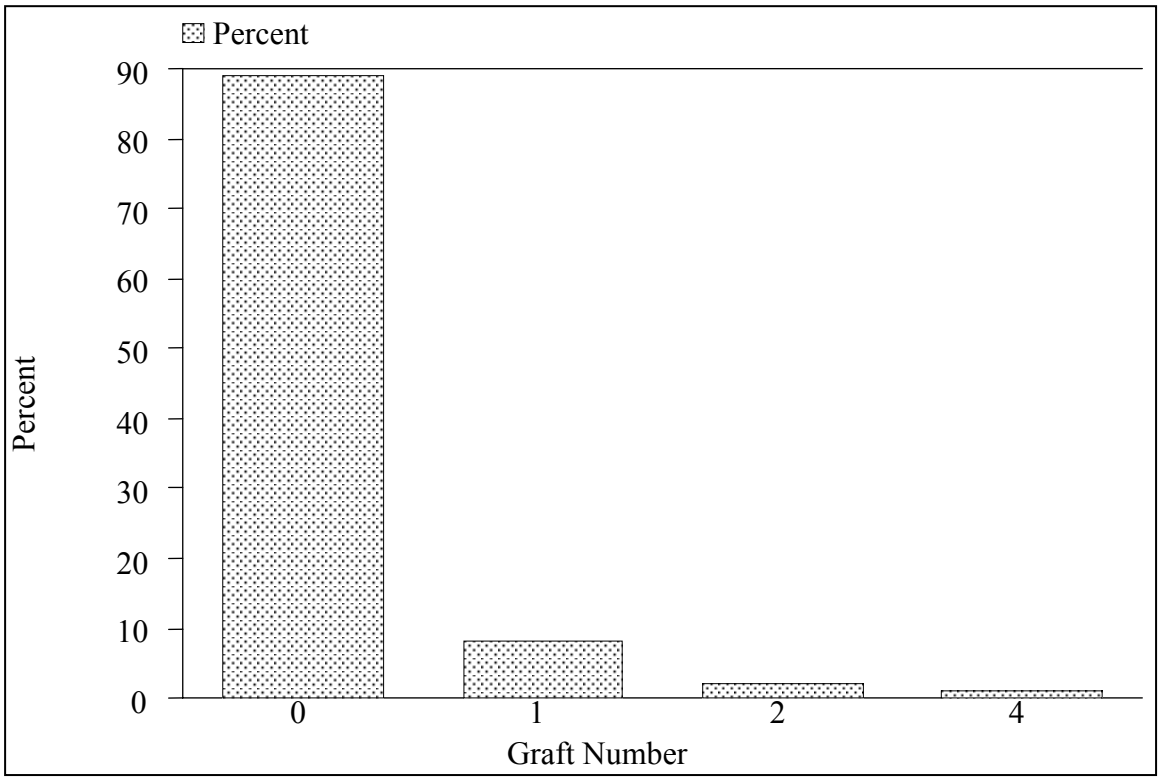


Table 2.3.1.3: Ocular co-morbidity, 2004

Ocular co-morbidity (N=138)	**No.**	**%**
Any ocular co-morbidity (a to d below)	90	65
a) Cornea vascularisation	79	57
• Superficial vascularisation	44	32
• Deep vascularisation	43	31
b) History of glaucoma	30	22
c) Current ocular inflammation	42	30
d) Previous blood transfusion	1	1

*patients have multiple ocular co-morbidity

Table 2.3.1.4: Pre-operative vision, 2004

Unaided VA (N=138)	**No.**	**%**
6/6	3	2.2
6/9	1	0.7
6/12	0	0.0
6/18	0	0.0
6/24	3	2.2
6/36	3	2.2
6/60	7	5.1
5/60	1	0.7
4/60	3	2.2
3/60	2	1.4
2/60	1	0.7
1/60	4	2.9
CF	45	32.6
HM	46	33.3
PL	15	10.9
No data	4	2.9

2.3.2: Donor details

Eye Banks in the United States of America (USA) were the most frequent sources, donating 69% of the corneal tissues (Table 2.3.2.1). The majority of donors were elderly patients with a median age of 59 years (Table 2.3.2.2). Optisol GS was the commonest cornea tissue storage medium used at 88% (Table 2.3.2.3). The major causes of death of the donors were related to the cardiac or circulatory system (33%) followed by causes related to the cerebrovascular system (15%) and malignancy (14%) (Table 2.3.2.4).

Table 2.3.2.1: Source of Donor Cornea Tissue, 2004

Source of donor (N=138)	**No.**	**%**
Local	20	14.5
USA	95	68.8
Sri Lanka	22	15.9
No data	1	0.7
If Local, ethnic group:		
• Malay	0	0
• Chinese	14	70
• Indian	5	25
• No data	1	5

Figure 2.3.2.1: Source of Donor Corneal Tissue, 2004

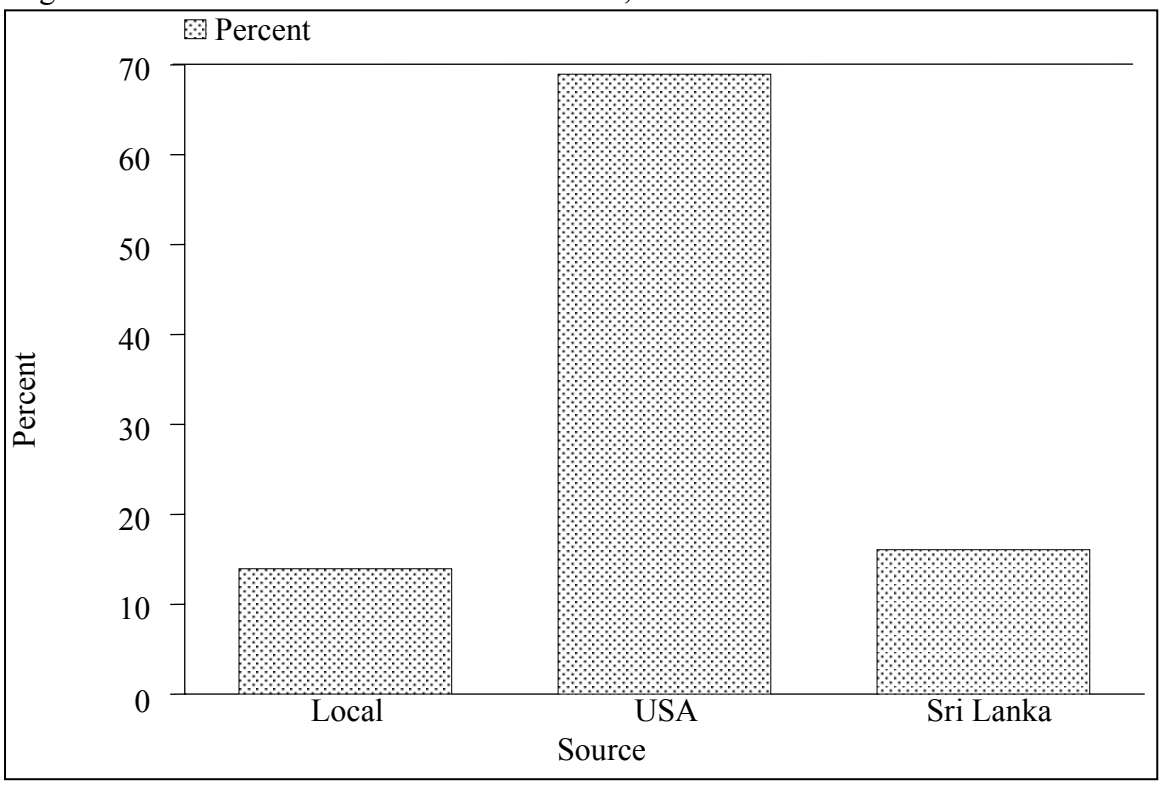


Table 2.3.2.2: Donor age distribution, 2004

Age group (years) (N=138)	**No.**	**%**
0-9	2	1.4
10-19	6	4.3
20-39	11	8.0
40-59	51	37.0
>=60	68	49.3
TOTAL	138	100
Mean	57	
SD	15	
Median	59	
Minimum	8	
Maximum	78	

Figure 2.3.2.2 (a): Donor age distribution, 2004

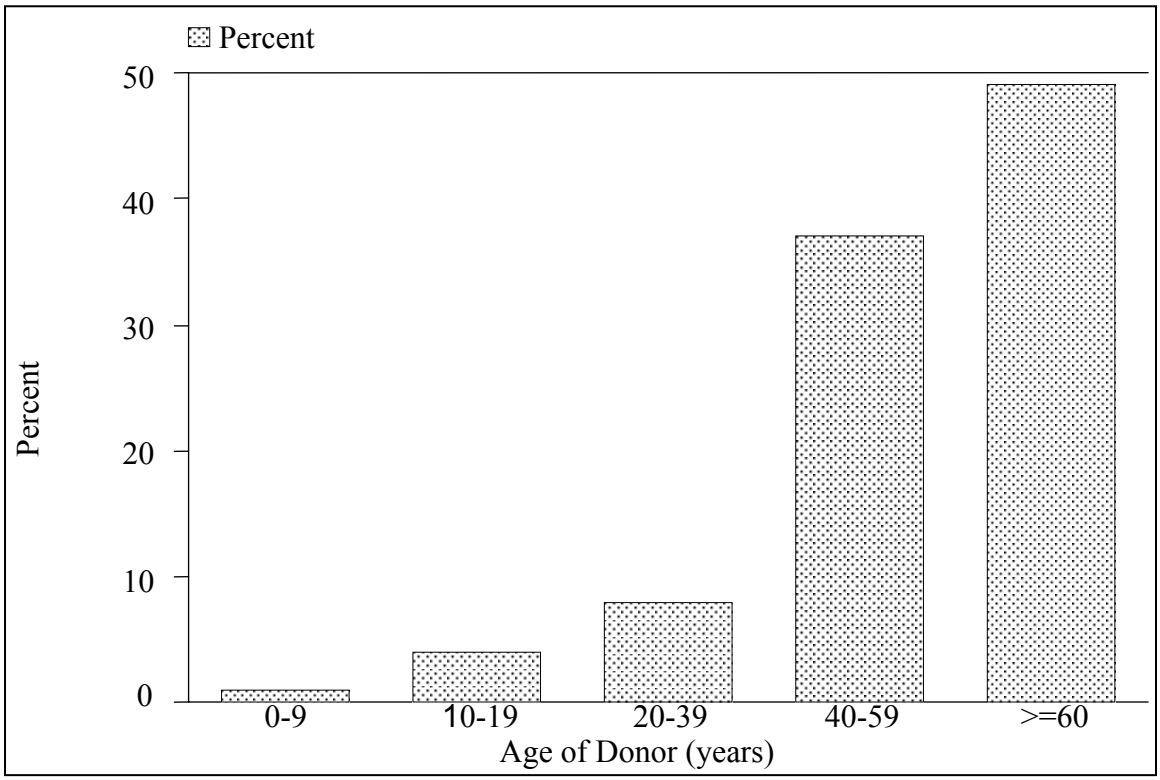


Figure 2.3.2.2 (b): Donor age distribution, 2004

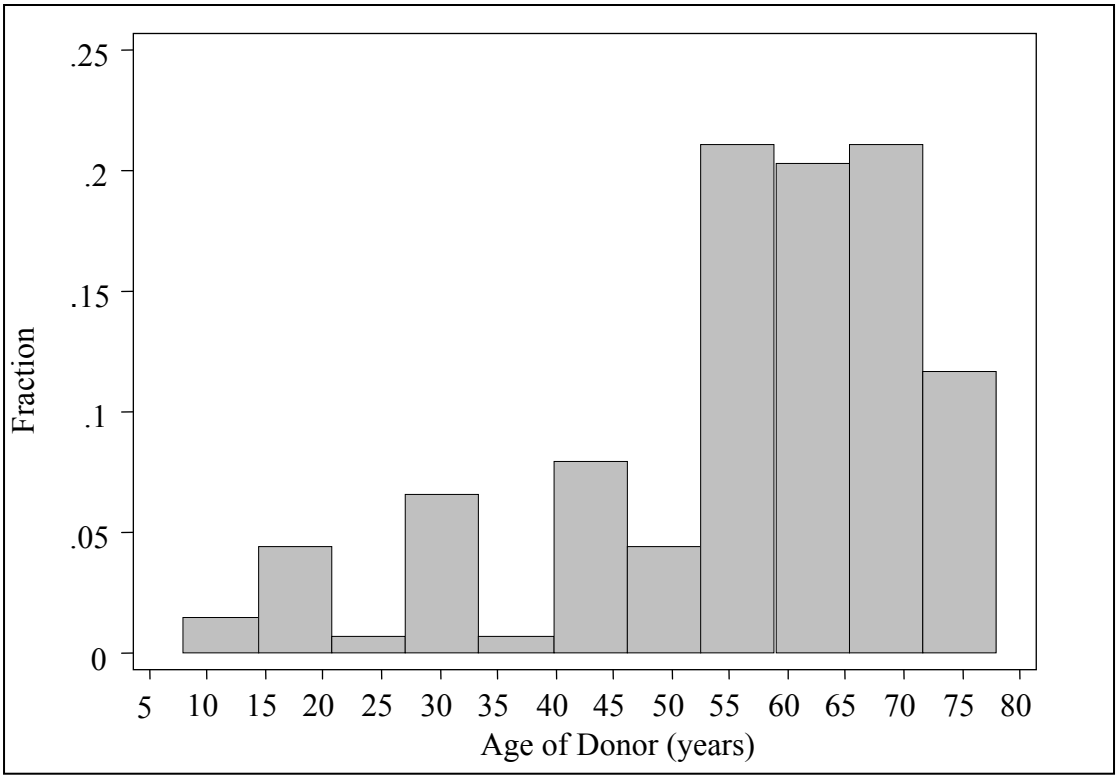


Table 2.3.2.3: Preservation media, 2004

Preservation media (N=138)	**No.**	**%**
Optisol GS	110	80
MK Medium	22	16
Moist Chamber	4	3
No data	2	1

Figure 2.3.2.3: Preservation media, 2004

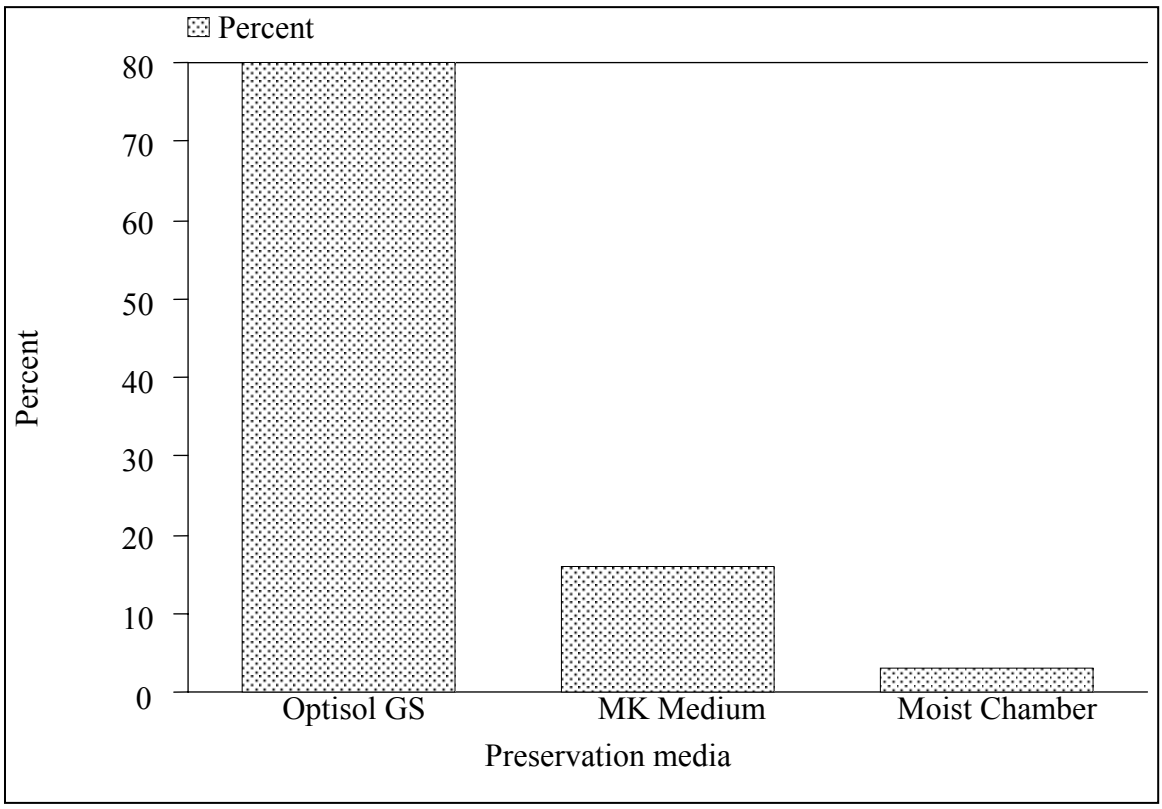
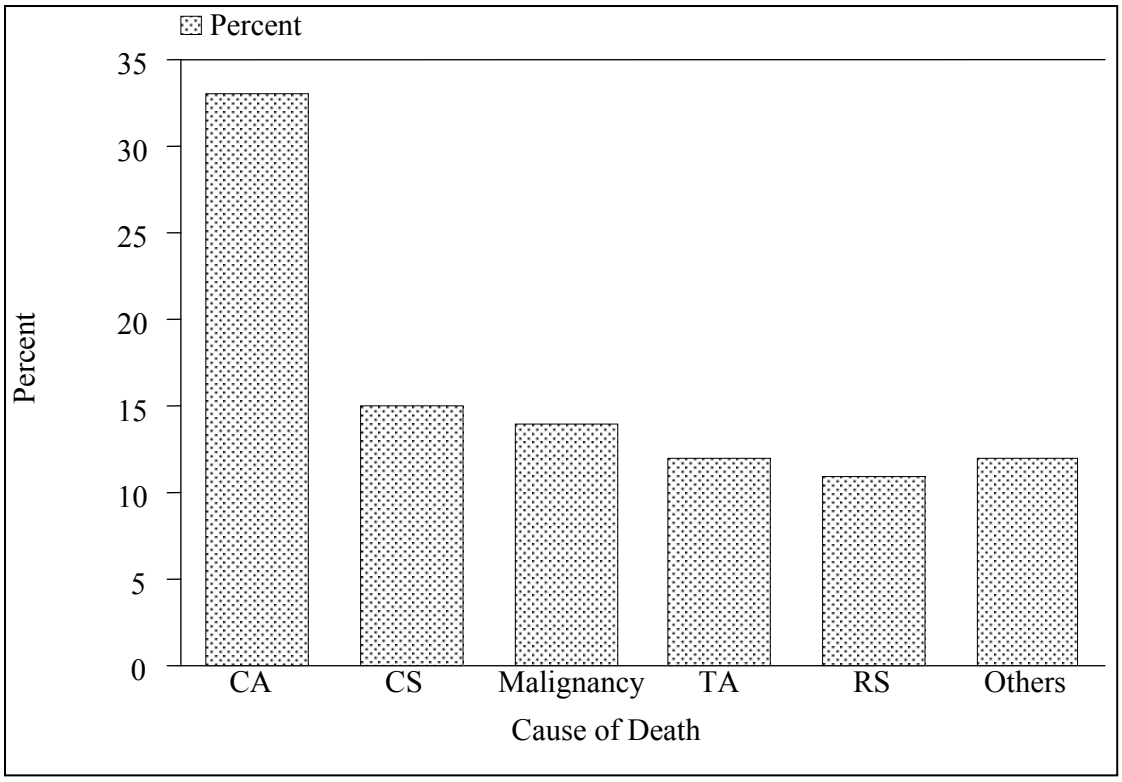


Table 2.3.2.4: Cause of death in cornea donors, 2004

Cause of death (N=138)	**No.**	**%**
Cardiac/Circulatory System	46	33.3
Cerebrovascular System	21	15.2
Malignancy	19	13.8
Trauma/Accident	17	12.3
Respiratory System	15	10.9
Others	17	12.3
No data	3	2.2

Figure 2.3.2.4: Cause of death in cornea donors, 2004



CA=Cardiac/Circulatory
CS=Cerebrovascular System
TA=Trauma/Accident
RS=Respiratory System

2.3.3: Transplant Practices

Penetrating Keratoplasty (PK) was the commonest type of surgery performed (87%) (Table 2.3.3.1). Cornea transplantation was performed in combination with other surgical procedures in 22% of cases. Cataract extraction, with or without intraocular lens implantation (IOL), was the commonest combined procedure (16 cases) (Table 2.3.3.2).

The recipient graft size ranged from 2mm to 10mm, with the mean recipient cornea graft size being 7.5mm (SD 1) (Table 2.3.3.3). 63.8% of cases had the donor tissue over-sized by 0.5mm (Table 2.3.3.4). The commonest suture technique was interrupted sutures (Table 2.3.3.5).

Table 2.3.3.1: Type of surgery, 2004

Type of surgery (N=138)	**No.**	**%**
Penetrating Keratoplasty	120	87.0
Lamellar Keratoplasty	13	9.4
Patch graft for cornea	3	2.2
Patch graft for sclera	2	1.4

Table 2.3.3.2: Type of Combined surgery, 2004

Combined surgery	**No.**
No. of patients with combined surgery	30 (22%)
(a) Glaucoma surgery	1
(b) Cataract extraction	16
(c) IOL	14
(d) Retinal surgery $\pm$ Internal tamponade	1
(e) Anterior vitrectomy	9
(f) Others	5

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

Table 2.3.3.3: Recipient Cornea Trephined Size, 2004

Graft size, mm	**No.**	**%**
2	1	0.7
3	0	0.0
4	1	0.7
5	0	0.0
5.5	1	0.7
6	3	2.2
6.25	0	0.0
6.50	2	1.4
6.75	1	0.7
7	25	18.1
7.25	10	7.2
7.50	35	25.4
7.75	10	7.2
8	19	13.8
8.25	4	2.9
8.50	6	4.3
8.75	0	0.0
9	9	6.5
9.25	0	0.0
9.50	0	0.0
9.75	0	0.0
10	1	0.7
No data	10	7.2
TOTAL	138	100
Mean	7.5	
SD	1	
Median	7.5	
Minimum	2	
Maximum	10	

Table 2.3.3.4: Difference in trephined sizes of recipient and donor corneas, 2004

Difference in Graft size, mm (N=138)	**No.**	**%**
Same size	9	6.5
0.25	28	20.3
0.5	88	63.8
0.75	1	0.7
1	1	0.7
2	1	0.7
No data	10	7.2

Table 2.3.3.5: Suture Technique, 2004

Suture Technique (N=138)	**No.**	**%**
Interrupted only	132	96
Continuous only	0	0
Combined	6	4

Figure 2.3.3.5: Suture Technique, 2004

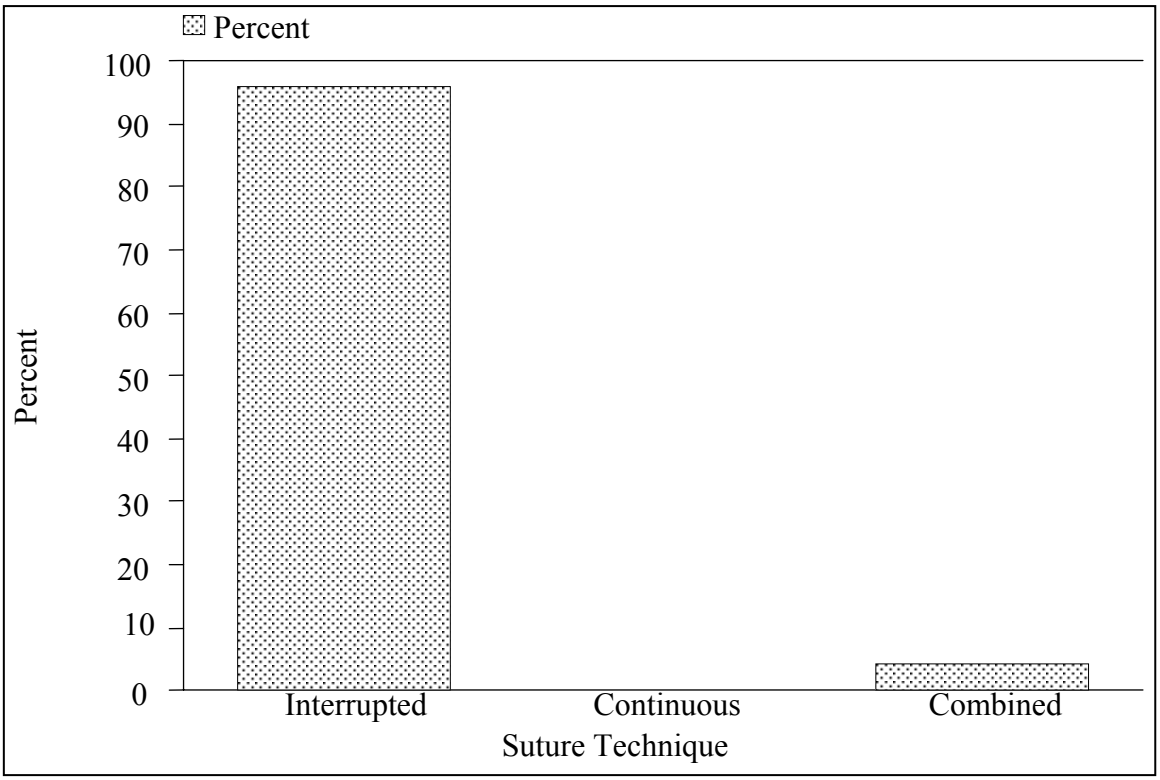
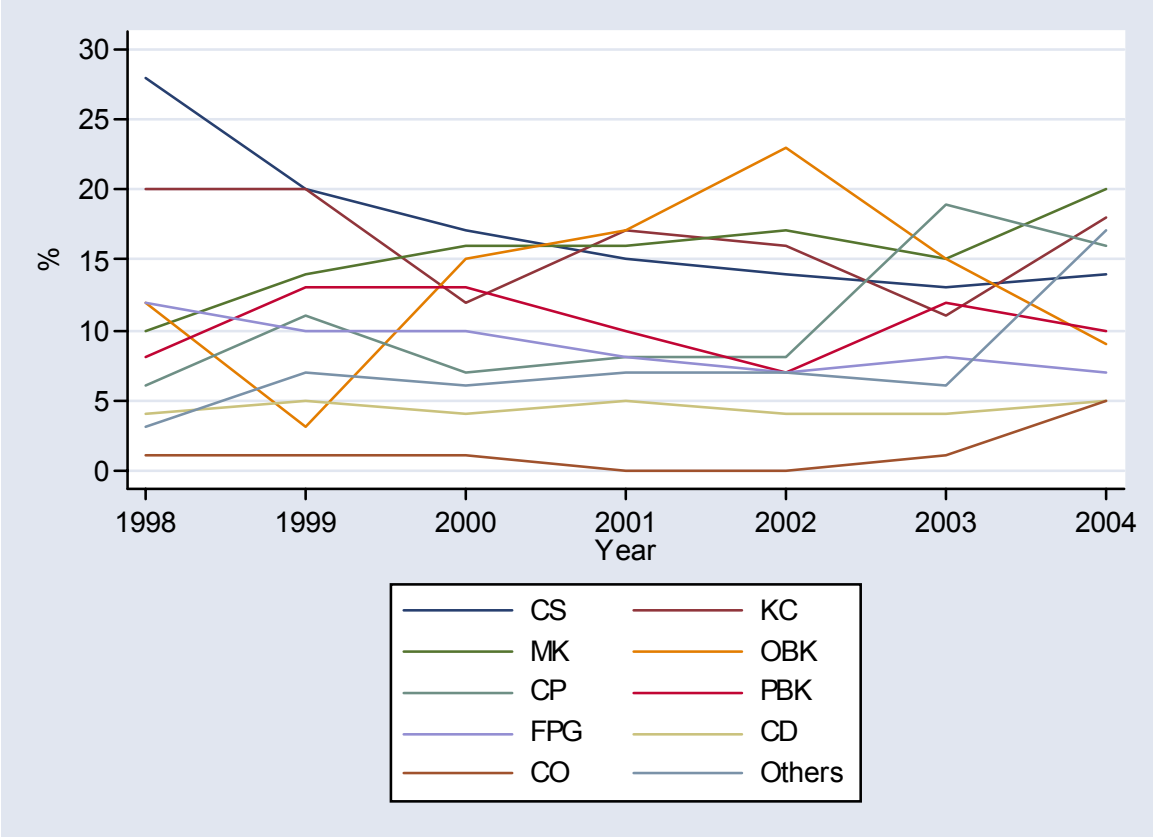


Figure 2.2.4 (b): Primary Diagnosis in Recipients, 1998-2004



CHAPTER 3

HEART AND LUNG TRANSPLANTATION

Editors:
Mr. Mohamed Ezani Hj Md. Taib
Dato' Dr. David Chew Soon Ping

Expert Panel:
Tan Sri Dato' Dr. Yahya Awang (Chair)
Mr. Mohamed Ezani Hj Md. Taib (Co-chair)
Datin Dr. Aziah Ahmad Mahayiddin
Dr. Aizai Azan Abdul Rahim
Dr. Ashari Yunus
Dato' Dr. David Chew Soon Ping
Dr. Hamidah Shaban

Contents

List of Tables

List of Figures

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 but none has been carried out to date. This is again primarily due to the lack of cadaveric organs.

The rest of the report that follows will review the results of heart transplantation in Malaysia till end of 2004.

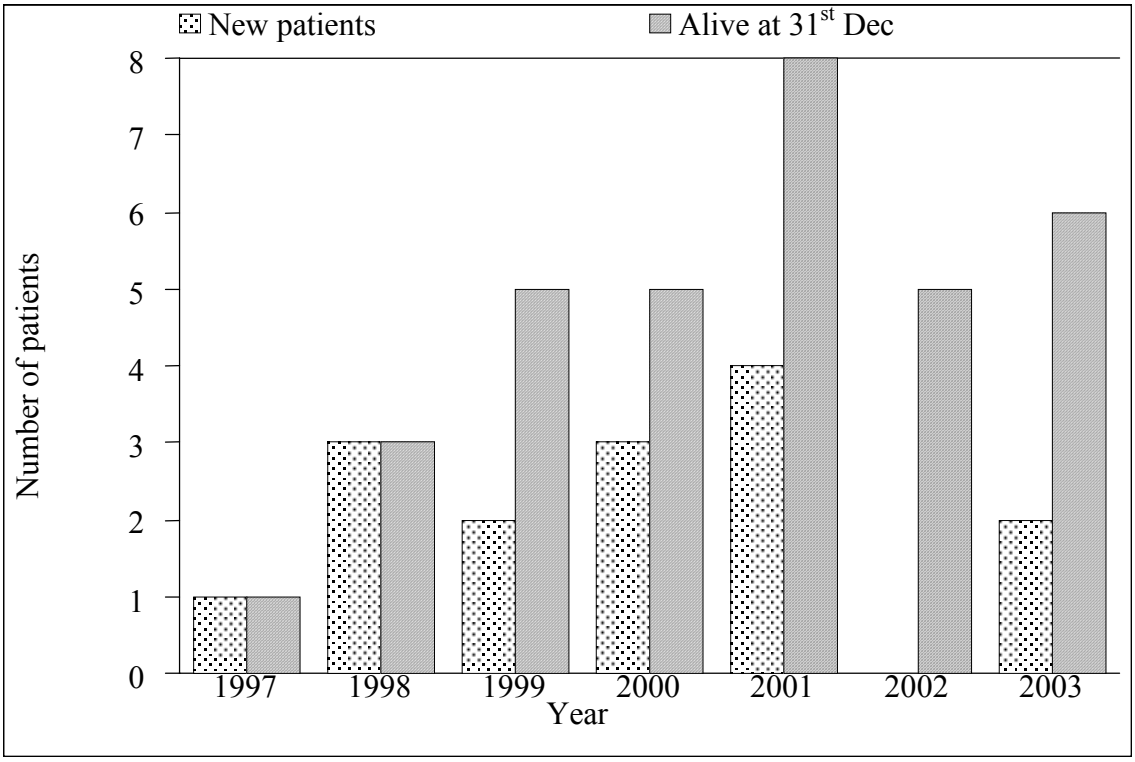
3.1 STOCK AND FLOW

Table 3.1.1: Stock and Flow of Heart Transplantation, 1997-2003

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

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

Figure 3.1.1: Stock and Flow of Heart Transplantation, 1997-2003



3.2 RECIPIENTS' CHARACTERISTICS

A total of 15 heart transplants have been carried out from 1997 to 2003. Two thirds of the recipients were males and 60% were Indians. The mean age of recipients was 37 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 commonest aetiology followed by dilated cardiomyopathy.

Table 3.2.1: Gender distribution, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Gender	No.	No.	No.	No.	No.	No.	No.	No.
Male	1	3	0	2	2	0	2	10
Female	0	0	2	1	2	0	0	5
TOTAL	1	3	2	3	4	0	2	15

Table 3.2.2: Ethnic group distribution, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Ethnic group	No.	No.	No.	No.	No.	No.	No.	No.
Malay	0	0	1	1	2	0	0	4
Chinese	0	0	0	1	0	0	1	2
Indian	1	3	1	1	2	0	1	9
TOTAL	1	3	2	3	4	0	2	15

Table 3.2.3: Age distribution, 1997-2003

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

*Age=date of transplant - date of birth

Table 3.2.4: Primary diagnosis, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Primary diagnosis	No.	No.	No.	No.	No.	No.	No.	No.
Ischaemic Cardiomyopathy	1	3	0	1	1	0	2	8
Idiopathic Dilated Cardiomyopathy	0	0	2	1	2	0	0	5
Restrictive Cardiomyopathy	0	0	0	0	0	0	0	0
End Stage Valvular Heart Disease	0	0	0	0	1	0	0	1
Hypertrophic Cardiomyopathy	0	0	0	1	0	0	0	1
Others	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	2	15

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 2 patients, azathioprine was later replaced by mycophenolate mofetil (Table 3.3.2).

All patients surviving to discharge were sent home on Neoral®. During follow up, 60% of patients were still on prednisolone. 40% of 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).

Table 3.3.1: Heart Procedure, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Heart Procedure	No.	No.	No.	No.	No.	No.	No.	No.
Orthotopic Bicaval	1	1	0	0	0	0	0	2
Orthotopic Traditional	0	2	2	3	4	0	2	13
Heterotopic	0	0	0	0	0	0	0	0
TOTAL	1	3	2	3	4	0	2	15

Table 3.3.2: Immunosuppressives used, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Type of immunosuppressive	No.	No.	No.	No.	No.	No.	No.	No.
Steroids								
Prednisolone	1	3	2	3	4	-	1	14
Methylprednisolone	1	3	2	3	4	-	2	15
Calcineurin Inhibitors								
Neoral®	1	3	2	3	4	-	1	14
Antimetabolites								
Azathioprine (AZA)	1	3	2	3	4	-	2	15
Mycophenolate Mofetil (MMF)	-	-	-	-	1	-	1	2
TOTAL patients at notification	1	3	2	3	4	0	2	15

Table 3.3.3: Immunosuppressives used at time of last follow-up up to 2004

Year of transplant*	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Type of immunosuppressive	No.	No.	No.	No.	No.	No.	No.	No.
Steroids								
Prednisolone	1	2	1	-	2	-	-	6
Methylprednisolone	1	-	-	-	1	-	-	2
Calcineurin Inhibitors								
Neoral®	1	2	2	1	3	-	1	10
Antimetabolites								
Azathioprine (AZA)	1	1	1	1	2	-	-	6
Mycophenolate Mofetil (MMF)		1	1	-	1	-	1	4
TOTAL patients at follow-up	1	2	2	1	3	0	1	10

*Data according to year of transplant of patient

Table 3.3.4: Duration of waiting time on waiting list, 1997-2003

Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Duration (months)	No.	No.	No.	No.	No.	No.	No.	No.
<5	0	2	1	0	1	0	1	5
5-<10	1	0	1	0	1	0	0	3
10-<15	0	0	0	1	0	0	0	1
15-<20	0	0	0	1	0	0	0	1
20-<25	0	0	0	0	0	0	0	0
25-<30	0	0	0	0	0	0	0	0
30-<35	0	0	0	0	0	0	0	0
35-<40	0	0	0	0	0	0	1	1
TOTAL	1	2	2	2	2	0	2	11
Mean	6	2	4	15	5	-	20	9
SD	-	0	1	6	5	-	25	11
Median	6	2	4	15	5	-	20	5
Minimum	6	2	3	10	1	-	2	1
Maximum	6	2	5	19	8	-	37	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 90% incidence in recipients (Table 3.4.1). Four patients were treated for rejection out of the 10 patients who were discharged from hospital (Table 3.4.4).

Five (33%) heart transplant recipients died in hospital following transplantation (Table 3.4.5). One died of hyperacute graft rejection. The other 4 died of multiorgan failure with septicaemia. (Table3.4.7). The 1 year Kaplan Meier patient survival rate was 60% (Table 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 2004

Year of transplant*	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Type of post transplant events	No.	No.	No.	No.	No.	No.	No.	No.
Drug Treated Hypertension	1	2	2	1	3	-	-	9
Bone Disease (Symptomatic)	1	-	-	-	1	-	-	2
Chronic Liver Disease	-	-	-	-	-	-	-	0
Cataracts	-	1	-	-	-	-	-	1
Diabetes	1	2	-	-	-	-	-	3
Renal Dysfunction	1	-	-	-	-	-	-	1
Stroke	-	-	-	-	-	-	-	0
Drug Treated Hyperlipidaemia	1	2	2	1	3	-	-	9
TOTAL patients at follow-up	1	2	2	1	3	0	1	10

*Data according to year of transplant of patient

Table 3.4.2: Post Transplant Malignancies at follow-up up to 2004

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

*Data according to year of transplant of patient

Table 3.4.3: Non-compliance at follow-up up to 2004

Year of transplant*	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Non-compliance during follow-up	No.	No.	No.	No.	No.	No.	No.	No.
Yes	-	-	2	-	-	-	-	2
No	1	2	-	1	3	-	1	8
TOTAL patients at follow-up	1	2	2	1	3	0	1	10
Areas of non-compliance:								
Immunosuppression medication	-	-	1	-	-	-	-	1
Patient unable to afford immunosuppression medications	-	-	-	-	-	-	-	0
Other medication	-	-	-	-	-	-	-	0
Other therapeutic regimen	-	-	1	-	-	-	-	1
TOTAL patients with noncompliance	0	0	2	0	0	0	0	2

*Data according to year of transplant of patient

Table 3.4.4: Patient treated for rejection at follow-up up to 2004

Year of transplant*	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**TOTAL**
Patient treated for rejection	No.	No.	No.	No.	No.	No.	No.	No.
Yes	-	2	1	-	2	-	-	5
No	1	-	1	1	1	-	1	5
TOTAL patients with follow-up	1	2	2	1	3	0	1	10
Number of rejection events								
1	-	1	-	-	1	-	-	2
2	-	1	-	-	1	-	-	2
3	-	-	1	-	-	-	-	1
TOTAL patients with rejection	0	2	1	0	2	0	0	5

*Data according to year of transplant of patient

Table 3.4.5: Time of deaths, 1997-2003

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

*Time=Date of death–date of transplant

Table 3.4.6: Patient survival, year of transplant 1997-2003

Year of Transplant	1997-2003	
Interval	% Survival	SE
6 months	67	12
1 year	60	13
2 year	45	13
3 year	38	13

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

Figure 3.4.6: Patient survival, year of transplant 1997-2003

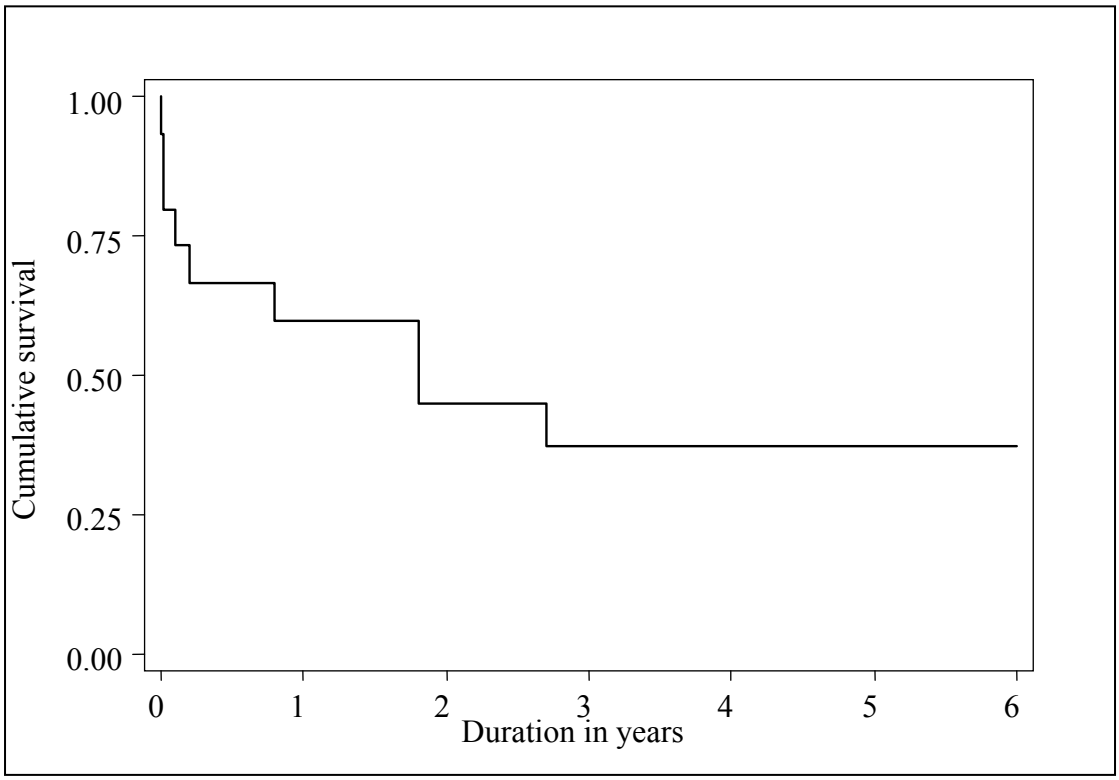


Table 3.4.7: Cause of death at discharge, 1997-2003

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

Table 3.4.8: Cause of death at follow-up, 1997-2003

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

CHAPTER 4

LIVER TRANSPLANTATION

Editors:
Dr. Ganesalingam A/L Kanagasabai
Dr. Lim Chooi Bee
Dr. Tan Soek Siam

Expert panel:
Dato' Dr. Zakaria Zahari (Chairman)
Dr. Ganesalingam A/L Kanagasabai
Dr. Goon Hong Kooi
Associate Professor Dr. Lee Way Seah
Dr. Lim Chooi Bee
Dr. Sushila Sivasubramaniam
Dato' Dr. Tan Kai Chah
Dr. Tan Soek Siam
Dr. S Thavaranjitham

Contents

List of Tables

List of Figures

4.0 INTRODUCTION

Liver transplantation is currently a universally accepted definitive treatment for end stage liver disease. Unfortunately it is a victim of its own success and its further development is being hindered by a marked shortage of cadaveric organs for transplant. The critical shortage of cadaveric organs in Malaysia has led surgeons to source organs from living donors for paediatric cases.

In Malaysia, the first liver transplant was done in Subang Jaya Medical Centre in 1995. In view of the resource limitation, liver transplantation only became available in the public hospital system in 2002. The first liver transplant was undertaken in Selayang Hospital on 10th April 2002.

4.1 STOCK AND FLOW

The number of liver transplants performed from 1993 to 2004 is 75. 61 (81%) were performed locally and 14 (19%) were performed at overseas centres.

Table 4.1.1: Stock and Flow of Liver Transplantation, 1993-2004

Year	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**
New transplant patients	1	1	8	13	3	2	8	3	5	10	5	16
Deaths	0	0	3	4	2	0	4	1	2	5	1	5
Retransplant	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	2
Functioning graft at 31st December	1	2	7	16	17	19	23	24	27	31	35	44

Figure 4.1.1: Stock and Flow of Liver Transplantation, 1993– 2004

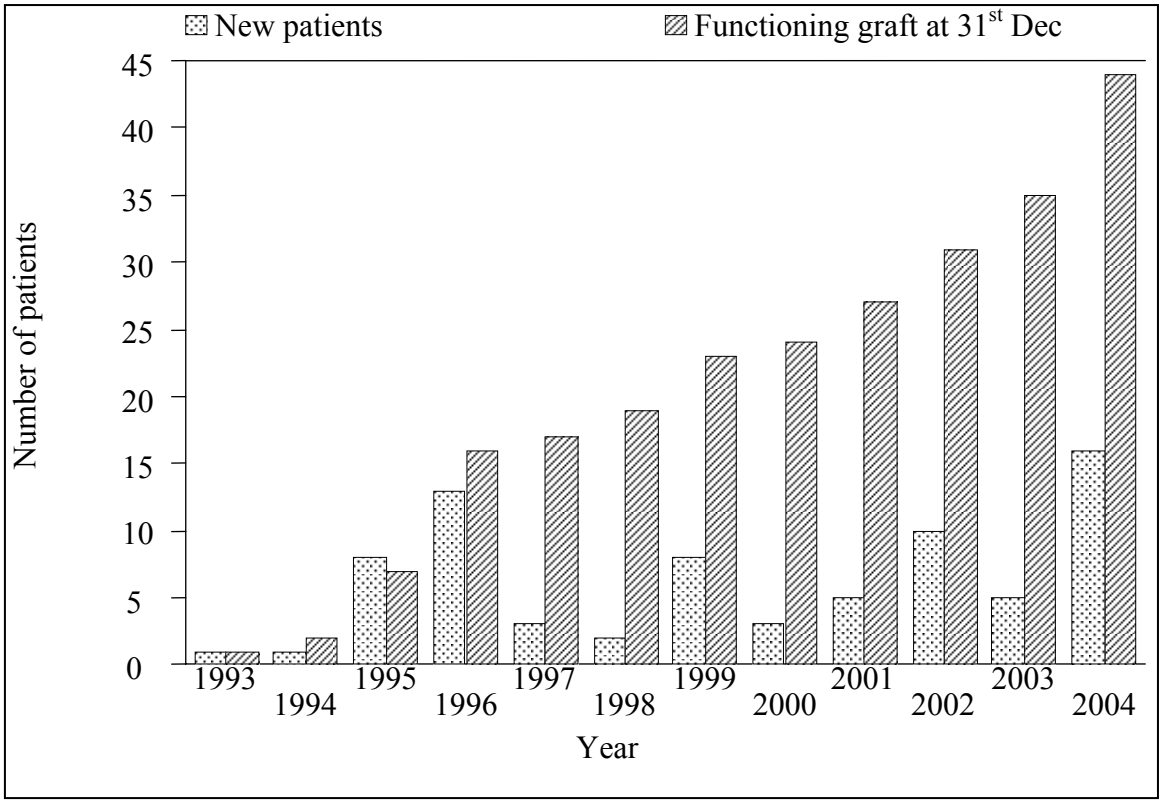


Table 4.1.2: Place of Transplant, 1993-2004

Year	93	94	95	96	97	98	99	00	01	02	03	04	TOTAL
	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	61
Overseas	1	1	0	3	2	1	0	0	0	1	3	2	14
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	75

Table 4.1.3: Centres for Liver transplantation, 1993-2004

Year	93	94	95	96	97	98	99
Centre	No.	No.	No.	No.	No.	No.	No.
Subang Jaya Medical Centre	0	0	8	10	1	1	8
Selayang Hospital	0	0	0	0	0	0	0
Australia	1	0	0	3	1	0	0
National University Hospital, Singapore	0	0	0	0	1	1	0
Kings College Hospital, UK	0	1	0	0	0	0	0
Tianjin, China	0	0	0	0	0	0	0
Asian Centre for Liver Disease & Transplantation, Singapore	0	0	0	0	0	0	0
TOTAL	1	1	8	13	3	2	8

Year	00	01	02	03	04	TOTAL
Centre	No.	No.	No.	No.	No.	No.
Subang Jaya Medical Centre	3	5	6	2	7	51
Selayang Hospital	0	0	3	0	7	10
Australia	0	0	0	0	0	5
National University Hospital, Singapore	0	0	0	0	0	2
Kings College Hospital, UK	0	0	0	0	0	1
Tianjin, China	0	0	0	1	1	2
Asian Centre for Liver Disease & Transplantation, Singapore	0	0	1	2	1	4
TOTAL	3	5	10	5	16	75

Table 4.1.4: Distribution of Centres of Follow-up of Transplant Recipients, 2004

Centre	No.	%
Number of patient with functioning graft at 31st December 2004	44	100
Kuala Lumpur Hospital	5	11
SJMC	29	66
Selayang Hospital	8	18
Singapore	1	2
UMMC	4	9

*There are 3 patients who are on follow-up in 2 centres

4.2 RECIPIENTS' CHARACTERISTICS

42 (56%) were males and 33 (44%) were females. The ethnic distribution of the liver transplant recipients are as follows: Chinese 40 (53%), Malays 29 (38%), Indians 4 (6%), Others 2 (3%).

63 (84%) of the transplant recipients were between 1 and 9 years of age at the time of transplant. Biliary atresia was the primary liver disease in 57 (76%) of the recipients. The indications for transplantation in these patients were failure to thrive with growth retardation and poor liver function.

Table 4.2.1: Gender distribution, 1993-2004

Year	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**TOTAL**
Gender	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	42
Female	1	1	2	8	1	1	5	2	3	3	0	6	33
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	75

Figure 4.2.1: Gender distribution, 1993-2004

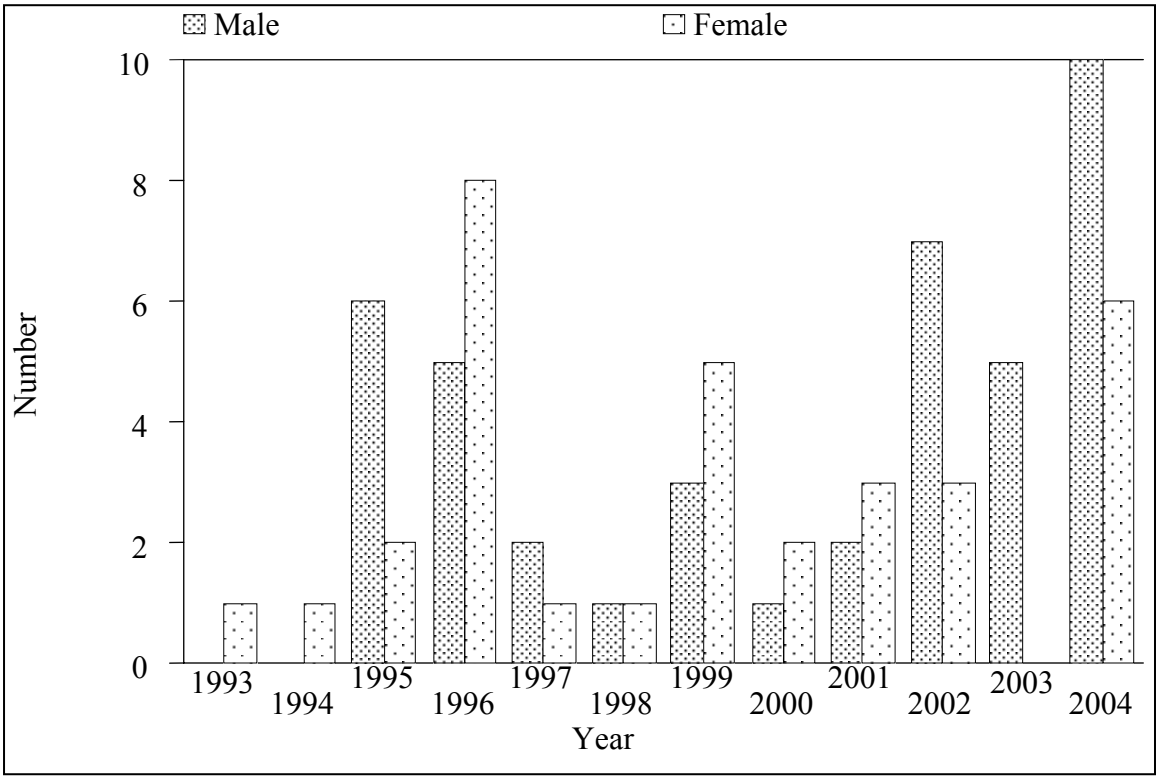


Table 4.2.2: Ethnic group distribution, 1993-2004

Year	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**TOTAL**
Ethnic group	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	29
Chinese	1	0	6	8	2	1	2	2	3	6	4	5	40
Indian	0	0	0	2	0	1	1	0	0	0	0	0	4
Others	0	0	0	0	0	0	1	0	0	1	0	0	2
TOTAL	1	1	8	13	3	2	8	3	5	10	5	16	75

Figure 4.2.2: Ethnic group distribution, 1993-2004

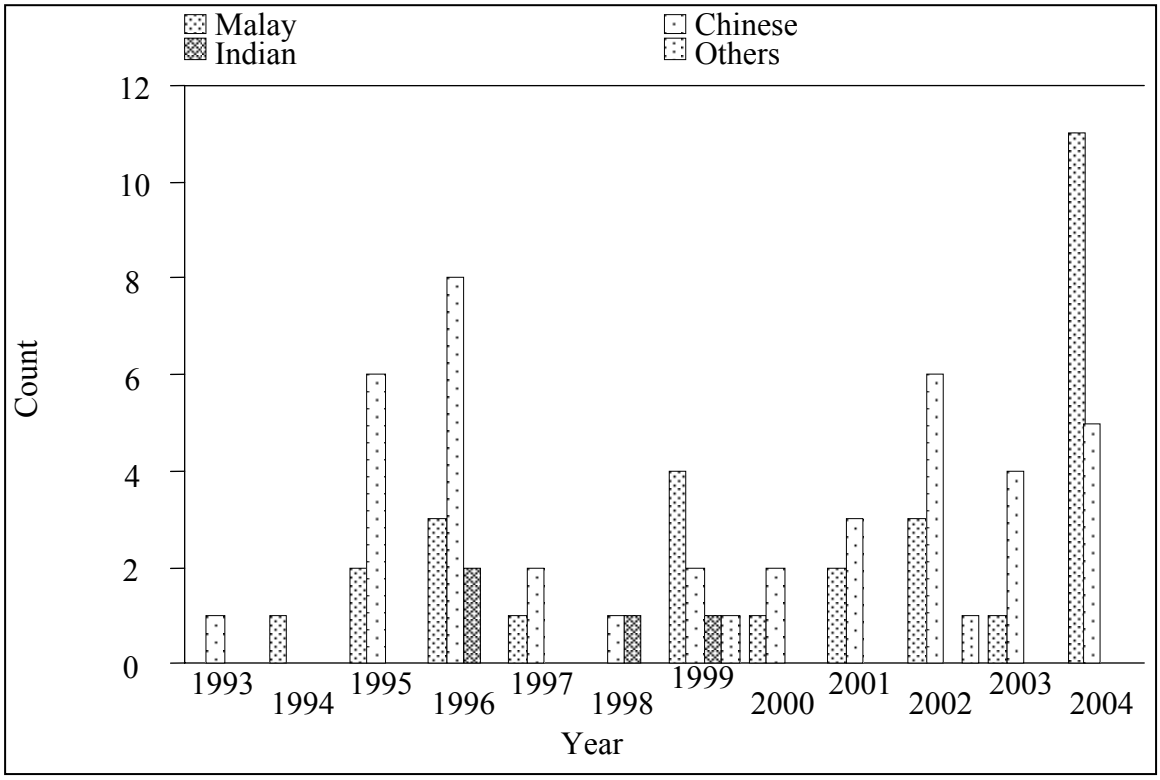


Table 4.2.3: Age distribution, 1993-2004

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Age group (years)	No.	No.	No.	No.	No.	No.	No.
<1	0	0	0	0	0	1	0
1-4	1	1	3	11	3	1	5
5-9	0	0	3	1	0	0	2
10-14	0	0	1	1	0	0	0
15-19	0	0	0	0	0	0	1
20-39	0	0	1	0	0	0	0
40-59	0	0	0	0	0	0	0
>=60	0	0	0	0	0	0	0
TOTAL	1	1	8	13	3	2	8
Mean	2	4	9	4	2	1	4
SD	-	-	9	4	1	1	5
Median	2	4	6	2	2	1	3
Minimum	2	4	2	2	1	3 months	1
Maximum	2	4	30	14	2	1	15

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Age group (years)	No.	No.	No.	No.	No.	No.
<1	0	0	1	0	0	2
1-4	3	4	4	2	9	47
5-9	0	1	4	2	3	16
10-14	0	0	0	0	1	3
15-19	0	0	0	0	1	2
20-39	0	0	1	0	0	2
40-59	0	0	0	0	1	1
>=60	0	0	0	1	1	2
TOTAL	3	5	10	5	16	75
Mean	1	2	6	18	12	7
SD	1	2	7	31	22	14
Median	1	2	4	7	3	2
Minimum	1	1	4 months	1	1	4 months
Maximum	2	5	24	73	74	74

*Age=date of transplant – date of birth

Table 4.2.4: Primary diagnosis, 1993-2004 (N=75)

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Primary Diagnosis	No.	No.	No.	No.	No.	No.	No.
Biliary atresia	1	1	7	12	3	1	7
Metabolic liver disease	0	0	1	1	0	0	0
Cholestatic liver disease	0	0	0	0	0	1	0
Primary biliary cirrhosis	0	0	0	0	0	0	0
Primary sclerosing cholangitis	0	0	0	0	0	0	0
Autoimmune hepatitis	0	0	0	0	0	0	1
Chronic hepatitis B	0	0	0	0	0	0	0
Chronic hepatitis C	0	0	0	0	0	0	0
Alcoholic liver disease	0	0	0	0	0	0	0
Malignancies	0	0	0	0	0	0	0
Acute liver failure	0	0	0	0	0	0	0
Idiopathic/Cryptogenic	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Primary Diagnosis	No.	No.	No.	No.	No.	No.
Biliary atresia	2	5	6	2	10	57
Metabolic liver disease	0	0	2	0	2	6
Cholestatic liver disease	1	0	0	0	0	2
Primary biliary cirrhosis	0	0	0	0	0	0
Primary sclerosing cholangitis	0	0	0	0	0	0
Autoimmune hepatitis	0	0	0	0	0	1
Chronic hepatitis B	0	0	0	3	2	5
Chronic hepatitis C	0	0	0	0	0	0
Alcoholic liver disease	0	0	0	0	0	0
Malignancies	0	0	1	2	1	4
Acute liver failure	0	0	0	0	1	1
Idiopathic/Cryptogenic	0	0	0	0	0	0
Others	0	0	2	0	1	3

*4 patients have more than one primary disease

Table 4.2.5: Indication for Transplantation, 1993-2004 (N=75)

Year	1993	1994	1995	1996	1997	1998	1999
Indication for Transplantation	No.	No.	No.	No.	No.	No.	No.
Recurrent encephalopathy	0	0	1	0	0	0	1
Uncontrolled bleeding varices	0	0	0	7	1	0	4
Intractable ascites	0	0	0	0	0	0	0
Spontaneous bacterial peritonitis	0	0	0	0	0	0	0
Poor liver function	1	1	7	11	3	1	8
Malignancy	0	0	0	0	0	0	0
Unacceptable quality of life	0	0	0	0	0	0	0
Failure to thrive, growth retardation in paediatric patients	0	0	6	10	3	2	6
Others	0	0	0	0	0	0	0
No data	0	0	0	0	0	0	0

Year	2000	2001	2002	2003	2004	TOTAL
Indication for Transplantation	No.	No.	No.	No.	No.	No.
Recurrent encephalopathy	0	0	1	0	0	3
Uncontrolled bleeding varices	1	1	0	0	2	16
Intractable ascites	0	0	0	0	0	0
Spontaneous bacterial peritonitis	0	0	0	0	0	0
Poor liver function	3	5	9	3	11	63
Malignancy	0	0	0	0	0	0
Unacceptable quality of life	0	0	1	0	0	1
Failure to thrive, growth retardation in paediatric patients	3	5	7	2	10	54
Others	0	0	0	0	1	1
No data	0	0	1	2	2	5

*13 patients had 1 indication for transplantation, 57 had more than 1 indication for transplantation

Table 4.2.6: Recipient blood group, 1993-2004 (N=75)

Year	1993	1994	1995	1996	1997	1998	1999
Blood group	No.	No.	No.	No.	No.	No.	No.
A	0	1	2	0	0	0	3
B	0	0	1	2	0	1	2
AB	0	0	0	1	0	1	0
O	0	0	2	5	1	0	3
No data	1	0	3	5	2	0	0
TOTAL	1	1	8	13	3	2	8

Year	2000	2001	2002	2003	2004	TOTAL
Blood group	No.	No.	No.	No.	No.	No.
A	0	1	3	1	4	15
B	0	1	1	0	1	9
AB	0	0	0	0	1	3
O	3	3	5	1	8	31
No data	0	0	1	3	2	17
TOTAL	3	5	10	5	16	75

4.3 TRANSPLANT PRACTICES

The highest number of transplants carried out was in 2004 but the yearly transplant number shows a variable trend. 85.3% of liver transplants were live donor transplants while 14.7% were cadaveric. 82.8 % of living donors were first degree relatives with mother to child being the most common (Table 4.3.1).

The immunosuppressive medications used are mainly tacrolimus and steroids (Table 4.3.2).

Table 4.3.1: Type of transplant, 1993-2004 (N=75)

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Type of Transplant	No.	No.	No.	No.	No.	No.	No.
Cadaveric	1	0	0	3	1	0	0
Living related - Mother	0	1	5	2	1	2	5
Living related - Father	0	0	2	7	1	0	2
Living related - Son	0	0	0	0	0	0	0
Living related - Brother	0	0	0	0	0	0	0
Living related - emotionally	0	0	0	0	0	0	0
Living unrelated	0	0	1	1	0	0	1
TOTAL	1	1	8	13	3	2	8

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Type of Transplant	No.	No.	No.	No.	No.	No.
Cadaveric	0	0	1	1	4	11
Living related - Mother	2	2	2	2	7	31
Living related - Father	0	2	3	0	1	18
Living related - Son	0	0	0	1	1	2
Living related - Brother	0	0	1	0	0	1
Living related - emotionally	0	0	0	1	0	1
Living unrelated	1	1	3	0	3	11
TOTAL	3	5	10	5	16	75

Table 4.3.2: Immunosuppressive drug treatment at transplantation, 1993-2004 (N=75)

Year	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Immunosuppressive drugs	No.	No.	No.	No.	No.	No.	No.
Steroids	0	0	2	5	0	2	5
Azathioprine	0	0	0	0	0	0	0
Cyclosporin A	1	1	1	2	0	0	0
Tacrolimus (FK506)	0	0	3	7	2	2	8
Mycophenolate Mofetil (MMF)	0	0	0	0	0	0	0
Rapamycin	0	0	0	0	0	0	0
Monoclonal/Polyclonal antibody	0	0	0	0	0	0	0
Anti IL2R Antibodies	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0
No data	0	0	4	3	1	0	0
TOTAL patients	1	1	8	13	3	2	8

Year	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Immunosuppressive drugs	No.	No.	No.	No.	No.	No.
Steroids	2	5	5	1	12	39
Azathioprine	0	0	0	0	4	4
Cyclosporin A	1	0	0	0	0	6
Tacrolimus (FK506)	2	5	9	5	12	55
Mycophenolate Mofetil (MMF)	0	0	0	0	0	0
Rapamycin	0	0	1	2	0	3
Monoclonal/Polyclonal antibody	0	0	0	0	0	0
Anti IL2R Antibodies	0	0	0	0	0	0
Others	0	0	0	0	0	0
No data	0	0	1	0	4	13
TOTAL patients	3	5	10	5	16	75

*21 patients had 1 type of drug, 37 patients had 2 types, 4 patients had 3 types

4.4 TRANSPLANT OUTCOMES

The 1 year survival rate for the period 1993-1998 and 1999-2004 was 71% and 66% respectively (Table and Figure 4.4.1). The survival rate is lower in the younger age group (< 10 years old) (Table and Figure 4.4.3). The most common known cause of death is sepsis (Table 4.4.4). However 8 cases have unknown cause due to either unavailable source data or death at home.

Table 4.4.1: Patient survival by year of transplant, 1993-2004 (N=75)

Year of Transplant	**1993 - 1998**		**1999 - 2004**	
Interval (months)	% 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, 1993-2004

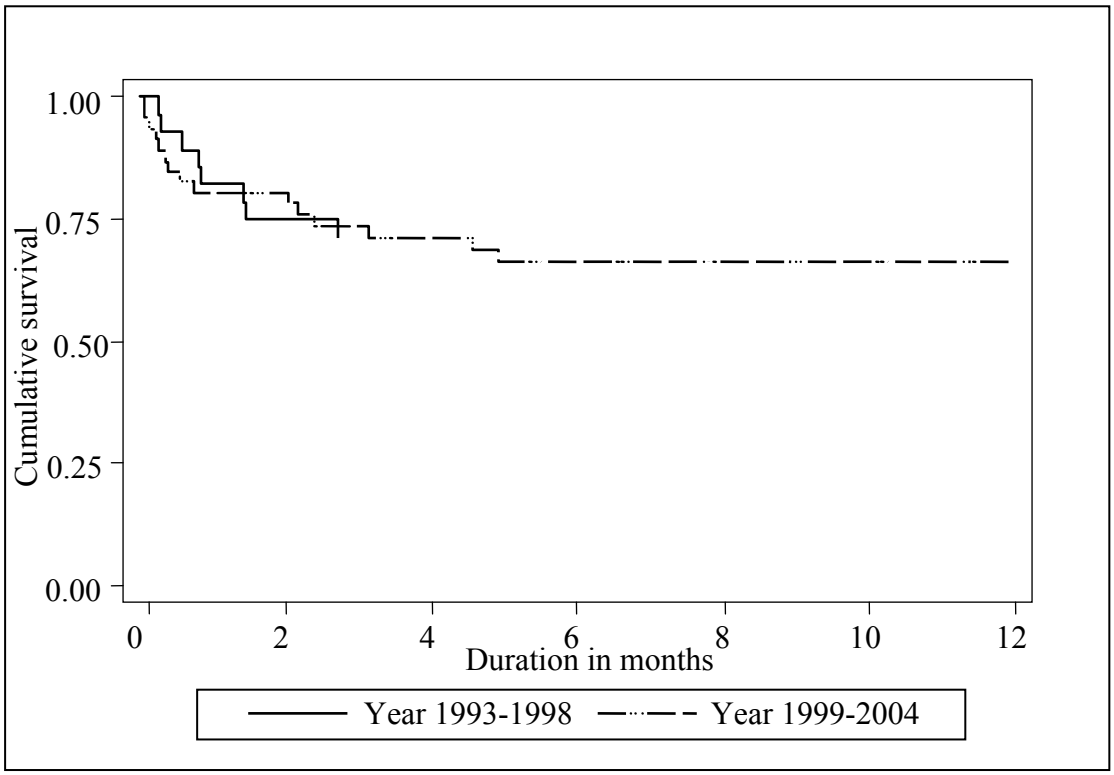


Table 4.4.2: Patient survival by gender, 1993-2004 (N=75)

Gender	**Male**		**Female**	
Interval (months)	% Survival	SE	% Survival	SE
1	80	6	82	7
6	70	7	66	8
12	70	7	66	8

SE=standard error

Figure 4.4.2: Patient survival by gender, 1993-2004

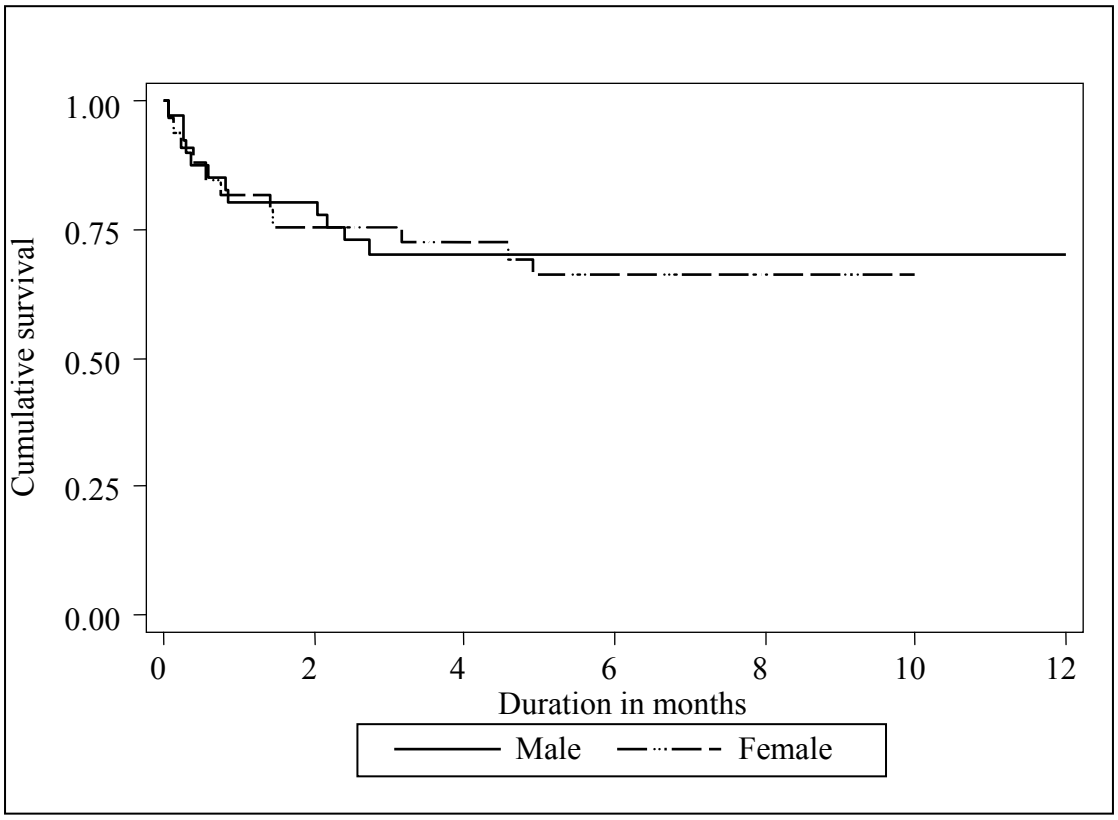


Table 4.4.3: Patient survival by age group, 1993-2004 (N=75)

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, 1993-2004

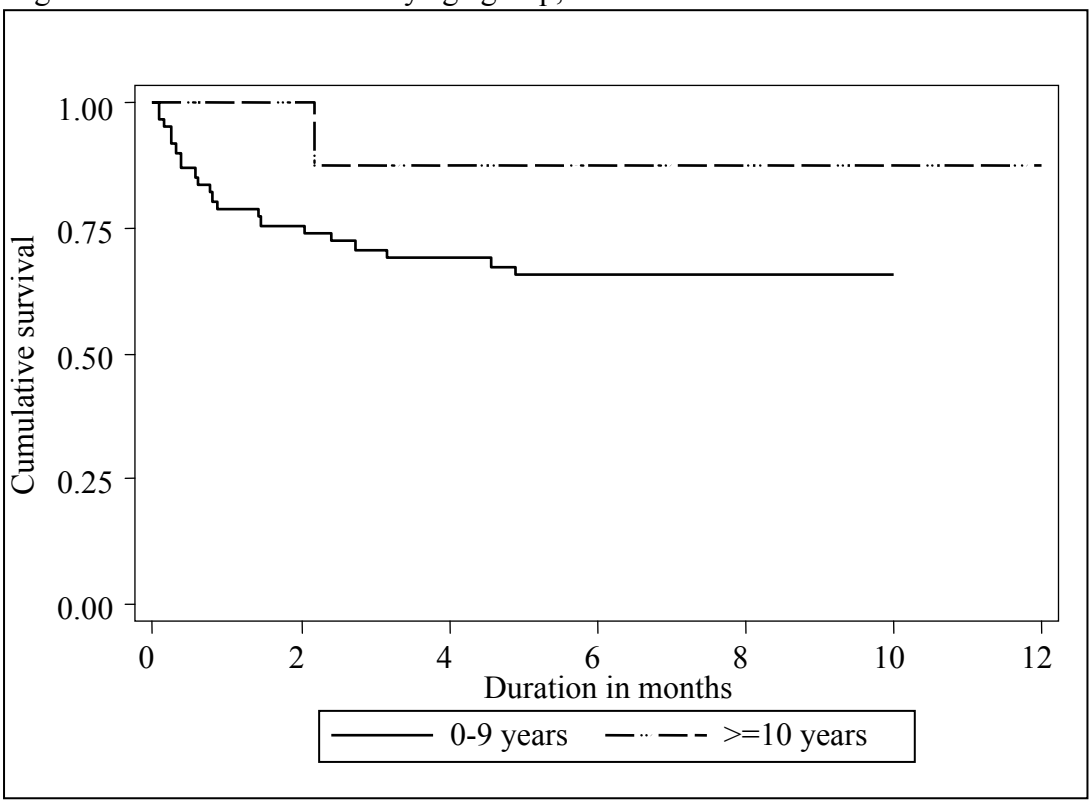


Table 4.4.4: Causes of death, 1993-2004 (N=75)

Year	1995	1996	1997	1998	1999	2000
Causes of death	No.	No.	No.	No.	No.	No.
Bleeding Oesophageal Varices – Post transplant	0	0	1	0	2	0
Chronic graft rejection	0	0	0	0	0	0
Intra-abdominal Bleeding	0	0	0	0	0	0
Ischaemic liver necrosis	0	0	0	0	0	1
Sepsis	0	2	0	0	0	0
Graft Failure	0	0	0	0	0	0
CMV Pneumonia	0	0	0	0	1	0
DIVC	0	0	0	0	0	0
Intracranial Haemorrhage	0	1	0	0	1	0
Pneumonia and Respiratory Failure	0	1	0	0	0	0
Post Transplant Lymphoproliferative Disease and Septicaemia	0	0	0	0	0	0
Unknown	3	0	0	0	0	0
TOTAL*	3	4	1	0	4	1

Year	2001	2002	2003	2004	TOTAL
Causes of death	No.	No.	No.	No.	No.
Bleeding Oesophageal Varices – Post transplant	0	0	0	0	3
Chronic graft rejection	1	0	0	0	1
Intra-abdominal Bleeding	0	0	1	0	1
Ischaemic liver necrosis	0	0	0	0	1
Sepsis	0	3	0	1	6
Graft Failure	0	0	0	1	1
CMV Pneumonia	0	0	0	0	1
DIVC	0	1	0	0	1
Intracranial Haemorrhage	0	0	0	0	2
Pneumonia and Respiratory Failure	0	0	0	0	1
Post Transplant Lymphoproliferative Disease and Septicaemia	1	0	0	0	1
Unknown	0	1	0	2	6
TOTAL*	2	5	1	4	25

*2 patients died with no date of death and cause of death

CHAPTER 5

RENAL TRANSPLANTATION

Editor:
Dr. Goh Bak Leong

Expert Panel:
Dato' Dr. Zaki Morad (Chair)
Dr. Goh Bak Leong (Co-chair)
Dr. Fan Kin Sing
Dr. Lily Mushahar
Mr. Rohan Malek
Dr. S Prasad Menon
Prof. Dr. Tan Si Yen

Contents

List of Tables

List of Figures

5.0 INTRODUCTION

This chapter presents results of the Renal Transplant section of the National Transplant Registry (NTR). The Renal Transplant section was formerly part of the National Renal Registry, which has been established since 1993 until its transplant component was transferred to the NTR in 2004. The renal transplant database currently comprises 2650 records of renal transplant recipients who have been transplanted since 1975. Case ascertainment in the early years was virtually 100% complete as transplant activity was low and almost all were performed locally. Ascertainment however is less complete since 1987 when significant numbers of patients began to go overseas for renal transplant treatment, initially to India and later to China.

The kidney transplant program was initiated in Malaysia after the first successful living related donor renal transplantation was carried out in Hospital Kuala Lumpur (HKL) on 15th December 1975 utilising an immunosuppressive protocol combining azathioprine and corticosteroids. The last 3 decades have seen many changes in renal transplantation activity in Malaysia (Figure 5.1.1). HKL has remained the major renal transplant centre of Malaysia for the last 3 decades. University Malaya Medical Centre started its transplant program in 1991 followed by Selayang Hospital in 2000. A few private hospitals do renal transplantation occasionally. Although cadaveric transplantation started early in 1976, the transplant program in Malaysia was almost an exclusively living related donor program until 1987 when many patients sought commercial living unrelated donor transplantation in India. It was only in 1996 when the Indian government passed legislation banning all commercial transplant activity that the number of commercial living unrelated transplants dropped. However, this was taken over by commercial cadaveric transplantation in China. In the early years, local transplants were carried out using an immunosuppressive protocol combining azathioprine and corticosteroids. In 1992 cyclosporine (CsA) based triple therapy was introduced. Since then CsA has remained the backbone of primary immunosuppression until recently when tacrolimus and mycophenolate mofetil (MMF) were increasingly used. The use of CsA was reported since 1987 among commercial transplant recipients.

5.1 STOCK AND FLOW

New renal transplant patients showed a modest increase from 30 transplants per year in 1980 to 174 per year in 2004. This increase in the number of transplants was mainly due to overseas commercial transplantation. By 2004, the number of functioning renal transplants has increased from 54 in 1980 to 1587 (Table 5.1.1).

Incident rates for renal transplantation showed modest increase from 2-3 per million population in the early 80's to between 5-7 per million since 1990 (Table 5.1.2). The transplant prevalence rate has increased steadily from 4 per million population in 1980 to 62 per million in 2004 (Table 5.1.3).

Table 5.1.1: Stock and Flow of Renal Transplantation, 1975-2004

Year	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**
New transplant patients	1	6	5	8	23	30	25	40	29	27	46	42
Died	0	2	3	2	2	5	4	3	14	6	7	8
Graft failure	0	0	0	0	2	3	10	6	8	5	8	7
Lost to follow up	0	0	0	0	0	0	0	0	0	0	0	0
Functioning graft at 31st December	1	5	7	13	32	54	65	96	103	119	150	177

Year	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**
New transplant patients	66	90	95	125	117	118	140	204	103	150
Died	8	9	10	19	13	16	20	28	16	31
Graft failure	8	12	8	12	18	19	23	21	28	28
Lost to follow up	0	0	0	5	1	3	1	3	3	1
Functioning graft at 31st December	227	296	373	462	547	627	723	875	931	1021

Year	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**
New transplant patients	126	103	126	143	162	169	157	174
Died	29	23	25	27	35	31	36	32
Graft failure	38	47	36	32	40	38	42	43
Lost to follow up	0	2	4	7	3	5	6	13
Functioning graft at 31st December	1080	1111	1172	1249	1333	1428	1501	1587

Figure 5.1.1: Stock and Flow of Renal Transplantation, 1975-2004

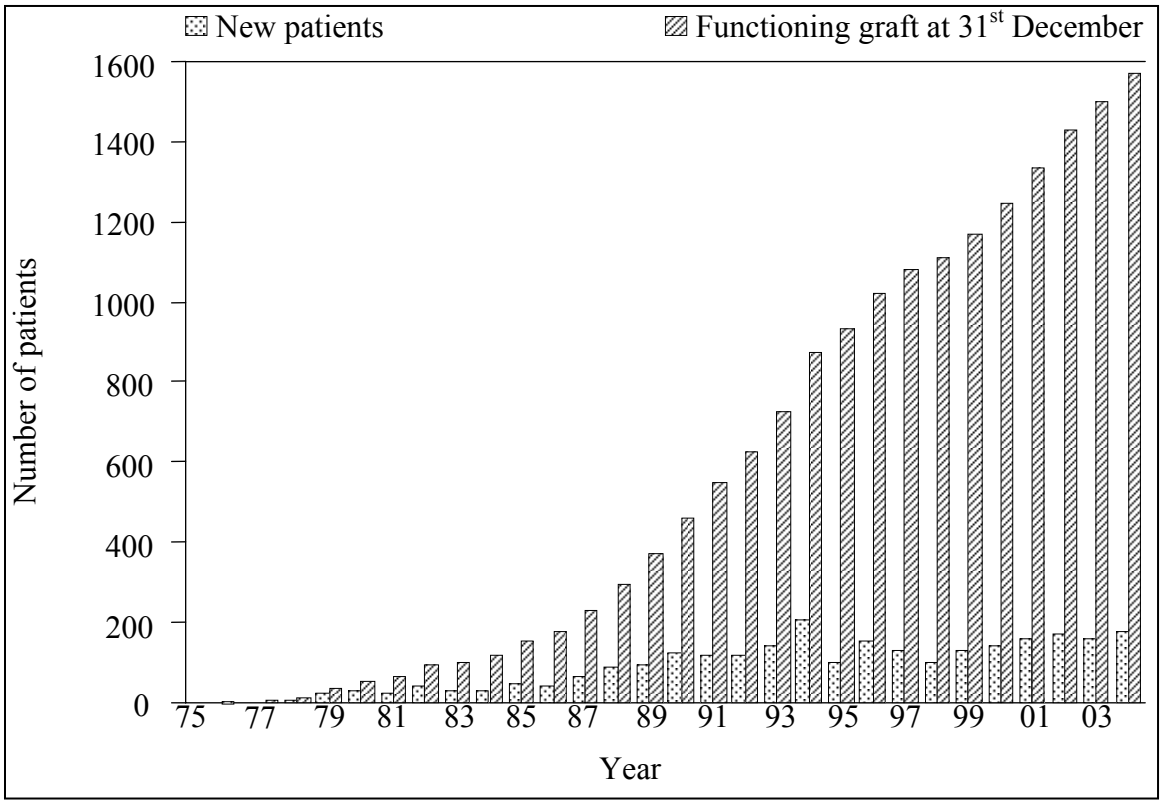


Table 5.1.2: New Transplant Rate per million population (pmp), 1975-2004

Year	75	76	77	78	79	80	81	82	83	84	85
New transplant patients	1	6	5	8	23	30	25	40	29	27	46
New transplant rate pmp	0	1	0	1	2	2	2	3	2	2	3

Year	86	87	88	89	90	91	92	93	94	95
New transplant patients	42	66	90	95	125	117	118	140	204	103
New transplant rate pmp	3	4	5	5	7	6	6	7	10	5

Year	96	97	98	99	00	01	02	03	04
New transplant patients	150	126	103	126	143	162	169	157	174
New transplant rate pmp	7	6	5	6	6	7	7	6	7

Figure 5.1.2: New Transplant Rate per million population (pmp), 1975-2004

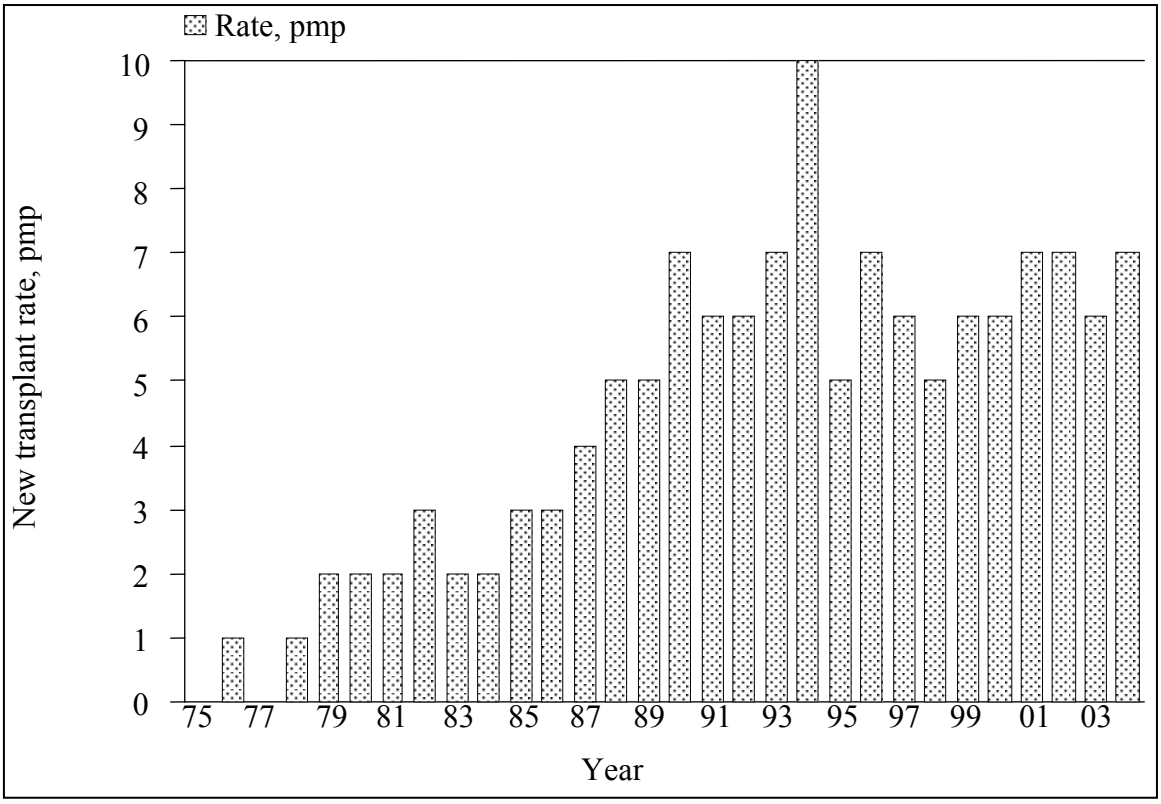


Table 5.1.3: Transplant Prevalence Rate per million population (pmp), 1975-2004

Year	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**
Functioning graft at 31st December	1	5	7	13	32	54	65	96	103	119	150
Transplant prevalence rate pmp	0	0	1	1	3	4	5	7	7	8	9

Year	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**
Functioning graft at 31st December	177	227	296	373	462	547	627	723	875	931	1021
Transplant prevalence rate pmp	11	14	17	21	26	29	33	37	44	45	48

Year	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**
Functioning graft at 31st December	1080	1111	1172	1249	1333	1428	1501	1587
Transplant prevalence rate pmp	50	50	52	53	56	58	60	62

Figure 5.1.3: Transplant Prevalence Rate per million population (pmp), 1975-2004

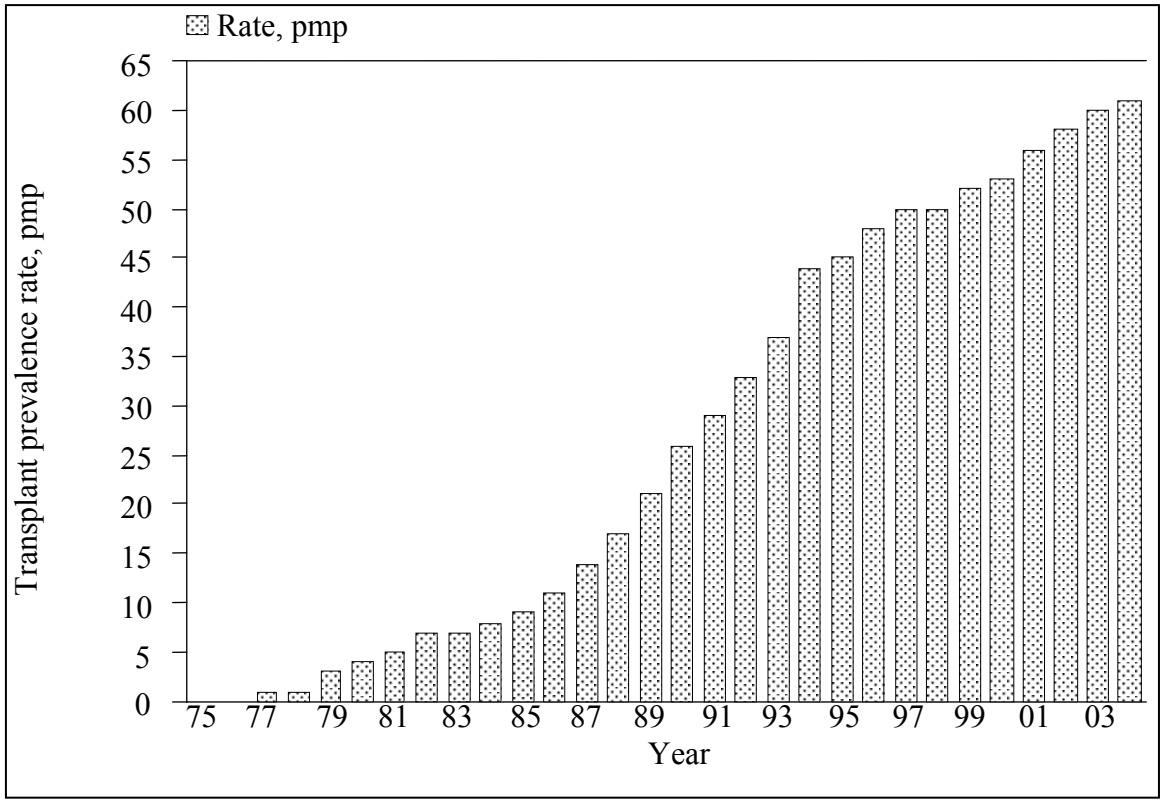


Table 5.1.4: Place of Renal Transplantation, 1975-2004

Year	1975		1976		1977		1978		1979		1980		1981		1982		1983		1984	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	1	100	5	83	3	60	7	88	21	91	25	83	22	88	35	88	23	79	26	96
UMMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selayang Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other local	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
China	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other overseas	0	0	1	17	2	40	1	13	2	9	5	17	3	12	5	13	6	21	1	4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	100	6	100	5	100	8	100	23	100	30	100	25	100	40	100	29	100	27	100

Year	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	39	85	34	81	42	64	44	49	29	31	45	36	41	35	31	26	36	26	33	16
UMMC	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4	3	3	2	5	2
Selayang Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other local	0	0	1	2	4	6	1	1	0	0	4	3	0	0	4	3	0	0	0	0
China	0	0	0	0	1	2	0	0	2	2	0	0	1	1	3	3	13	9	21	10
India	1	2	3	7	16	24	43	48	61	64	72	58	67	57	74	63	86	61	144	71
Other overseas	6	13	4	10	3	5	2	2	3	3	4	3	5	4	2	2	2	1	1	0
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	46	100	42	100	66	100	90	100	95	100	125	100	117	100	118	100	140	100	204	100

Year	1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
HKL	36	35	32	21	29	23	33	32	36	29	28	20	33	20	29	17	26	17	20	11	844	32
UMMC	10	10	7	5	6	5	7	7	16	13	19	13	23	14	14	8	6	4	9	5	132	5
Selayang Hospital	0	0	0	0	0	0	0	0	0	0	4	3	11	7	11	7	11	7	11	6	48	2
Other local	0	0	0	0	0	0	0	0	1	1	3	2	4	2	1	1	1	1	2	1	26	1
China	35	34	104	69	79	63	50	49	60	48	80	56	82	51	102	60	108	69	121	70	862	33
India	21	20	6	4	7	6	6	6	5	4	9	6	8	5	12	7	4	3	10	6	655	25
Other overseas	1	1	1	1	3	2	3	3	2	2	0	0	1	1	0	0	1	1	1	1	71	3
Unknown	0	0	0	0	2	2	4	4	6	5	0	0	0	0	0	0	0	0	0	0	12	0
TOTAL	103	100	150	100	126	100	103	100	126	100	143	100	162	100	169	100	157	100	174	100	2650	100

5.2 RECIPIENTS' CHARACTERISTICS

The mean age for new transplant recipients has increased from 31±6 years in 1980 to 41±13 years in 2004 (Table 5.2.1). Since renal transplantation was established in Malaysia in 1975, men are in the majority among renal transplant recipients. However, the percentage has reduced gradually from around 70-80% in the early 1980's to 55-60% over the last 10 years. Over the years, the proportion of diabetic transplant recipients has increased, from hardly any in the early 1980's to 10-20% for the last decade.

In 2004, 6% were HbsAg positive and 8% 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 5-10% for the last 10 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 8-15% for the last 8 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%.

Chronic glomerulonephritis was the primary cause of ESRF in only 10-20% of renal transplant recipients in the early 1980's, and this had increased to 25-35% for the last 5 years (Table 5.2.2). While the majority of renal transplant recipients still presented late with unknown primary renal disease, the proportion had decreased from 50-80% in the 1980's to 30-45% for the last 5 years. As expected, patients with diabetes mellitus had become increasingly frequent renal transplant recipients, from <5% in the 1980's to 7-16% over the last 5 years.

Table 5.2.1: Renal Transplant Recipients' Characteristics, 1975-2004

Year	75	76	77	78	79	80	81	82	83	84
New transplant patients	1	6	5	8	23	30	25	40	29	27
Age at transplant (years)										
Mean	31	37	26	35	30	31	31	29	29	31
SD	-	6	4	4	8	6	8	9	7	9
% Male	100	83	80	88	78	83	68	70	66	70
Race										
• % Malay	0	0	20	38	39	23	12	18	14	22
• % Chinese	0	50	60	63	48	70	56	60	62	52
• % Indian	0	17	20	0	13	7	24	20	21	26
• % Bumiputra Sabah	0	0	0	0	0	0	0	0	0	0
• % Bumiputra Sarawak	0	0	0	0	0	0	0	0	0	0
• % Others	100	33	0	0	0	0	8	3	3	0
% Diabetic (co-morbid/primary renal disease)	0	0	0	0	4	0	4	0	3	7
% HbsAg positive	0	0	0	14	11	21	7	23	25	0
% Anti-HCV positive	0	0	0	67	0	60	67	50	82	50

Year	85	86	87	88	89	90	91	92	93	94
New transplant patients	46	42	66	90	95	125	117	118	140	204
Age at transplant (years)										
Mean	30	28	32	33	39	35	34	38	38	39
SD	7	8	11	12	15	13	11	13	13	12
% Male	72	74	74	57	66	61	65	57	60	67
Race										
• % Malay	15	24	21	21	11	13	12	8	13	9
• % Chinese	59	48	56	61	79	75	79	77	76	75
• % Indian	20	26	18	14	6	7	5	10	11	13
• % Bumiputra Sabah	0	0	0	0	0	0	0	0	0	0
• % Bumiputra Sarawak	2	0	0	1	1	0	0	0	0	0
• % Others	4	2	5	2	3	5	4	4	1	3
% Diabetic (co-morbid/primary renal disease)	0	2	2	4	8	6	7	13	10	11
% HbsAg positive	20	16	24	15	31	16	11	13	9	10
% Anti-HCV positive	55	64	61	60	40	41	18	22	23	13

Year	95	96	97	98	99	00	01	02	03	04	TOTAL
New transplant patients	103	150	126	103	126	143	162	169	157	174	2650
Age at transplant (years)											
Mean	36	39	36	38	37	40	41	40	42	41	37
SD	12	11	12	11	13	13	13	13	13	13	13
% Male	57	57	63	59	61	64	63	56	66	61	63
Race											
• % Malay	17	9	12	17	16	13	27	23	22	18	16
• % Chinese	61	83	78	69	71	76	62	67	71	68	70
• % Indian	18	5	7	8	8	8	8	8	5	10	10
• % Bumiputra Sabah	0	0	0	0	0	0	0	0	0	2	0
• % Bumiputra Sarawak	0	0	0	0	0	0	0	0	0	0	0
• % Others	3	3	3	6	6	2	3	2	2	2	3
% Diabetic (co-morbid/ primary renal disease)	13	9	11	9	10	14	18	15	22	19	11
% HbsAg positive	7	13	6	6	5	5	4	7	9	6	10
% Anti-HCV positive	16	20	7	18	10	8	15	9	10	8	18

Table 5.2.2: Primary causes of end stage renal failure, 1975-2004

Year	1975		1976		1977		1978		1979		1980		1981		1982		1983		1984	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	1	100	6	100	5	100	8	100	23	100	30	100	25	100	40	100	29	100	27	100
Glomerulonephritis	0	0	1	17	2	40	2	25	3	13	3	10	4	16	7	18	5	17	4	15
Diabetes Mellitus	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	1	4
Hypertension	0	0	0	0	0	0	0	0	0	0	0	0	1	4	1	3	1	3	1	4
Obstructive uropathy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0
ADPKD	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0
Drugs / toxic nephropathy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	4	67	3	60	6	75	16	70	25	83	16	64	28	70	21	72	14	52
Others	1	100	1	17	0	0	0	0	3	13	3	10	3	12	7	18	2	7	7	26

Year	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	46	100	42	100	66	100	90	100	95	100	125	100	117	100	118	100	140	100	204	100
Glomerulonephritis	5	11	17	40	16	24	26	29	14	15	34	27	35	30	22	19	39	28	62	30
Diabetes Mellitus	0	0	1	2	0	0	3	3	7	7	4	3	5	4	10	8	9	6	15	7
Hypertension	4	9	1	2	3	5	2	2	2	2	2	2	2	2	4	3	4	3	5	2
Obstructive uropathy	0	0	1	2	1	2	1	1	1	1	2	2	5	4	6	5	9	6	3	1
ADPKD	1	2	0	0	0	0	0	0	1	1	0	0	2	2	0	0	1	1	5	2
Drugs / toxic nephropathy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	33	72	18	43	43	65	56	62	61	64	82	66	59	50	73	62	67	48	104	51
Others	6	13	4	10	4	6	5	6	11	12	11	9	11	9	10	8	13	9	18	9

Year	1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
New transplant patients	103	100	150	100	126	100	103	100	126	100	143	100	162	100	169	100	157	100	174	100	2650	100
Glomerulonephritis	29	28	45	30	29	23	28	27	41	33	47	33	41	25	53	31	51	32	59	34	724	27
Diabetes Mellitus	11	11	10	7	9	7	5	5	9	7	16	11	23	14	16	9	25	16	27	16	207	8
Hypertension	4	4	7	5	4	3	5	5	6	5	18	13	17	10	23	14	24	15	45	26	186	7
Obstructive uropathy	2	2	2	1	3	2	4	4	4	3	3	2	3	2	2	1	2	1	2	1	57	2
ADPKD	1	1	4	3	2	2	1	1	1	1	3	2	1	1	3	2	5	3	4	2	36	1
Drugs / toxic nephropathy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	0
Hereditary nephritis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
Unknown	50	49	77	51	64	51	54	52	62	49	55	38	62	38	69	41	60	38	78	45	1360	51
Others	13	13	11	7	18	14	10	10	6	5	12	8	22	14	15	9	12	8	26	15	265	10

5.3 TRANSPLANT PRACTICES

In the early years, from 1975 up till 1986 renal transplantation was predominantly live related donor transplantation, which made up 90-100% of all renal transplants in the country. After 1986 the transplant rate increased significantly, contributed mainly by commercial live unrelated donor transplants done in India which made up 60-70% of all transplants while only 20-30% of all transplants were from live related donors. It was only in 1996 when such activities were proscribed that the proportion of commercial live unrelated transplants dropped. However, this was later taken over by commercial cadaveric transplant activity in China. In 2004, commercial transplants from China constituted 74% of all new renal transplantation, while live donor transplantation made up 12% and local cadaveric transplants contributed another 11% of all new renal transplantation (Table 5.3.1).

Table 5.3.1: Type of Renal Transplantation, 1975-2004

Year	1975		1976		1977		1978		1979		1980		1981		1982		1983		1984	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Commercial Cadaver	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0
Commercial Live Donor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Donor (genetically related)	1	100	2	40	4	100	7	100	19	90	27	96	22	100	36	100	26	96	26	100
Live Donor (emotionally related)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadaver	0	0	3	60	0	0	0	0	2	10	1	4	0	0	0	0	0	0	0	0
TOTAL	1	100	5	100	4	100	7	100	21	100	28	100	22	100	36	100	27	100	26	100

Year	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994	
	No	%	N.	%	No	%	No	%	No	%	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial Cadaver	0	0	2	5	2	3	0	0	3	3	0	0	3	3	3	3	15	11	21	11
Commercial Live Donor	1	2	1	3	15	25	43	49	61	65	72	59	64	59	73	66	83	61	143	72
Live Donor (genetically related)	42	98	36	92	44	72	45	51	30	32	50	41	42	39	31	28	36	26	33	17
Live Donor (emotionally related)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadaver	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	2	1	2	1
TOTAL	43	100	39	100	61	100	88	100	94	100	122	100	109	100	111	100	136	100	199	100

Year	1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Commercial Cadaver	36	39	105	72	80	68	50	52	60	51	79	56	82	51	102	60	109	69	126	74	879	34
Commercial Live Donor	18	19	4	3	7	6	4	4	4	3	10	7	7	4	11	7	3	2	4	2	628	25
Live Donor (genetically related)	35	38	34	23	23	19	26	27	38	32	20	14	32	20	31	18	25	16	19	11	842	33
Live Donor (emotionally related)	0	0	0	0	0	0	2	2	5	4	6	4	4	2	3	2	5	3	2	1	27	1
Cadaver	4	4	2	1	8	7	15	15	10	9	27	19	37	23	22	13	15	10	19	11	173	7
TOTAL	93	100	145	100	118	100	97	100	117	100	142	100	162	100	169	100	157	100	170	100	2549	100

*Commercial cadaver (China, India, other overseas) *Commercial live donor (living unrelated) *Cadaver (local)
*For 101 patients there is no complete information on type; it is known that 84 are living related

Table 5.3.2: Biochemical data, 2004

Biochemical parameters	
Creatinine, mmol/L	N=1492
• Mean	131.6
• SD	63.6
• Median	119
• Minimum	38
• Maximum	817
Hb, g/dL	N=1492
• Mean	12.9
• SD	1.9
• Median	12.9
• Minimum	4.9
• Maximum	19.7
Albumin, g/L	N=1492
• Mean	39.6
• SD	4.9
• Median	39.6
• Minimum	11
• Maximum	57
Calcium, mmol/L	N=1492
• Mean	2.4
• SD	0.2
• Median	2.4
• Minimum	1.1
• Maximum	3.3
Phosphate, mmol/L	N=1492
• Mean	1.1
• SD	0.2
• Median	1.1
• Minimum	0.3
• Maximum	2.7

*Extreme values were excluded and missing data was imputed using the mean

Table 5.3.3: Medication data, 2004

Medication data	**Single drug treatment**		**Drug treatment**	
	No.	%	No.	%
All patients	1492	100	1492	100
(i) Immunosuppressive drug(s) treatment				
Prednisolone	14	1	1458	98
Azathioprine	0	0	642	43
Cyclosporine	3	0	1193	80
Tacrolimus (FK506)	0	0	186	12
Mycophenolate mofetil (MMF)	1	0	539	36
Rapamycin (sirolimus)	0	0	5	0
Others	1	0	20	1
(ii) Non-Immunosuppressive drug(s) treatment				
Beta blocker	105	7	654	44
Calcium channel blocker	184	12	798	53
ACE inhibitor	39	3	266	18
AIIRB	16	1	86	6
Anti-lipid	67	4	553	37
Other anti-hypertensives	4	0	132	9

*There are 14 patients without any drug treatment

CsA/prednisolone based triple therapy has remained the backbone of maintenance immunosuppressive therapy. In 2004, 80% of renal transplant recipients were on CsA while 98% were on prednisolone. Only 12% were on tacrolimus. However, 36% of the recipients were on MMF as opposed to 43% on azathioprine.

5.4 TRANSPLANT OUTCOMES

5.4.1 Post-transplant complications

Table 5.4.1: Post transplant complications, 2004

Post transplant complications	Complication developed before transplant (regardless of complication after transplantation)		Complication developed only after transplantation	
	No.	%	No.	%
All patients	1492	100	1492	100
Diabetes	174	12	120	8
Cancer	2	0	18	1
Cardiovascular disease + cerebrovascular disorder	77	5	82	5
Hypertension	956	64	370	25

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

64% of the recipients had hypertension as a co-morbidity before transplantation while another 25% developed hypertension post transplantation (Table 5.4.1). Among these patients, only 23% 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 (44%). Only 18% were on ACE inhibitors while another 6% were on AIIRBs.

It is also interesting to note while 12% 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 Death and Graft loss

In 2004, 32 (2%) of transplant recipients died and 43 (3%) 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 2 decades and in 2004, they accounted for 29%, 11% and 11% of the causes of death respectively (Table 5.4.3). 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, 1975-2004

Year	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**
No. at risk	1	3	6	10	23	43	60	81	100	111	135
Transplant death	0	2	3	2	2	5	4	3	14	6	7
Transplant death rate %	0	67	50	20	9	12	7	4	14	5	5
Graft loss	0	0	0	0	2	3	10	6	8	5	8
Graft loss %	0	0	0	0	9	7	17	7	8	5	6
Acute rejection	0	0	0	0	0	0	0	0	0	0	0
Acute rejection rate %	0	0	0	0	0	0	0	0	0	0	0
All losses	0	2	3	2	4	8	14	9	22	11	15
All losses rate %	0	67	50	20	17	19	23	11	22	10	11

Year	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**
No. at risk	164	202	262	335	418	505	587	675	799	903
Transplant death	8	8	9	10	19	13	16	20	28	16
Transplant death rate %	5	4	3	3	5	3	3	3	4	2
Graft loss	7	8	12	8	12	18	19	23	21	28
Graft loss %	4	4	5	2	3	4	3	3	3	3
Acute rejection	0	0	0	0	0	0	0	0	0	0
Acute rejection rate %	0	0	0	0	0	0	0	0	0	0
All losses	15	16	21	18	31	31	35	43	49	44
All losses rate %	9	8	8	5	7	6	6	6	6	5

Year	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**
No. at risk	976	1051	1096	1142	1211	1291	1381	1465	1544
Transplant death	31	29	23	25	27	35	31	36	32
Transplant death rate %	3	3	2	2	2	3	2	2	2
Graft loss	28	38	47	36	32	40	38	42	43
Graft loss %	3	4	4	3	3	3	3	3	3
Acute rejection	0	0	0	0	0	0	0	3	18
Acute rejection rate %	0	0	0	0	0	0	0	0	1
All losses	59	67	70	61	59	75	69	78	75
All losses rate %	6	6	6	5	5	6	5	5	5

*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, 1975-2004

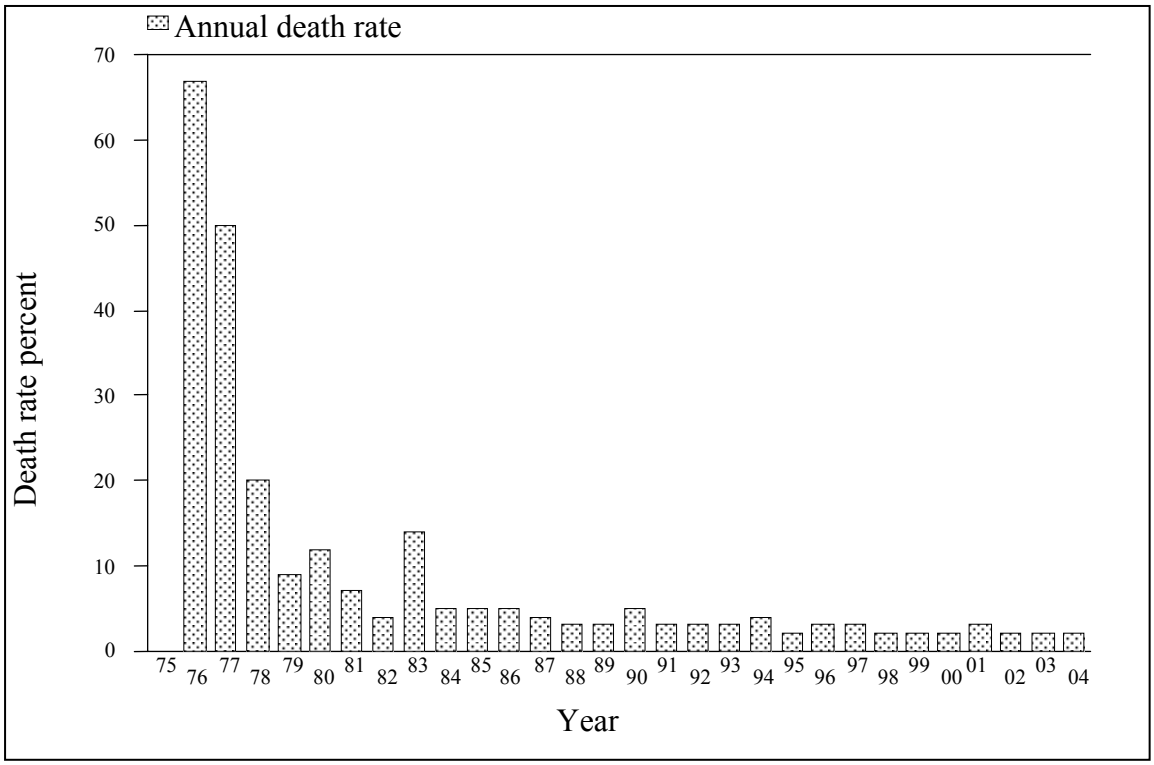


Figure 5.4.2(ii): Transplant Recipient Graft Loss Rate, 1975-2004

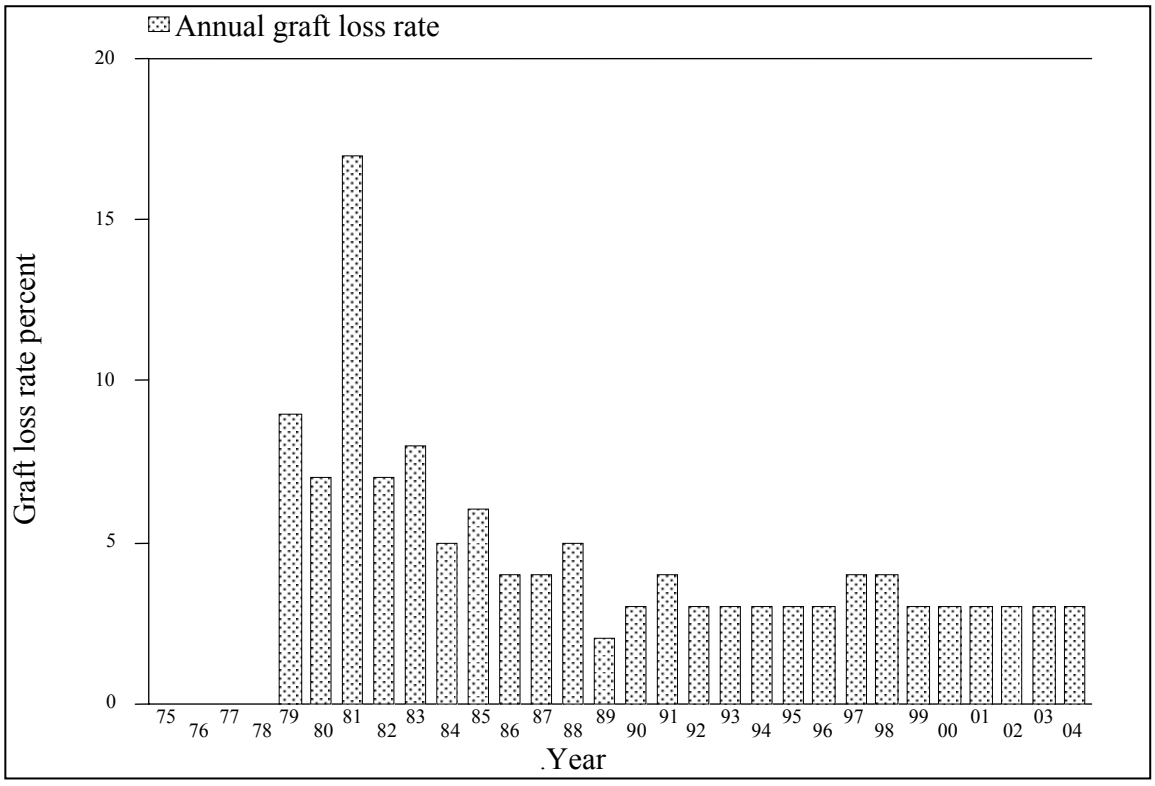


Table 5.4.3: Causes of Death in Transplant Recipients, 1975-2004

Year	1975		1976		1977		1978		1979		1980		1981		1982		1983		1984	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Cardiovascular	0		0	0	0	0	0	0	0	0	0	0	0	0	1	33	0	0	0	0
Died at home	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infection	0		0	0	0	0	0	0	0	0	1	20	1	25	0	0	4	29	3	43
Graft failure	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0	0
Liver disease	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	14
Accidental death	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	0		1	50	1	33	0	0	0	0	1	20	0	0	1	33	1	7	1	14
Unknown	0		1	50	2	67	2	100	2	100	3	60	3	75	1	33	8	57	2	29
TOTAL	0		2	100	3	100	2	100	2	100	5	100	4	100	3	100	14	100	7	100

Year	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Cardiovascular	0	0	1	13	1	11	0	0	1	8	1	5	0	0	2	13	4	19	4	14
Died at home	0	0	0	0	0	0	0	0	1	8	1	5	3	23	0	0	3	14	0	0
Infection	2	29	2	25	3	33	3	33	6	50	11	52	5	38	8	50	7	33	18	62
Graft failure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	0	0	0	0	0	0	0	0	0	0	3	14	0	0	1	6	1	5	0	0
Liver disease	1	14	1	13	0	0	2	22	1	8	0	0	1	8	1	6	1	5	1	3
Accidental death	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others	1	14	0	0	0	0	2	22	1	8	4	19	2	15	1	6	1	5	3	10
Unknown	3	43	4	50	5	56	2	22	2	17	1	5	2	15	3	19	4	19	3	10
TOTAL	7	100	8	100	9	100	9	100	12	100	21	100	13	100	16	100	21	100	29	100

Year	1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		TOTAL	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No.	%	No.	%	No.	%	No.	%
Cardiovascular	7	41	4	13	3	10	3	13	4	13	10	32	6	15	5	16	9	23	4	11	70	14
Died at home	1	6	3	9	2	7	4	17	6	19	1	3	5	12	5	16	5	13	4	11	44	9
Infection	3	18	18	56	14	48	9	38	7	23	11	35	19	46	9	29	10	26	10	29	184	37
Graft failure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cancer	1	6	2	6	0	0	3	13	3	10	2	6	6	15	4	13	6	15	6	17	39	8
Liver disease	1	6	3	9	2	7	2	8	3	10	1	3	1	2	3	10	2	5	1	3	29	6
Accidental death	1	6	0	0	0	0	0	0	1	3	1	3	1	2	1	3	0	0	0	0	5	1
Others	2	12	1	3	4	14	0	0	5	16	3	10	2	5	2	6	5	13	9	26	54	11
Unknown	1	6	1	3	4	14	3	13	2	6	2	6	1	2	2	6	2	5	1	3	72	14
TOTAL	17	100	32	100	29	100	24	100	31	100	31	100	41	100	31	100	39	100	35	100	497	100

Table 5.4.4: Causes of Graft Failure, 1975-2004

Year	1975		1976		1977		1978		1979		1980		1981		1982		1983		1984	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Rejection	0		0		0		0		1	50	1	25	1	10	2	33	2	25	1	20
Calcineurin toxicity	0		0		0		0		0	0	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0		0		0		0		0	0	0	0	0	0	0	0	0	0	0	0
Ureteric obstruction	0		0		0		0		0	0	0	0	0	0	0	0	0	0	0	0
Infection	0		0		0		0		0	0	1	25	2	20	0	0	1	13	1	20
Vascular causes	0		0		0		0		0	0	0	0	0	0	0	0	0	0	0	0
Recurrent / de novo renal disease	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
Unknown	0		0		0		0		1	50	2	50	7	70	4	67	5	63	3	60
TOTAL	0		0		0		0		2	100	4	100	10	100	6	100	8	100	5	100

Year	1985		1986		1987		1988		1989		1990		1991		1992		1993		1994	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Rejection	2	25	3	43	1	13	5	38	1	13	4	31	10	53	9	47	10	43	10	42
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	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0
Ureteric obstruction	0	0	0	0	0	0	1	8	0	0	0	0	0	0	0	0	0	0	1	4
Infection	1	13	0	0	0	0	0	0	0	0	1	8	1	5	0	0	0	0	1	4
Vascular causes	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	1	4	1	4
Recurrent / de novo renal disease	0	0	0	0	0	0	0	0	0	0	2	15	1	5	1	5	1	4	2	8
Others	0	0	0	0	0	0	2	15	0	0	1	8	0	0	1	5	0	0	1	4
Unknown	5	63	4	57	7	88	5	38	7	88	4	31	6	32	8	42	11	48	8	33
TOTAL	8	100	7	100	8	100	13	100	8	100	13	100	19	100	19	100	23	100	24	100

Table 5.4.4: Causes of Graft Failure, 1975-2004

Year	1995		1996		1997		1998		1999		2000	
	No	%	No	%	No	%	No	%	No	%	No	%
Rejection	15	52	14	50	20	53	27	53	23	64	19	59
Calcineurin inhibitor toxicity	0	0	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0	0	0	0	1	3	0	0	0	0	0	0
Ureteric obstruction	1	3	0	0	0	0	0	0	0	0	0	0
Infection	0	0	0	0	0	0	1	2	0	0	1	3
Vascular causes	1	3	1	4	4	11	3	6	1	3	3	9
Recurrent/de novo renal disease	0	0	2	7	1	3	1	2	0	0	0	0
Others	1	3	0	0	5	13	5	10	0	0	2	6
Unknown	11	38	11	39	7	18	14	27	12	33	7	22
TOTAL	29	100	28	100	38	100	51	100	36	100	32	100

Year	2001		2002		2003		2004		TOTAL	
	No	%	No.	%	No.	%	No.	%	No.	%
Rejection	25	61	22	55	22	50	30	70	280	50
Calcineurin inhibitor toxicity	0	0	0	0	0	0	0	0	0	0
Other drug toxicity	0	0	0	0	0	0	0	0	2	0
Ureteric obstruction	0	0	0	0	0	0	0	0	3	1
Infection	2	5	0	0	2	5	1	2	16	3
Vascular causes	1	2	0	0	3	7	4	9	24	4
Recurrent/de novo renal disease	2	5	2	5	1	2	1	2	17	3
Others	0	0	4	10	1	2	0	0	23	4
Unknown	11	27	12	30	15	34	7	16	194	35
TOTAL	41	100	40	100	44	100	43	100	559	100

5.4.3 Patient and Graft Survival

The overall transplant patient survival rate from 1993 to 2004 was 95%, 92%, 89% and 80% at 1 year, 3 years, 5 years and 10 years respectively, while the overall graft survival rate was 97%, 93%, 88% and 77% respectively. These survival rates are comparable to the USRDS outcomes.

Table 5.4.5: Patient survival, 1993-2004

Interval (years)	% Survival	SE
1	95	1
3	92	1
5	89	1
10	82	1

SE=standard error

Figure 5.4.5: Patient survival, 1993-2004

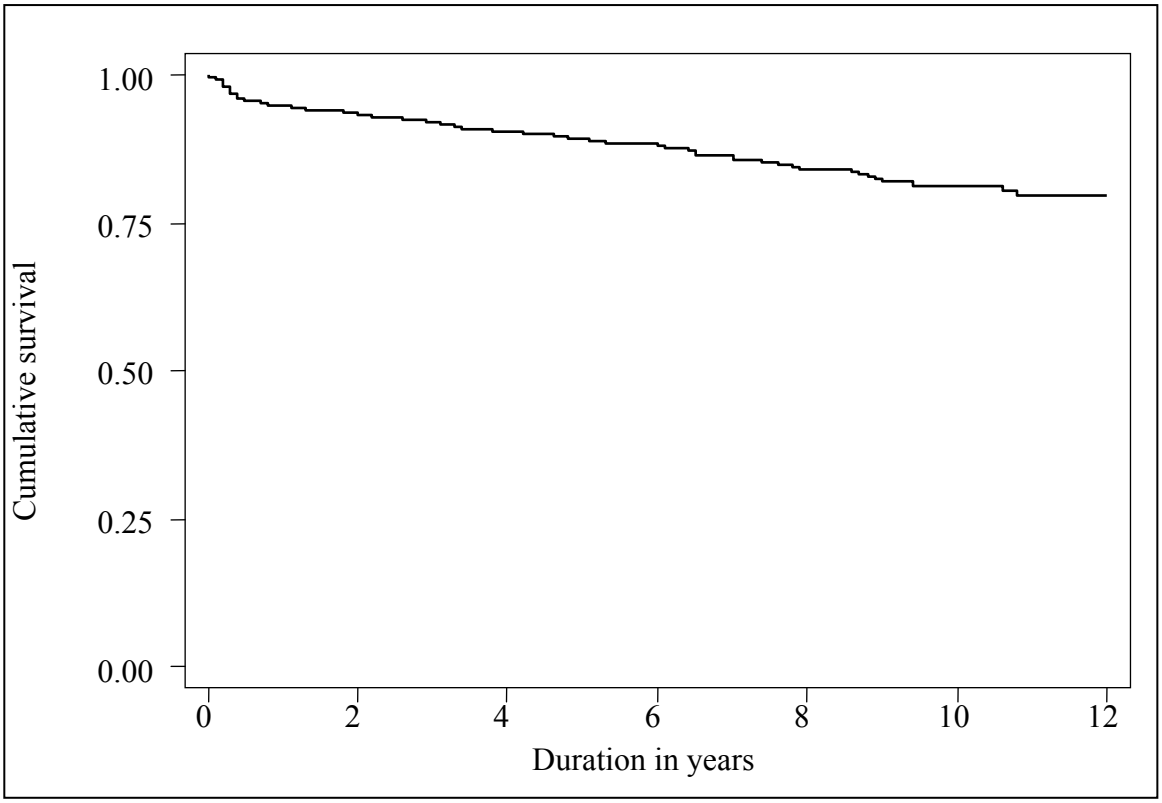


Table 5.4.6: Graft survival, 1993-2004

Interval (years)	% Survival	SE
1	97	0
3	93	1
5	88	1
10	77	2

SE=standard error

Figure 5.4.6: Graft survival, 1993-2004

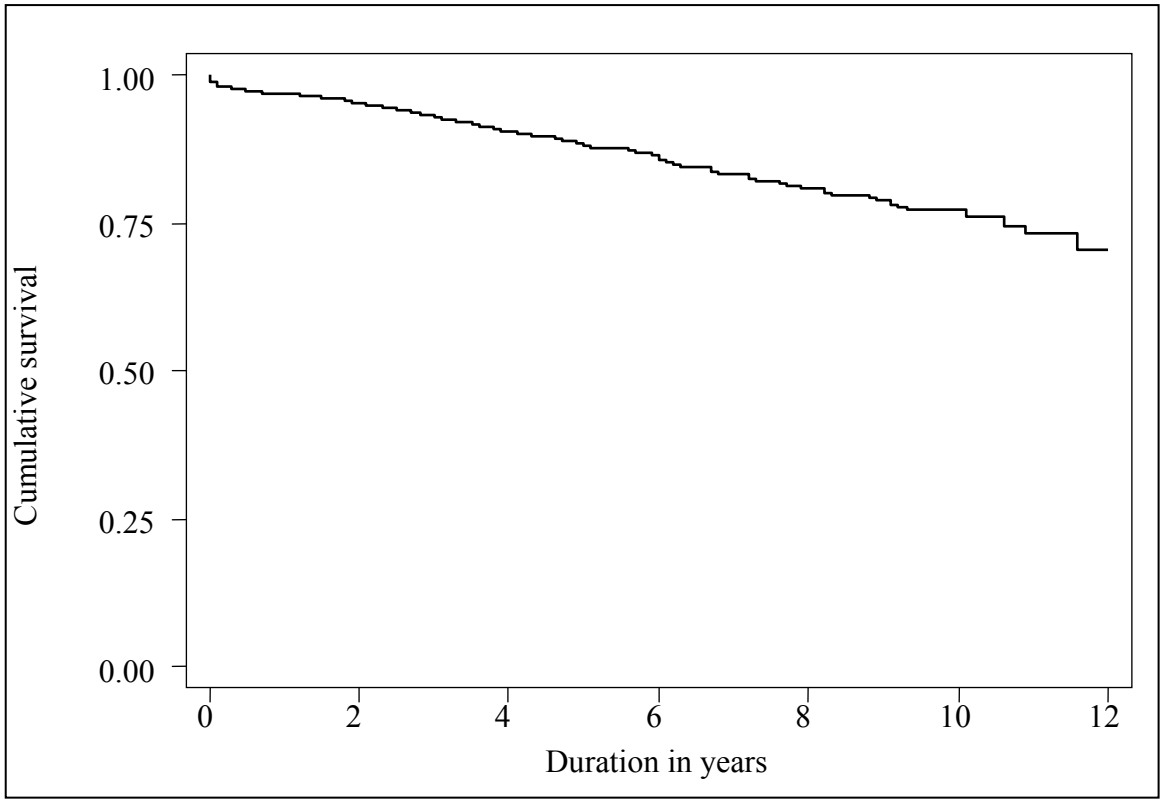
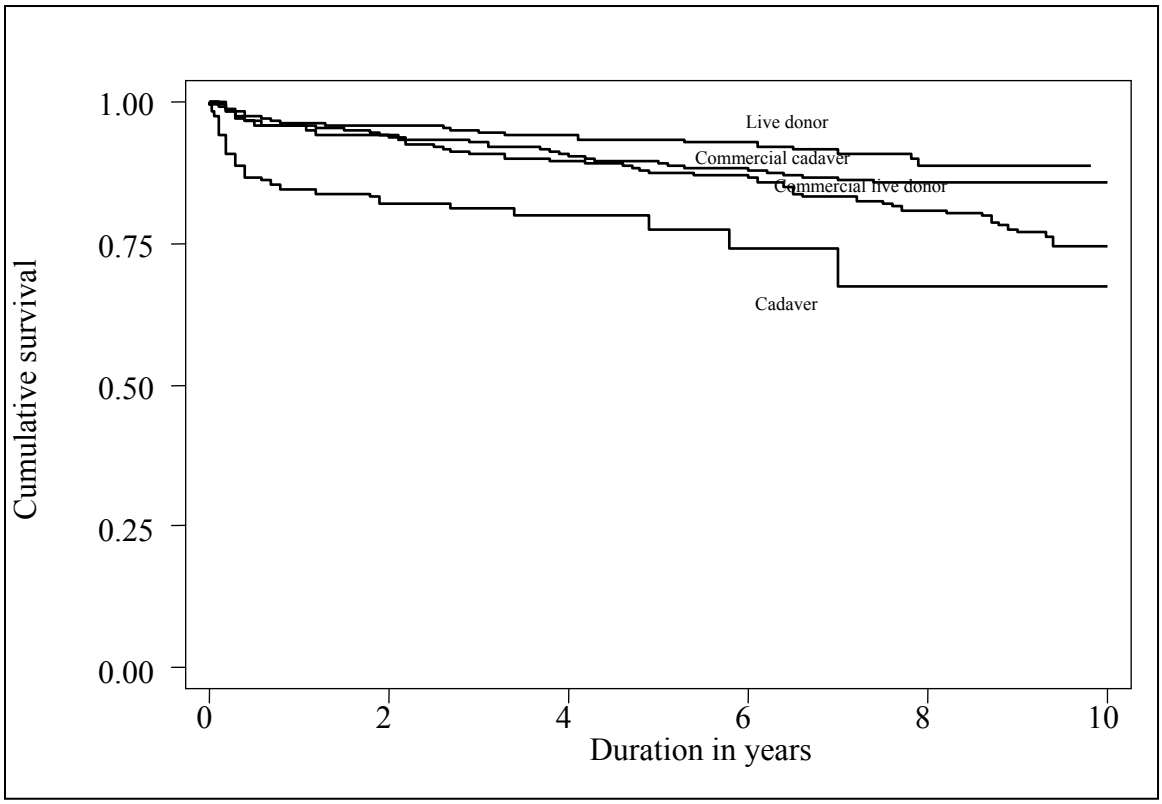


Table 5.4.7: Patient survival by type of transplant, 1993-2004

Type of Transplant	Commercial Cadaver		Commercial Live Donor		Live Donor		Cadaver	
Interval (years)	% Survival	SE	% Survival	SE	% Survival	SE	% Survival	SE
1	96	1	96	1	96	1	85	3
3	93	1	91	2	95	1	81	3
5	89	1	87	2	93	1	77	4
10	86	2	74	3	89	2	67	8

SE=standard error

Figure 5.4.7: Patient survival by type of transplant, 1993-2004



Outcomes of renal transplantation from the four donor groups are shown in Figure 5.4.7 and 5.4.8 and demonstrate substantially different patient & graft survival rates. Living donor grafts had 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%, 93% and 89% respectively. The graft survival rates also differed between these 4 groups; living and commercial cadaver donor graft had the best outcomes.

The differences in graft survival rates among these 4 groups of donor source were significant even after adjustment for multiple risk factors such as age, gender, ethnicity, year of transplant, smoking status, BMI, diabetes, hepatitis B and C, HLA match, cardiovascular disease and prior dialysis time. Hence other immunological and non immunological factors such as PRA, cold ischaemia time, number of previous transplants, donor factors and the effect of immunosuppressive regime may contribute to the observed differences in outcomes (refer 11th Report of the Malaysian Dialysis & Transplant Registry 2003: Chapter 6).

Table 5.4.8: Graft survival by type of transplant, 1993-2004

Type of Transplant	Commercial Cadaver		Commercial Live Donor		Live Donor		Cadaver	
Interval (years)	% Survival	SE	% Survival	SE	% Survival	SE	% Survival	SE
1	98	0	98	1	94	1	91	2
3	97	1	92	2	91	2	85	3
5	93	1	84	2	86	2	85	3
10	83	3	71	3	78	3	52	21

SE=standard error

Figure 5.4.8: Graft survival by type of transplant, 1993-2004

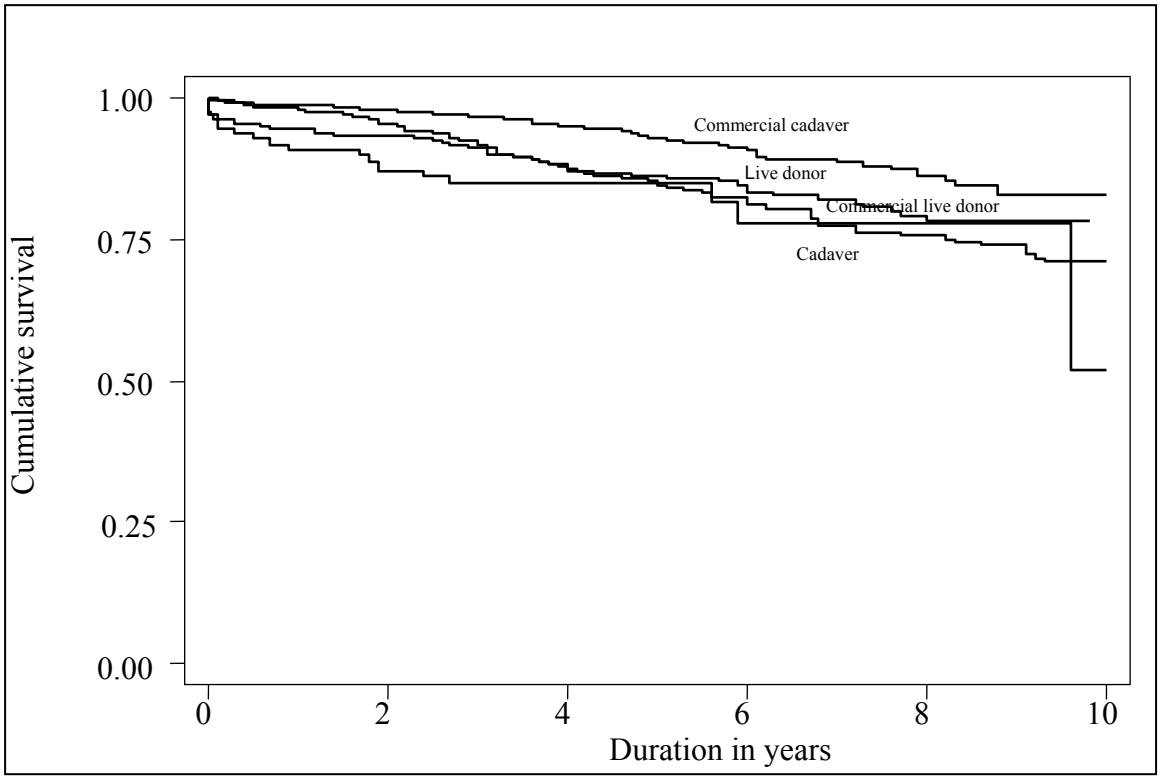
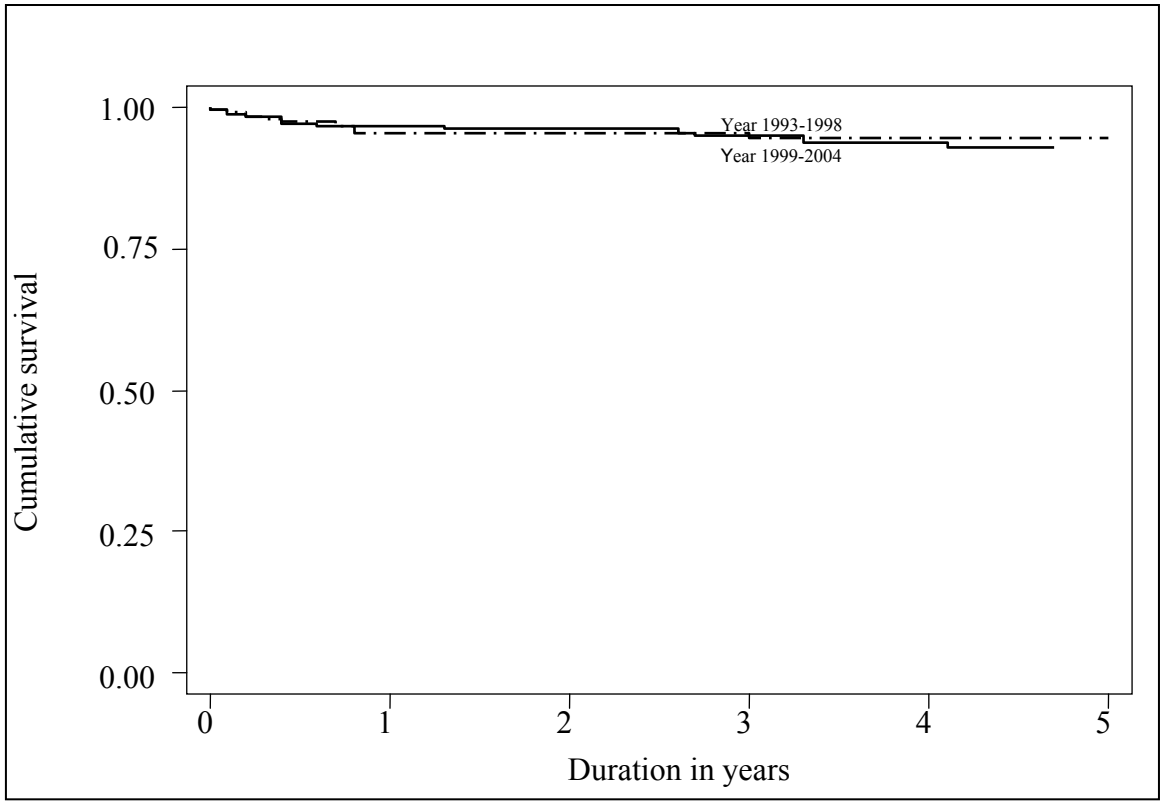


Table 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)

Year of Transplant	1993-1998		1999-2004	
Interval (years)	% Survival	SE	% Survival	SE
1	97	1	96	2
3	95	2	95	2
5	93	2	95	2

SE=standard error

Figure 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)



Our data shows that there are higher risk patients among more recent transplants. For example, more recent transplant recipients are older and a greater proportion of them had diabetes. This prompted us to compare the patient and graft survival rates for 1993-1998 cohort and 1999-2004 cohort.

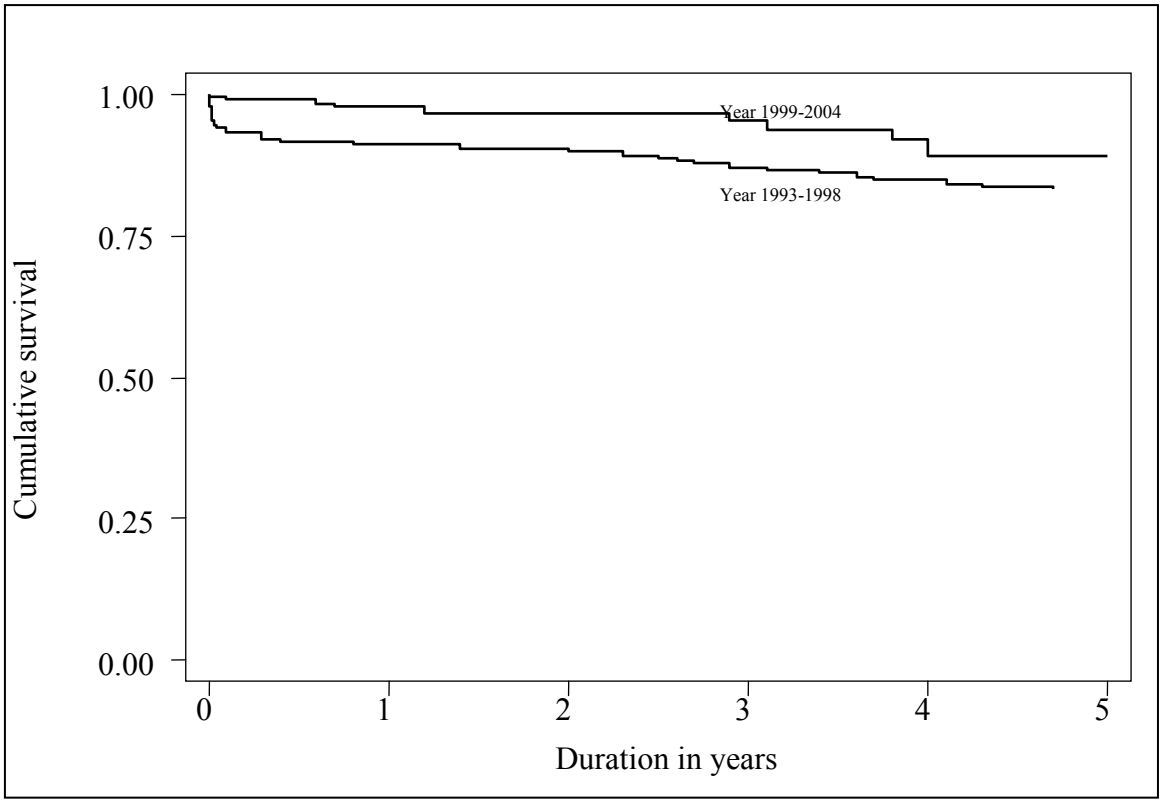
We found that patient survival rate for living related donor renal transplants has remained excellent and unchanged for these two cohorts (Figure 5.4.9).

Table 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004)

Year of Transplant	1993-1998		1999-2004	
Interval (years)	% Survival	SE	% Survival	SE
1	91	2	98	1
3	87	2	96	2
5	83	3	89	3

SE=standard error

Figure 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004)



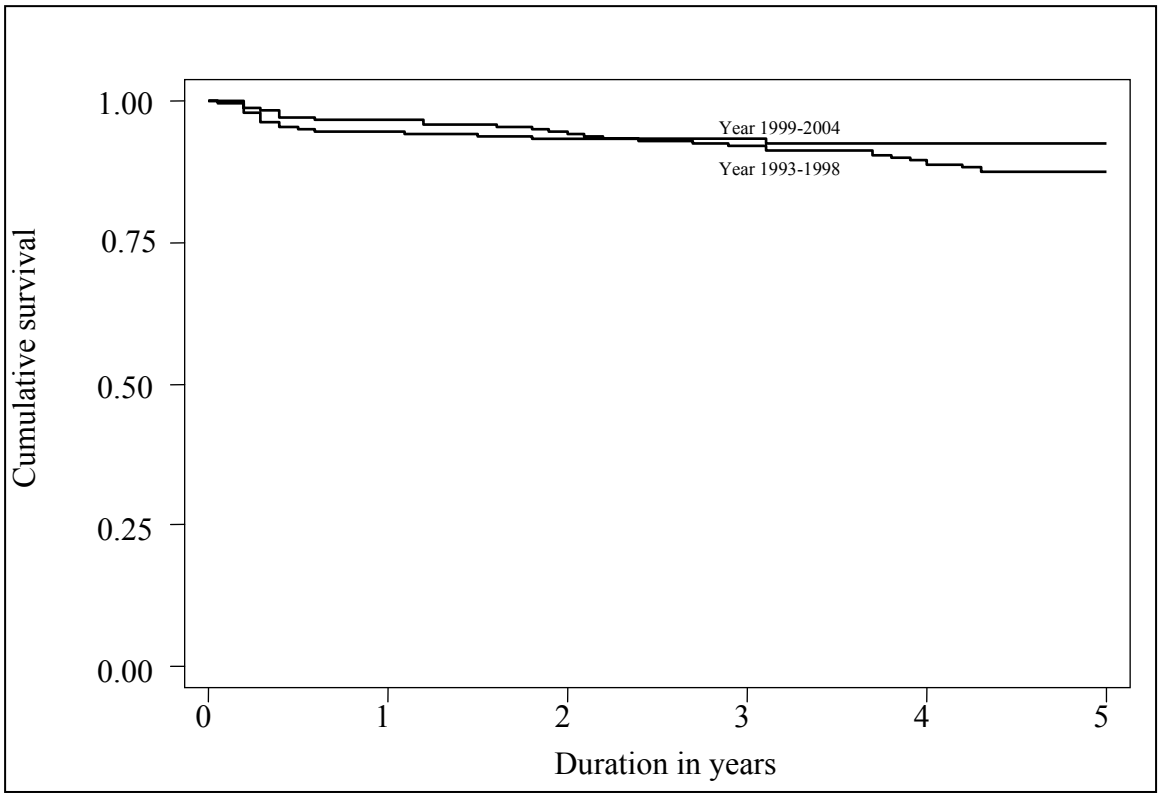
However, the risk of graft failure for living related donor renal transplantation improved for the 1999-2004 cohort compared to the 1993-1998 cohort (Table & Figure 5.4.10). One possible explanation, among others, is the increasing use of newer immunosuppressive agents such as MMF and FK506 in recent years. Therefore, there is a need to determine the effect of exposure to the newer immunosuppressive agents on graft survival.

Table 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2004)

Year of Transplant	1993-1998		1999-2004	
Interval (years)	% Survival	SE	% Survival	SE
1	94	1	96	1
3	92	2	93	1
5	87	2	92	1

SE=standard error

Figure 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2004)



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 1999-2004 cohorts (Figure 5.4.11 and 5.4.12).

Table 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2004)

Year of Transplant	1993-1998		1999-2004	
Interval (years)	% Survival	SE	% Survival	SE
1	98	1	99	1
3	97	1	97	1
5	92	2	95	2

SE=standard error

Figure 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2004)

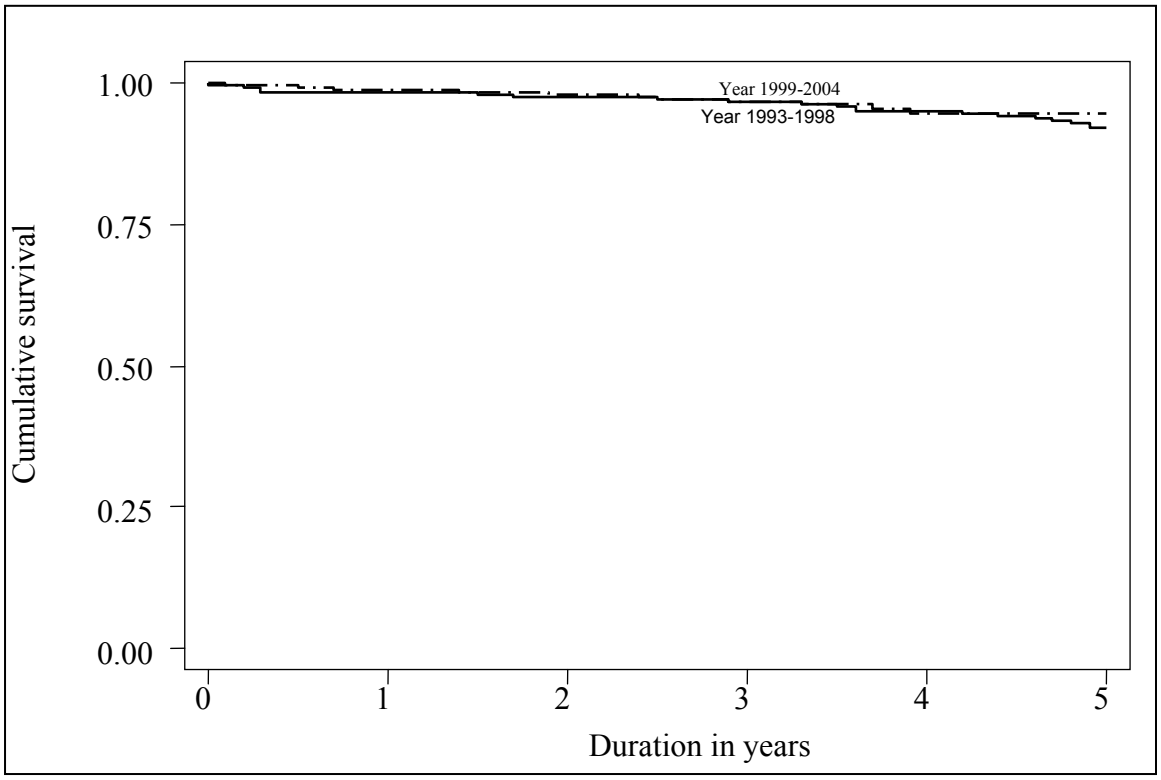


Figure 5.4.7: Patient survival by type of transplant, 1993-2004

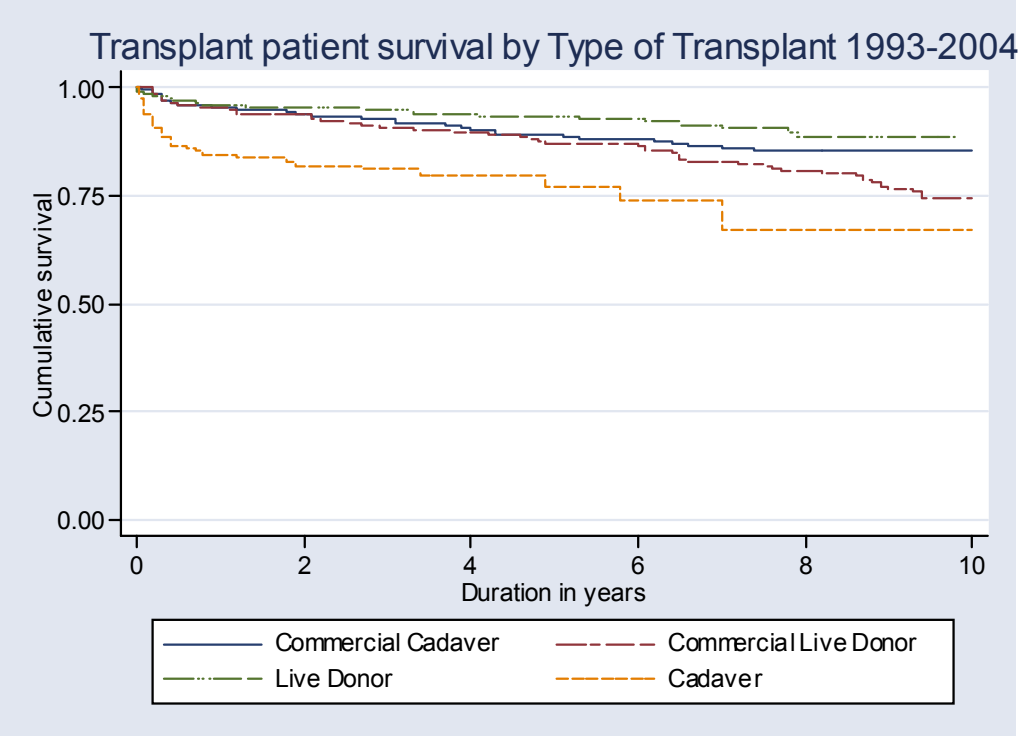


Figure 5.4.8: Graft survival by type of transplant, 1993-2004

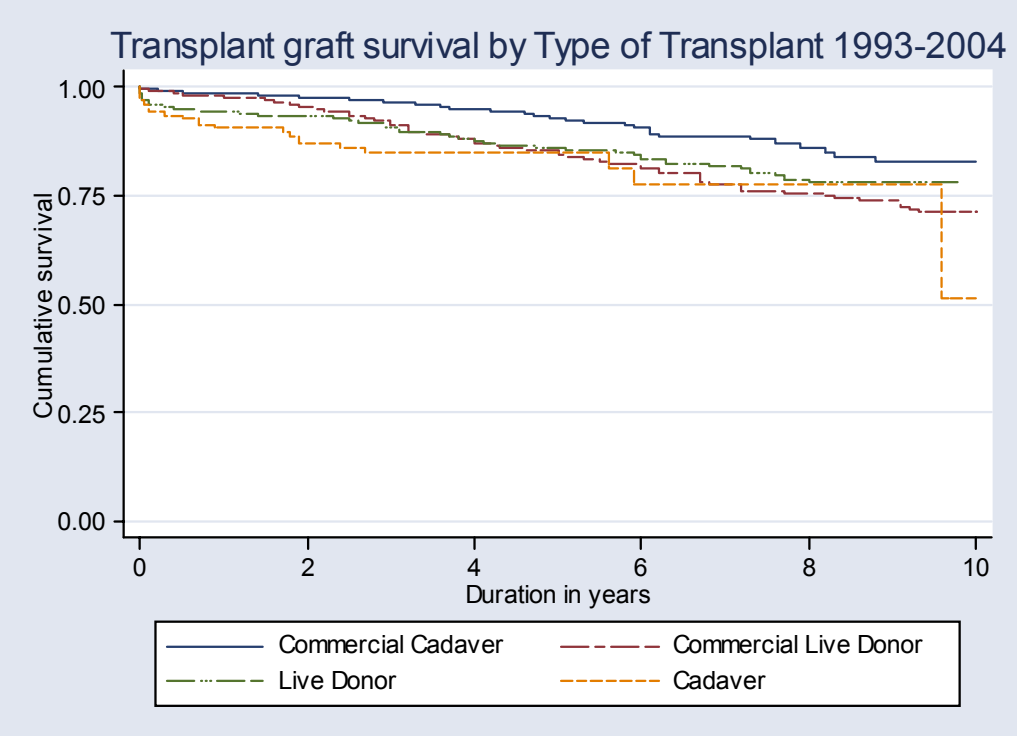


Figure 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)

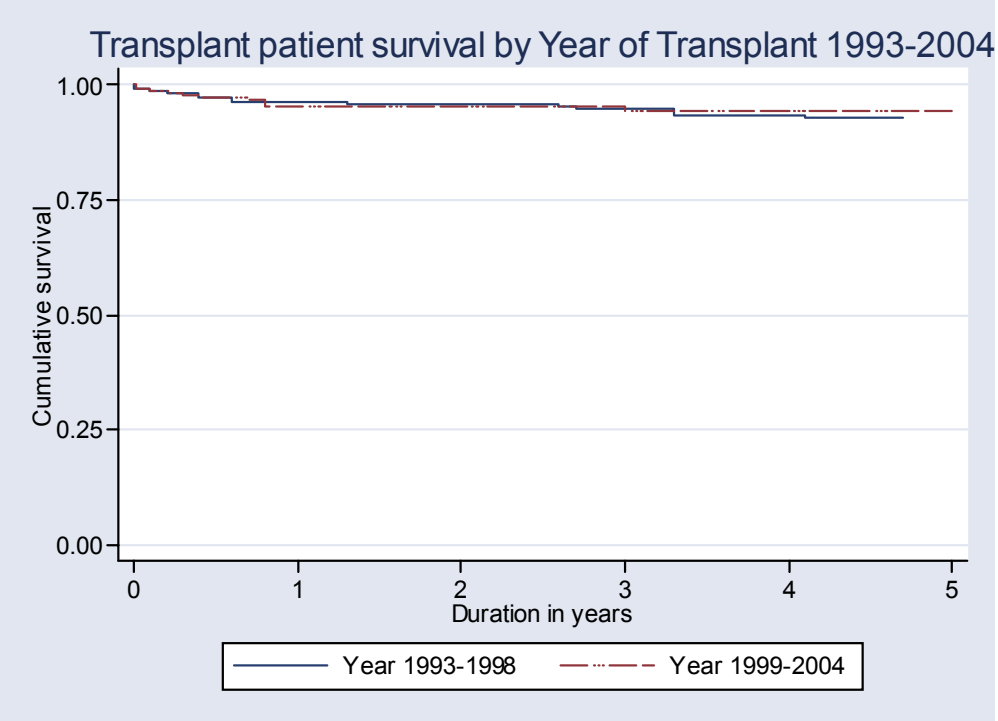
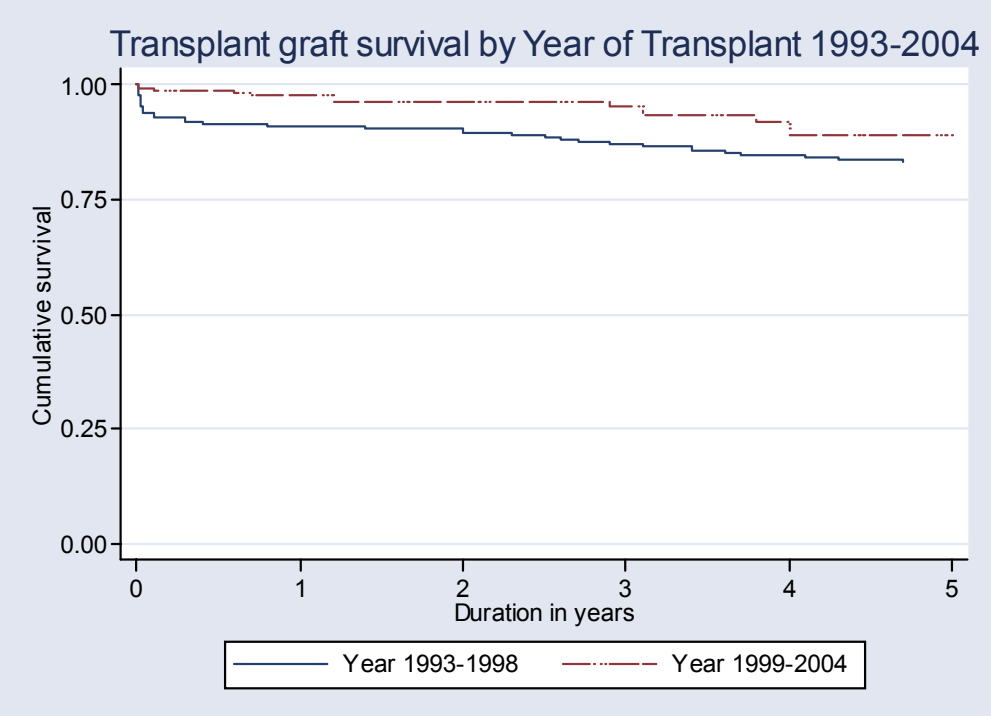


Figure 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004)



CHAPTER 6

HOMOGRAFT - HEART VALVE TRANSPLANTATION

Editor:
Mr. Hamdan Leman

Contents

List of Tables

List of Figures

6.0 INTRODUCTION

The use of cardiovascular tissue homografts has become routine especially in paediatric cardiac surgery. These homografts have been successfully implanted as biological conduit prostheses during operations to repair congenital heart defects. Part of the reason for the increasing demand for these homografts with or without valves is because of its recognised inherent value, such as superior perfusion parameters, durability of conducting performance, ease of handling during implantation and the reduced risk of thrombo-embolic phenomena. Its use will remove the need for postoperative anticoagulation therapy. This is particularly essential in children, women of childbearing age and other patients in whom anticoagulation is contraindicated. Allograft implantation i.e. implantation of tissues of the same species is also preferred in an environment where sepsis is of concern. Allografts have an inherent resistance to infection as compared to non-biological prostheses.

In a response to the rising demand for homograft implantation that corresponds to a growing paediatric cardiac practice, Institut Jantung Negara (IJN) has embarked on establishing a cardiovascular tissue bank in 1995. The rising cost of imported homografts has further supported the establishment of the tissue bank within the institution. IJN has successfully retrieved and prepared cardiac homografts that have been implanted in more than a hundred patients.

The homograft unit at IJN comprises of surgeons and medical technicians involved in retrieving, processing and cryopreserving cardiovascular tissue for storage. The main issue remains the unresolved shortage of donors. This is despite continued efforts and steps taken to streamline the organisational structure for organ donation, build an efficient network system and improve public and medical staff awareness. With an anticipated increase in demand for homografts in the coming years and our country's hopes of attaining self-sufficiency it is important that this problem is given its due consideration.

6.1 STOCK AND FLOW

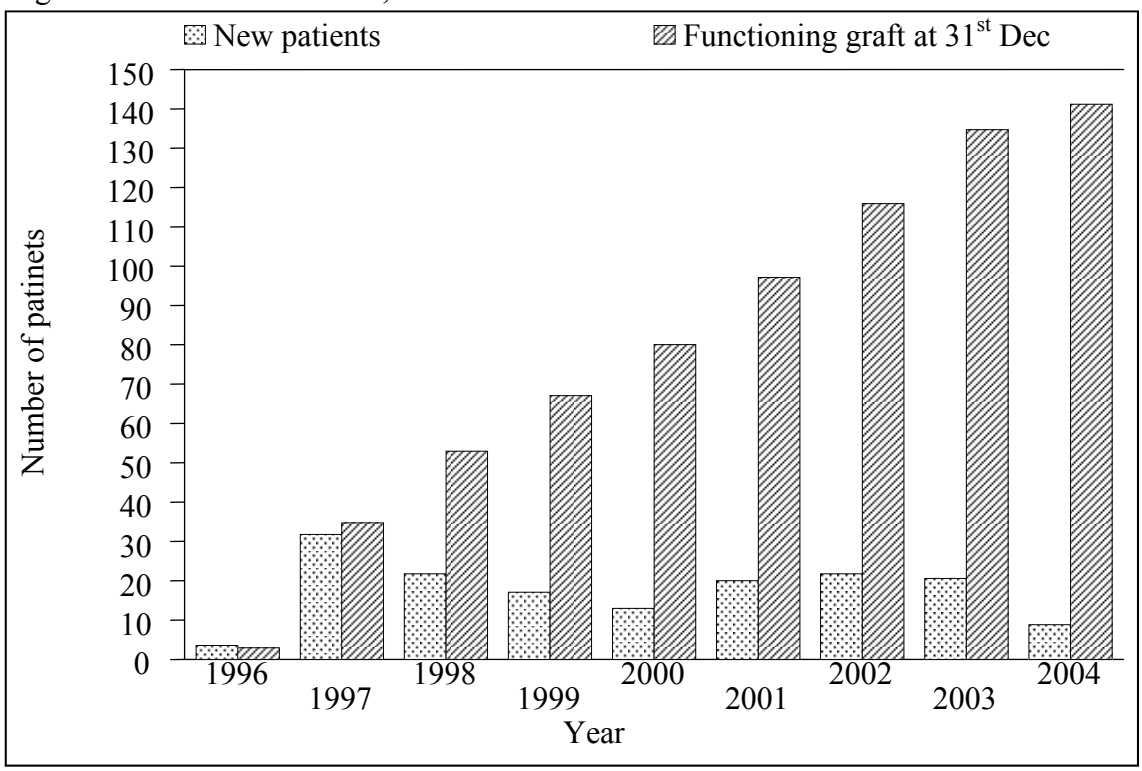
Out of 160 patients receiving a homograft 141 patients survived the procedure (survival 141/160). The highest number of tissue retrieval was in 1997 (32 pieces). Over the years 2001 to 2003 retrieval was averaging 20 pieces a year, but in the year 2004 only 9 pieces of homograft have been retrieved.

Table 6.1.1: Stock and Flow, 1996-2004

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

*based on year of death

Figure 6.1.1: Stock and Flow, 1996-2004



6.2 RECIPIENTS' CHARACTERISTICS

In the recipient population, there was an equal gender distribution (male:female ratio 81:79) (Table 6.2.1) and Malays (97/160) constituted more than half of the recipients (Table 6.2.2). The majority of recipients were in the age group of 0 to 9 years old (90/160) followed by 10 to 19 years (52/160) and >20 years of age (18/160) (Table 6.2.3).

Table 6.2.1: Gender distribution, 1996-2004

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Gender	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Male	2	19	9	9	10	6	9	14	3	81
Female	2	13	13	8	3	14	13	7	6	79
TOTAL	4	32	22	17	13	20	22	21	9	160

Figure 6.2.1: Gender distribution, 1996-2004

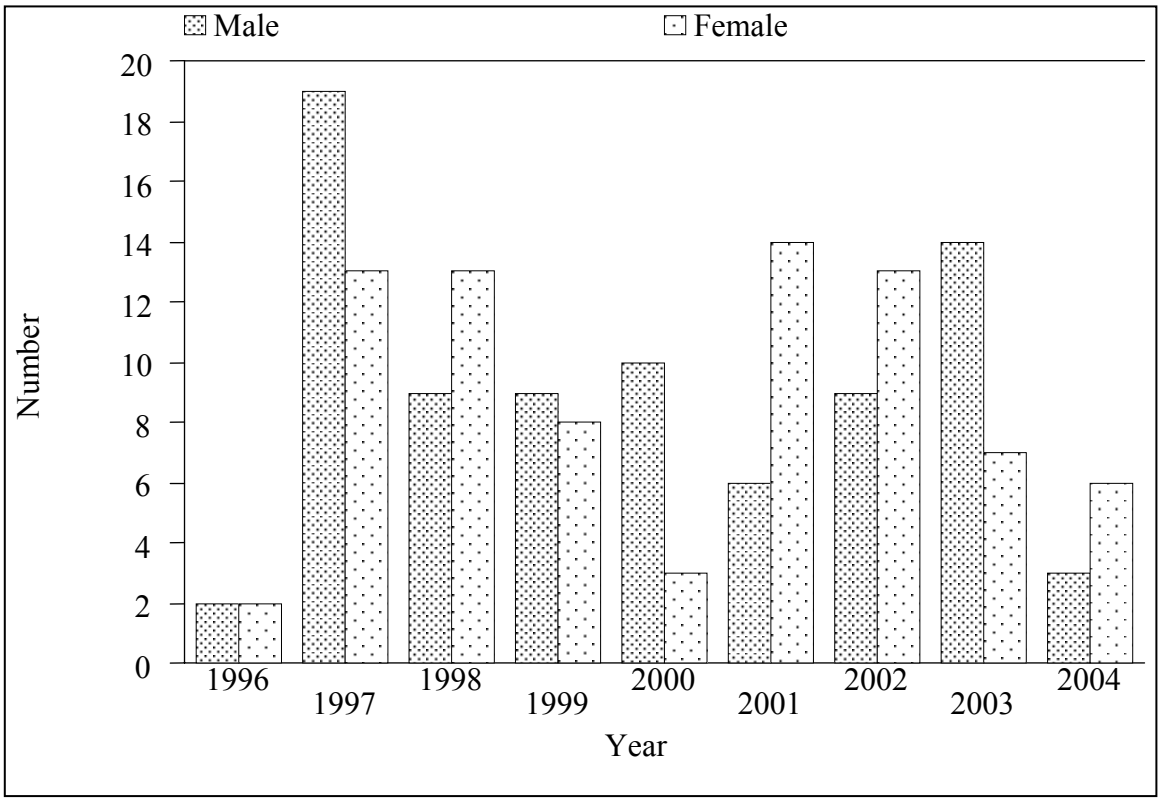


Table 6.2.2: Ethnic group distribution, 1996-2004

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Ethnic group	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Malay	1	19	15	9	9	10	16	12	6	97
Chinese	3	11	4	3	2	9	4	6	1	43
Indian	0	2	2	2	0	1	2	2	1	12
Others	0	0	1	3	2	0	0	1	1	8
TOTAL	4	32	22	17	13	20	22	21	9	160

Figure 6.2.2: Ethnic group distribution, 1996-2004

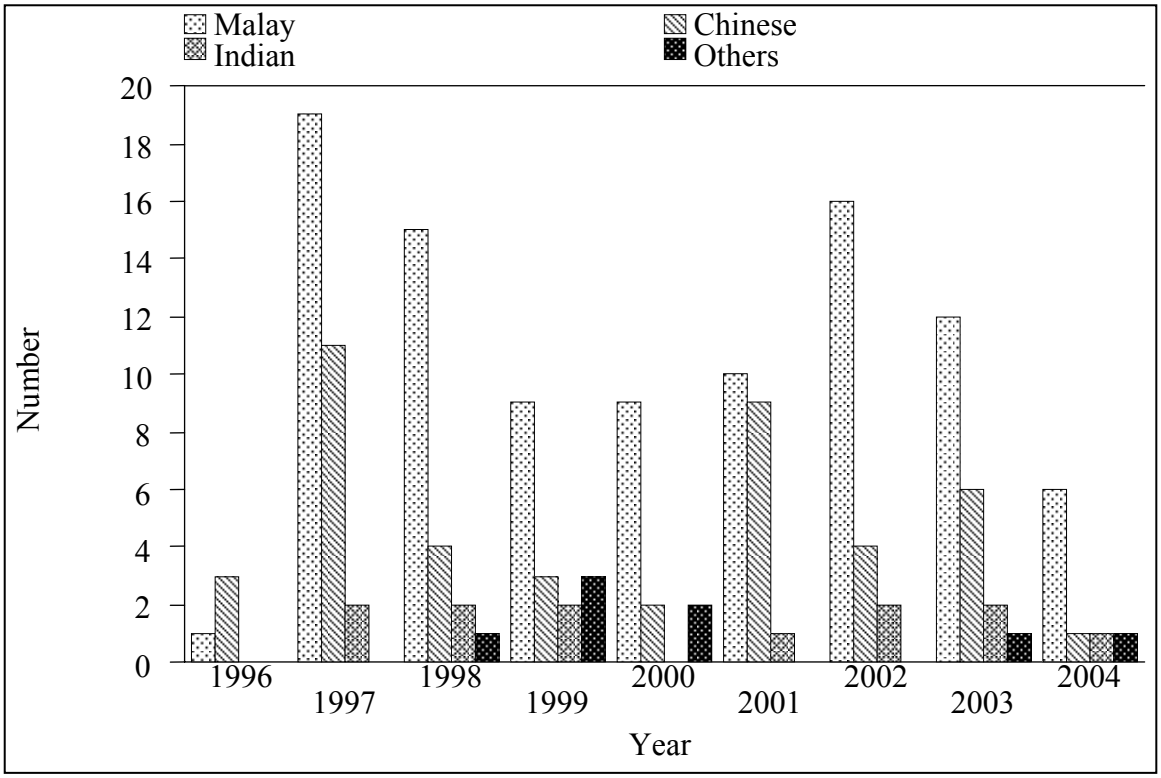
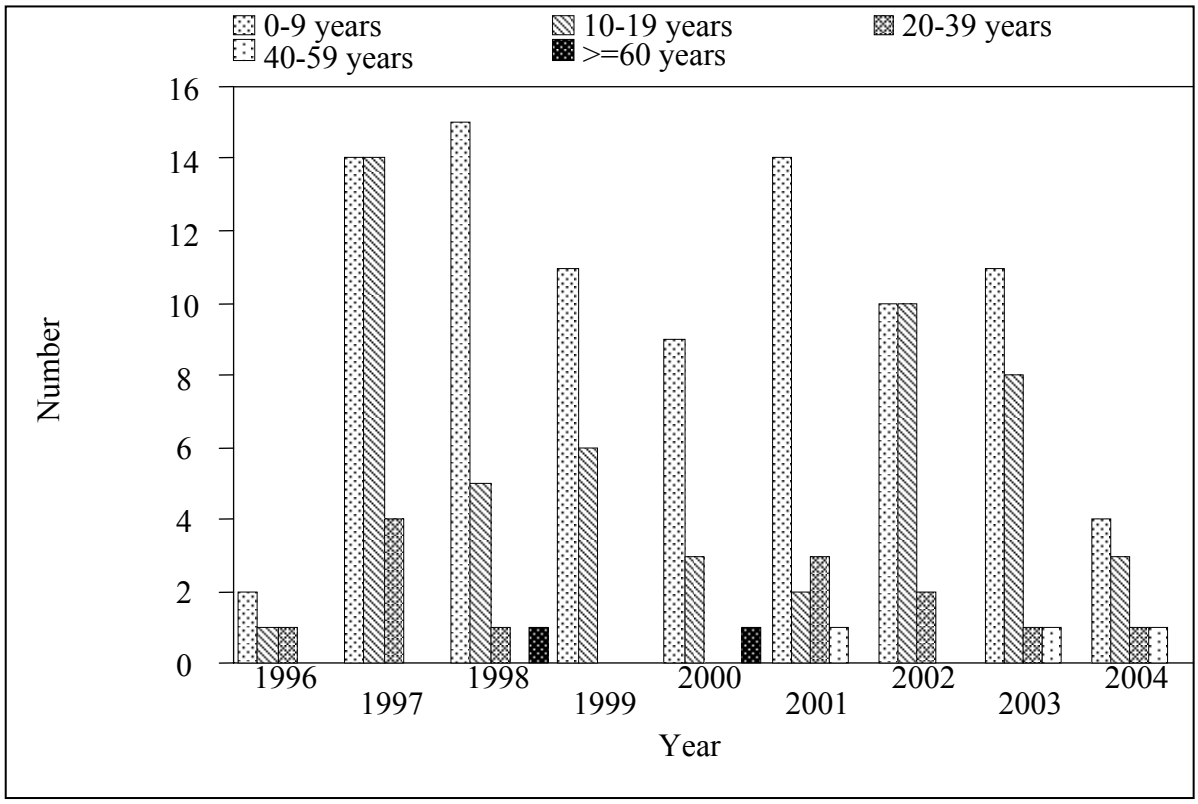


Table 6.2.3: Age distribution in years, 1996-2004

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL
Age group (years)	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
0-9	2	14	15	11	9	14	10	11	4	90
10-19	1	14	5	6	3	2	10	8	3	52
20-39	1	4	1	0	0	3	2	1	1	13
40-59	0	0	0	0	0	1	0	1	1	3
>=60	0	0	1	0	1	0	0	0	0	2
TOTAL	4	32	22	17	13	20	22	21	9	160
Mean	12	12	11	7	13	11	10	12	15	11
SD	7	7	15	4	17	14	6	11	11	11
Median	11	11	8	7	9	5	10	9	10	9
Minimum	5	3 months	3 months	1	2	6 months	3	2	5	3 months
Maximum	21	30	70	17	67	53	28	53	42	70

*Age=date of implantation – date of birth

Figure 6.2.3: Age distribution in years, 1996-2004



6.3 TRANSPLANT PRACTICES

6.3.1 Donor details

A total of 160 cardiovascular homograft implantations had been carried out, 81 aortic and 79 pulmonary, according to tissue of origin, from 1996 till the end of 2004.

Table 6.3.1: Number of valves harvested by type of homograft, 1996-2004

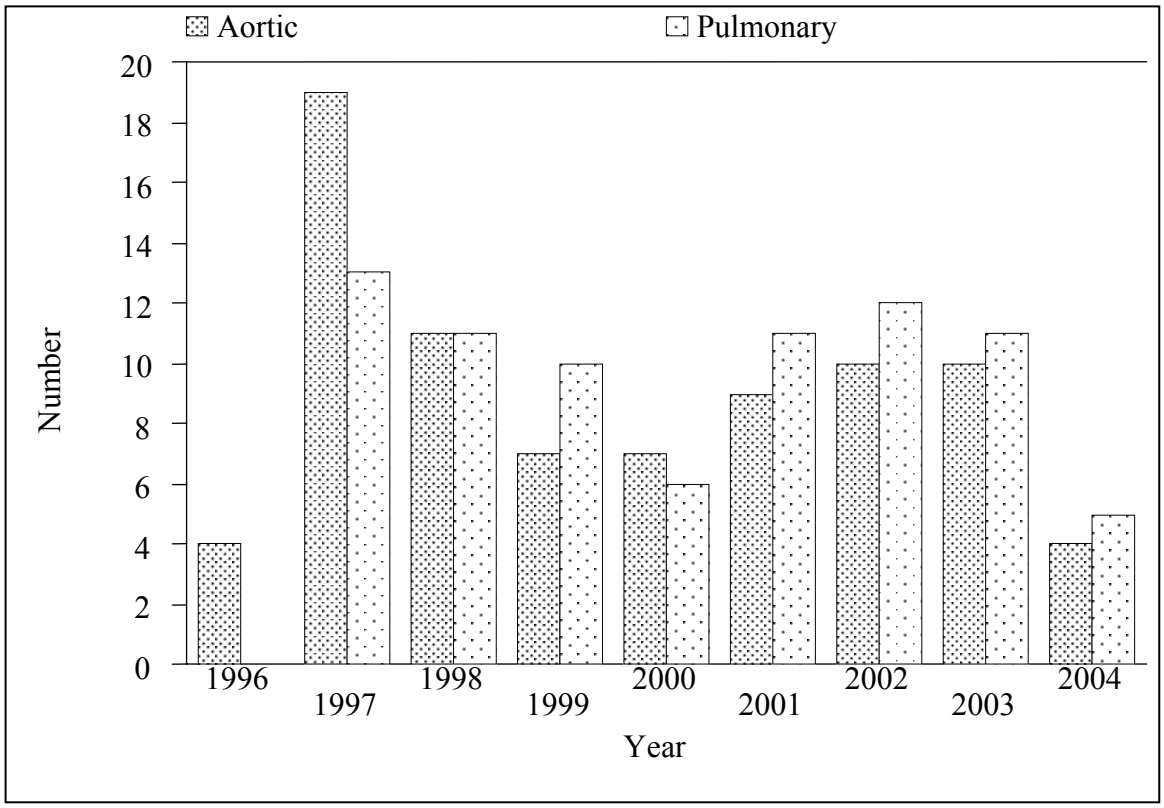
Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Type of homograft	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aortic	8	17	10	8	11	14	10	7	2	87
Pulmonary	1	14	11	10	12	12	14	8	4	86
TOTAL	9	31	21	18	23	26	24	15	6	173

6.3.2 Transplant details

Table 6.3.2: Type of transplant, 1996-2004

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**TOTAL**
Type of transplant	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aortic	4	19	11	7	7	9	10	10	4	81
Pulmonary	0	13	11	10	6	11	12	11	5	79
TOTAL	4	32	22	17	13	20	22	21	9	160

Figure 6.3.2: Type of transplant, 1996-2004



6.4 TRANSPLANT OUTCOMES

Table 6.4.1: Patient survival by gender, 1996-2004

Gender	**Male**		**Female**	
Interval (years)	% Survival	SE	% Survival	SE
1	91	3	89	4
3	89	4	86	4
5	89	4	86	4

SE=standard error

Figure 6.4.1: Patient survival by gender, 1996-2004

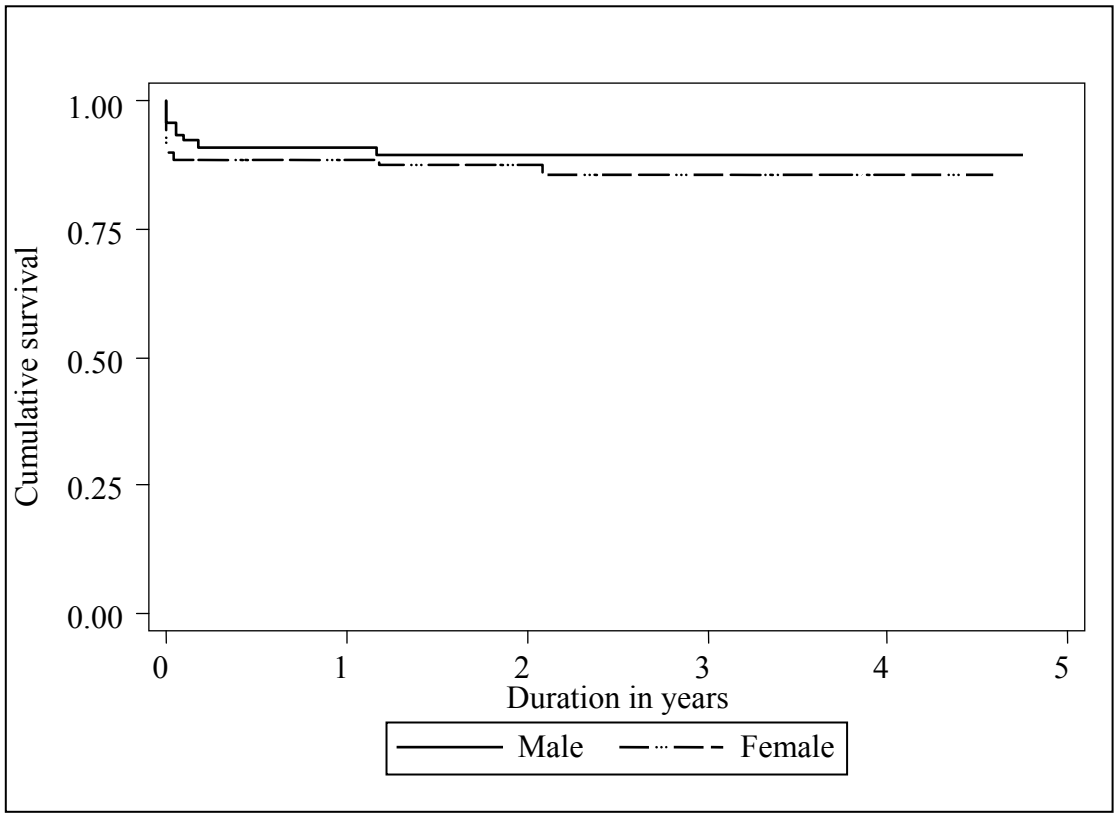


Table 6.4.2: Patient survival by age group, 1996-2004

Age group	**0-9 years**		**10-19 years**		**>=20 years**	
Interval (months)	% Survival	SE	% Survival	SE	% Survival	SE
1	86	4	96	3	94	5
3	84	4	92	4	94	5
5	84	4	92	4	94	5

SE=standard error

Figure 6.4.2: Patient survival by age group, 1996-2004

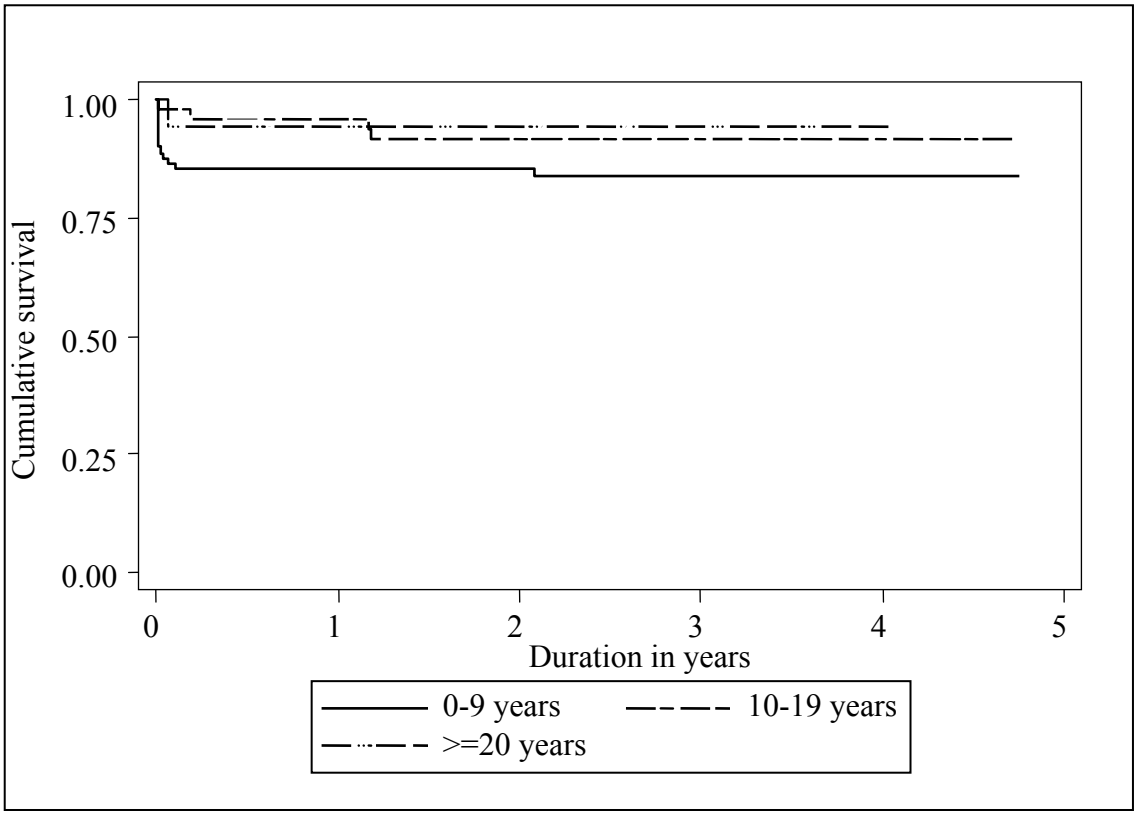
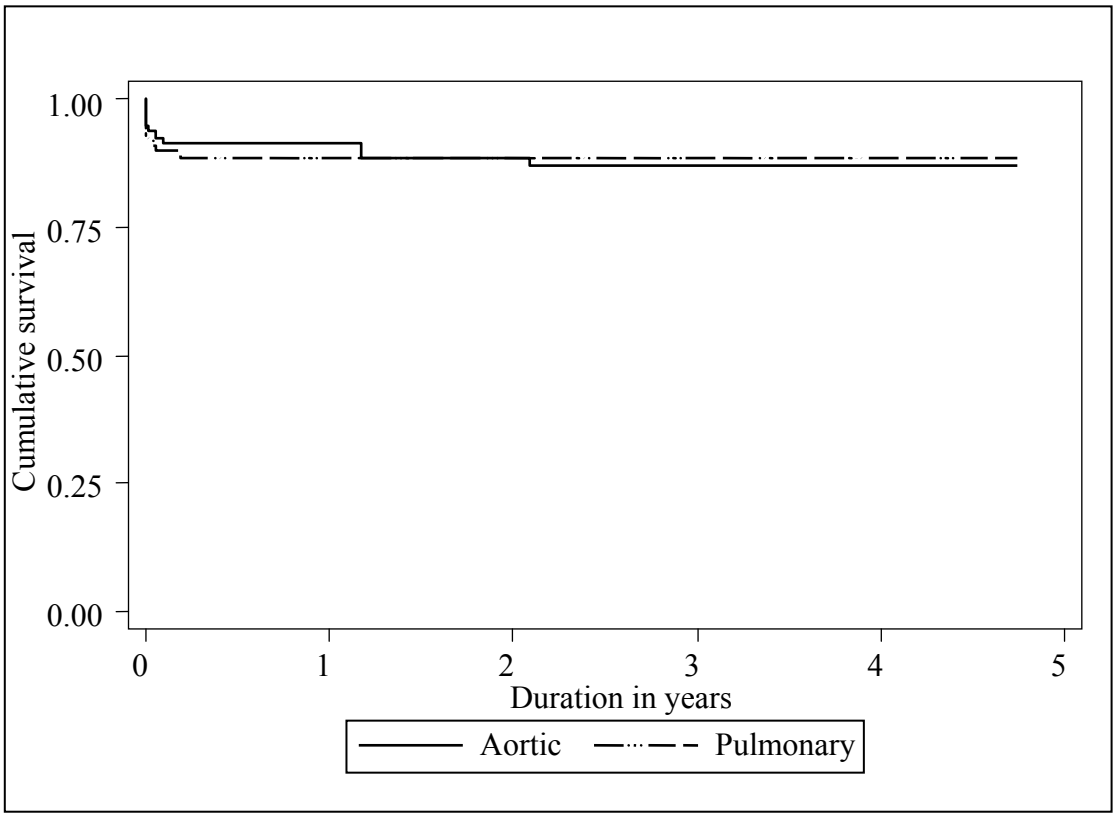


Table 6.4.3: Patient survival by type of homograft, 1996-2004

Type of homograft	**Aortic**		**Pulmonary**	
Interval (years)	% Survival	SE	% Survival	SE
1	91	3	89	4
3	87	4	89	4
5	87	4	89	4

SE=standard error

Figure 6.4.3: Patient survival by type of homograft, 1996-2004



CHAPTER 7

BONE AND TISSUE TRANSPLANTATION

Editor:
Dr. Suzina Sheikh Ab Hamid

Expert Panel:
Prof. Dr. Zulmi Wan (Chairman)
Prof. Dr. Abdul Rani Samsudin
Dr. Badrul Shah Badaruddin
Dato' Dr. Hasim Mohamad
Dr. Norimah Yusof
Dr. Robert Penafort

Contents

List of Tables

7.0 INTRODUCTION

Treating diseased bone is an important issue in Malaysia. Bony defects occur at various parts of the body due to multiple causes and need to be repaired accordingly. Massive allografts are being increasingly used for reconstruction of skeletal defects following tumour resection. Bone granules implantation into tooth extraction socket helps in preserving the height of the alveolar bone. Thus, the need of a Tissue & Bone Bank is becoming obvious as there is advancement in surgical technology in the country.

The National Tissue Bank, School of Medical Sciences, was established in July 1991 at Universiti Sains Malaysia (USM), Health Campus, Kelantan. The university with the co-operation of the Malaysian Institute for Nuclear Technology Research (MINT) and International Atomic Energy Agency (IAEA) has formed a Tissue Bank that is capable of producing tissue grafts for the country. Besides providing deep-frozen bone allografts, the National Tissue Bank also produces freeze-dried bone allografts and amniotic membranes. Amniotic membrane acts as a biological wound dressing in the management of burns, skin laceration and ulcer and corneal ulcer.

The National Tissue Bank produces safe and high quality tissue grafts for clinical use in patients. It conducts screening and tissue processing based on Good Manufacturing Practice principles and was awarded Quality Management System MS ISO 9001:2000 in March 2005.

Besides the National Tissue Bank there are two other bone banks in the country: Bone Bank Hospital Kuala Lumpur (HKL) which was established in 1993 and Bone Bank University Malaya Medical Centre (UMMC) which was established in 2004. Both bone banks supply deep-frozen bone allografts to various hospitals in the country.

This section is on Bone and Tissue allografts supplied by the Tissue and Bone Banks in Malaysia. However data on recipients of bone and tissues is still lacking.

The results shown below reveal that the banks are capable of processing and providing various types of tissue/bone to government and private hospitals throughout the country. These tissue/ bone banks have actively embarked on these activities since 1996.

However, it does not reflect the complete scenario on tissue and bone transplantation due to the limited information available. The number of tissue/bone supplied by these banks depends on the availability of tissues procured/obtained and not on their level of participation in providing tissues. Obviously the number of patients requiring tissue and bone transplantation exceeds the number of tissue/bone available.

7.1 STOCK OF BONE AND AMNIOTIC MEMBRANE ALLOGRAFTS

Table 7.1: No. (pieces) of bone and amniotic membrane allografts distributed by National Tissue Bank, USM from 1996-2003

	Year							
Types of Tissue/Bone	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Deep-Frozen Allograft -Femur -Femoral head -Humerus -Tibia -Radius -Patella tendon	-	-	15	52	82	55	82	116
Freeze-Dried Bone Allograft -Cancellous Chip -Cortical ring/plate -Cortico-cancellous	-	-	69	74	56	48	42	36
Amniotic membrane -Air-dried -Glycerol preserved	432	300	640	755	1250	800	1132	1020

Table 7.2: The types of tissue/bone allografts supplied by Tissue/Bone Banks in 2004

	Tissue/Bone Bank		
Types of Tissue/Bone Allograft	National Tissue Bank, USM	Bone Bank, HKL	Bone Bank, UMMC
	No. (pieces)	No. (pieces)	No. (pieces)
DF Knee slices	1	0	0
DF Femur	9	0	1
DF Femoral head	50	0	0
DF Humerus	1	0	0
DF Tibia	6	3	0
DF Radius	1	0	0
DF Patella tendon	2	1	0
DF Fibula	2	1	0
FD Cancellous	17	0	0
FD Cortical	2	0	0
FD Cortico-cancellous	10	0	0
FD Cortex	1	0	0
Amniotic membranes	1128	0	0
TOTAL	**1230**	**5**	**1**

DF – Deep-frozen
FD – Freeze-dried

7.2 HOSPITALS WHERE TISSUES ARE UTILISED

Table 7.3: The names of hospitals/other sectors using bone allografts in 2004

	Tissue/Bone Bank		
	National Tissue Bank, USM	Bone Bank, HKL	Bone Bank, UMMC
	No. (pieces)	No. (pieces)	No. (pieces)
MOH			
Hospital Kuala Lumpur	0	4	0
Hospital Pulau Pinang	5	0	0
Hospital Kota Bahru	5	1	0
Hospital Melaka	1	0	0
Hospital Seremban	2	0	0
Hospital Sarawak	4	0	0
Hospital Sultanah Aminah, Johor Bahru	9	0	0
Hospital Alor Star	1	0	0
TOTAL	**27**	**5**	**0**
University			
HUKM	3	0	0
HUSM	39	0	0
UMMC	9	0	1
TOTAL	**51**	**0**	**1**
Private and other sectors			
Hospital Fatimah, Ipoh	1	0	0
Sri Kota Medical Centre, Klang	2	0	0
Zimmer	9	0	0
Stryker	2	0	0
Jasa Dental Surgery, Kuala Lumpur	10	0	0
TOTAL	**24**	**0**	**0**

Table 7.4: The names of hospitals/other sectors using amniotic membranes in 2004

	Tissue/Bone Bank
	National Tissue Bank, USM
	No. (pieces)
MOH	
Hospital Kuala Lumpur	22
Hospital Sarawak, Kuching	6
Hospital Melaka	5
Hospital Tengku Ampuan Rahimah, Klang	4
Hospital Sultanah Aminah, Johor Bahru	73
Hospital Tengku Ampuan Afzan, Kuantan	6
TOTAL	**116**
University	
HUSM (Phamacy)	1001
UMMC	5
HUKM	4
TOTAL	**1010**
Private	
Gleneagles Medical Centre, Penang	2
TOTAL	**2**

*Only National Tissue Bank, USM supplied the amniotic membrane

CADAVERIC ORGAN AND TISSUE DONATION

Introduction

The first cadaveric organ donation in Malaysia took place on 1st June 1976 and involved kidneys only. Over the following 20 years, the number of cadaveric organ (mainly kidneys) and tissue (mainly cornea) donations were few and far between and these were managed on an ad hoc basis by the recipient transplant teams. Although there were ample data regarding the subsequent transplantation and the recipients, not much data was available pertaining to these cadaveric donors.

In 1999, Tissue Organ Procurement (TOP) teams were established in 16 MOH hospitals to facilitate the management of the cadaveric organ and tissue donation in the respective hospitals. Since then, TOP teams have also been set up in other MOH hospitals and some university and private hospitals. The setting up of these donor procurement teams saw a three to four fold rise in the number of annual cadaveric donations in the subsequent years.

The National Transplant Procurement Management Unit was set up in 2001. This unit comprises of full time transplant coordinators and is responsible for the central coordination for the management of the cadaveric donor and the procurement of the organs and tissues throughout the country. They work in close liaison with the local TOP teams who manage the donor at hospital level, the recipient transplant teams and the organ/tissue retrieval teams. The unit arranges the logistics of transporting the retrieval teams to the donor and bringing back the organs/tissues to the respective centres for transplantation. It is also responsible for the promotion and central registration of donor pledges as well as the training of hospital staff and increasing awareness of the public and hospital personnel about organ donation. Standard operating procedures (SOPs) and workflows for organ and tissue donation were put into place and better data collection and recording of the cadaveric donation were obtained.

List of Tables

Table A1: Number of procurement by year, 1997-2004

	Number of procurement by year Total=124							
Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Number of donors	5	7	4	13	24	30	25	16
Rate of procurement (per million population)	0.25	0.34	0.19	0.59	1.07	1.31	1.07	0.67
Organs procured								
Cornea	4	10	6	18	34	48	40	20
Heart	1	3	2	3	4	-	2	-
Liver	-	-	2	1	1	2	1	3
Kidney	8	10	6	22	38	25	16	18
Heart valve	-	1	2	8	11	11	10	10
Bone	-	1	-	3	2	6	5	5
Skin	-	-	-	2	2	3	-	1

Table A2: Donor's age, 1997-2004

Donor's age	**Total=124 No. (%)**
Age group, (years)	
<1	1 (0.81)
1-9	6 (4.84)
10-19	22 (17.74)
20-29	26 (20.97)
30-39	11 (8.87)
40-49	23 (18.55)
50-59	21 (16.94)
60-69	7 (5.65)
70-79	6 (4.84)
No data	1 (0.81)
Mean	35.81
SD	18.83
Median	35.00
Minimum*	<1
Maximum**	79.00

*The youngest 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 79 years old (donated eyes); the oldest organ donor was 65 years old (donated kidneys)

Table A3: Donor's gender, 1997-2004

Donor's gender	**Total=124 No. (%)**
Gender	
Male	104 (83.87)
Female	20 (16.13)

Table A4: Donor's ethnic group, 1997-2004

Donor's ethnic group	**Total=124 No. (%)**
Ethnic group	
Malay	5 (4.03)
Chinese	76 (61.29)
Indian	36 (29.03)
Others*	7 (5.65)

*This included one Orang Asli donor

Table A5: Donor's religion, 1997-2004

Donor's religion	**Total=124 No. (%)**
Religion	
Islam	7 (5.65)
Buddhism	41 (33.06)
Hinduism	31 (25.00)
Christianity	3 (2.42)
Unknown*	42 (33.87)

*For 42 Chinese donors the religion was not stated

Table A6: Donor's nationality, 1997-2004

Donor's nationality	**Total=124 No. (%)**
Nationality	
Malaysian	119 (95.97)
Non-Malaysian	5 (4.03)

Table A7: Donor's state of residence, 1997-2004

Donor's state of residence*	**Total=124 No. (%)**
State of residence	
Johor	9 (7.26)
Malacca	5 (4.03)
Negeri Sembilan	7 (5.65)
Selangor	27 (21.77)
Kuala Lumpur	14 (11.29)
Putrajaya	1 (0.81)
Perak	13 (10.48)
Kedah	7 (5.65)
Perlis	0 (0)
Pulau Pinang	10 (8.06)
Pahang	8 (6.45)
Terengganu	1 (0.81)
Kelantan	1 (0.81)
Sabah	5 (4.03)
Sarawak	0 (0)
Labuan	0 (0)
Unknown	16 (12.90)

*State of residence according to home address

Table A8: Donor status, 1997-2004

Donor status	**Total=124 No. (%)**
Status of donor	
Pledged	13 (10.48)
Non-pledged	111 (89.52)

Table A9: Type of donors, 1997-2004

Type of donors	**Total=124 No. (%)**
Brain dead	80 (64.52)
Cadaveric tissue donor*	44 (35.48)

*Post cardiac death, cadaveric tissue donors can only donate tissues such as corneas, heart valves, bone and skin

Table A10: Causes of death, 1997-2004

Causes of death	**Brain dead organ donors Total=80 No. (%)**	**Cadaveric tissue donors Total=44 No. (%)**	**Total=124 No. (%)**
Injury from MVA	45 (56.25)	16 (36.36)	61 (49.19)
Injury from fall	5 (6.25)	0 (0)	5 (4.03)
Injury from assault	3 (3.75)	1 (2.27)	4 (3.23)
Injury from industrial accident	1 (1.25)	0 (0)	1 (0.81)
Spontaneous hypertensive intracranial bleed	10 (12.5)	4 (9.09)	14 (11.29)
Spontaneous AVM/ Aneurysm intracranial bleed	7 (8.75)	1 (2.27)	8 (6.45)
Brain anoxia	1 (1.25)	1 (2.27)	2 (1.61)
Brain tumour	2 (2.5)	0 (0)	2 (1.61)
Thromboembolic brain infarct	3 (3.75)	2 (4.55)	5 (4.03)
Cardiac disease	1 (1.25)	12 (27.27)	13 (10.48)
Drowning	0 (0)	1 (2.27)	1 (0.81)
Others	1 (1.26)	5 (11.36)	6 (4.84)
Unknown	1 (1.25)	1 (2.27)	2 (1.61)

Table A11: Blood group, 1997-2004

Blood group	**Total=124 No. (%)**
A positive	24 (19.35)
B positive	25 (20.16)
AB positive	3 (2.42)
O positive	39 (31.45)
Not available*	33 (26.61)

*Cadaveric donors who donated tissues only were not tested for blood group

Table A12: Transmissible infection screening on cadaveric donors, 1997-2004

Transmissible infection screening	**Total donor=124 Total screened=123***
HIV serology	
Non-reactive	123
Hepatitis B surface antigen	
Non-reactive	121
Reactive	2 **
Hepatitis B Core Antibody ***	
Non-reactive	5
Reactive	5
Hepatitis C status	
Non-reactive	122
Reactive	1****
VDRL status	
Non-reactive	123
Toxoplasma status *****	
Non-reactive	114
Reactive	8
CMV IgG status *****	
Non-reactive	104
Reactive	18

*Of 124 donors one cadaveric tissue donor could not be tested for serology as blood taken at the time of procurement was lysed; the tissues procured were not utilised for transplantation

**Kidneys from these donors were transplanted into HbsAg positive recipients

***Hepatitis B Core Antibody serology has been done since 2003 for potential cadaveric liver donors. Ten donors who were HbsAg negative were tested for Hepatitis B Core Antibody; 5 were found to be Core Antibody reactive. These 5 were further tested for Hbs Antibody and 3 were found to be reactive for Hbs Antibody indicating recovery from Hepatitis B infection with natural immunity

****One eye donor was found to be Hepatitis C Antibody reactive and the eyes that were procured were not utilised for transplantation

*****Cadaveric tissue donors were not tested for CMV or Toxoplasma serology if only corneas or heart valves were donated

Table A13: Procurement details, 1997-2004

Procurement details	**Total=124 No. (%)**
Type of institution where donor came from	
MOH state/general hospitals	80 (64.52)
MOH district hospitals	10 (8.06)
University hospitals	16 (12.90)
Private hospitals	16 (12.90)
Home	2 (1.61)
Location where donor was referred from	
ICU	57 (45.97)
Ward	5 (4.03)
Emergency department	8 (6.45)
Mortuary	12 (9.68)
Home	2 (1.61)
Not available	41 (33.06)
Location where procurement was done	
Operation theatre	76 (61.29)
Mortuary	41 (33.06)
Ward	5 (4.03)
Home*	2 (1.61)

*Procurement of organs and tissues from brain dead donors were carried out in the operation theatre, while multi-tissue procurement from cadaveric tissue donors was mainly done in the mortuary. Procurement in the ward and at home involved corneas only

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.

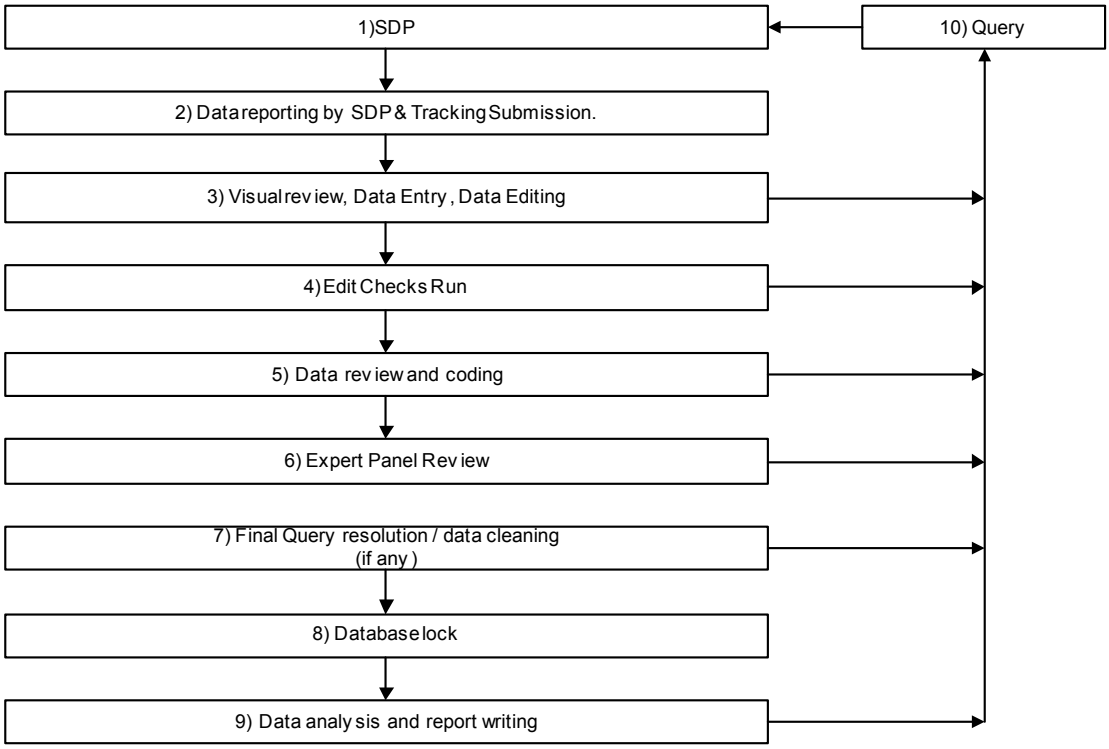
Data sources

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. All retrospective data until year 2003 was collected via Cornea Transplant Retrospective Notification forms.

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 CRC to track data submission and generate queries to site. All retrospective data was mapped and transferred to the current system.

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. As data for kidney transplant is inter-related with National Renal Registry's patient data, retrospective data was obtained from the National Renal Registry.

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.

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 first year of operation. As more data is accrued to its database over time, time trend analysis will be of interest in future.

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
CMV	Cytomegalovirus
CRC	Clinical Research Centre
CsA	Cyclosporin A
DIVC	Disseminated Intravascular Coagulopathy
ESRF	End Stage Renal Failure
FK506	Tacrolimus
GCT	Germ Cell Tumour
GMC	Gleneagles Medical Centre
GS	Gentamicin and Streptomycin
GVHD	Graft Versus Host Disease
Hb	Haemoglobin
HbsAg	Hepatitis B surface Antigen
HCV	Hepatitis C Virus
HIV	Human Immuno-deficiency Virus
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
IJN	Institut Jantung Negara (National Heart Institute)
IL2R	Interleukin 2 Receptor
IOL	Intraocular Lens
IT	Information Technology
KLA	HKL, Adult
KLP	HKL, Paediatric
LWE	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

NET	Neuroectodermal Tumour
NGO	Non-Governmental Organisation
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
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
VDRL	Venereal Disease Reference Laboratory
VOD	Veno-Occlusive Disease

DIRECTORY OF PARTICIPATING CENTRES 2004

Blood and Marrow Transplant Services

MOH

Hospital Kuala Lumpur
Haematology Department

Jalan Pahang
50586 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26155306
Fax :(03)26155310

Hospital Kuala Lumpur
Paediatrics BMT Unit, Institute Paediatrics

Jalan Pahang
50586 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26155555 Ext.: 6905
Fax :(03)26948187

PRIVATE

Gleneagles Medical Centre, Penang
Oncology-Haematology Department

Gleneagles Medical Centre
1, Jalan Pangkor
10050 Pulau Pinang
Pulau Pinang

Tel :(04)2202189
Fax :(04)2262994

Lam Wah Ee Hospital
Oncology-Haematology Department

Jalan Tan Sri Teh Ewe Lim
11600 Pulau Pinang
Pulau Pinang

Tel :(04)6571888 Ext.: 1136
Fax :(04)6570940

Subang Jaya Medical Centre
Haematology Department

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

Tel :(03)56341212
Fax :(03)56306209

Subang Jaya Medical Centre
Paediatrics BMT Unit

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

Tel :(03)56306361
Fax :(03)56306209

UNIVERSITY

Hospital Universiti Kebangsaan Malaysia
Maybank BMT Centre

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

Tel :(03)91702250
Fax :(03)91738255

University of Malaya Medical Centre
Division of Haematology, Department of Medicine

Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)79502741
Fax :(03)79557740

Blood and Marrow Transplant Services

UNIVERSITY

University of Malaya Medical Centre
Paediatric BMT Unit, Department of Paediatrics

Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan

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

Bone and Tissue Transplant Services

MOH

Hospital Alor Setar
Department of Orthopaedic Surgery

06550 Alor Setar
Kedah Darul Aman

Tel :(04)7303333 Ext.: 179
Fax :(04)7323770

Hospital Ipoh
Department of Orthopaedics

Jalan Hospital
30990 Ipoh
Perak Darul Ridzuan

Tel :(05)5222460
Fax :(05)2412826

Hospital Kajang
Orthopaedics Department

Jalan Semenyih
43000 Kajang
Selangor Darul Ehsan

Tel :(03)87363333

Hospital Kangar
Jabatan Ortopedik & Traumatologi

Jalan Kolam
01000 Kangar
Perlis Indera Kayangan

Tel :(04)9763333
Fax :(04)9767237

Hospital Kota Bharu
Department of Orthopaedics

Jalan Hospital
15590 Kota Bharu
Kelantan Darul Naim

Tel :(09)7485533 Ext.: 2374 / 2364
Fax :(09)7486951

Hospital Kota Bharu
Department of Surgery

Jalan Hospital
15590 Kota Bharu
Kelantan Darul Naim

Tel :(09) 7485533 Ext.: 2616 / 2226
Fax :(09) 7475418

Hospital Kuala Lumpur
Institute of Orthopaedic & Traumatology

Jalan Pahang
50586 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26155555 Ext.: 5543 / 5534
Fax :(03)26927281

Hospital Kuala Terengganu
Orthopaedic Department

Jalan Sultan Mahmud
20400 Kuala Terengganu
Terengganu Darul Iman

Tel :(09)6212121

Hospital Kuantan
Department of Orthopaedics

Jalan Tanah Puteh
25100 Kuantan
Pahang Darul Makmur

Tel :(09)5133333
Fax :(09)5142712

Hospital Pakar Sultanah Fatimah
Orthopaedics Department

Jalan Salleh
84000 Muar
Johor Darul Takzim

Tel :(06)9521901

Bone and Tissue Transplant Services

MOH

Hospital Pulau Pinang
Department of Orthopaedics

Penang Hospital
Jalan Residensi
10990 Pulau Pinang
Pulau Pinang

Tel :(04)2002127
Fax :(04)2002127

Hospital Seberang Jaya
Orthopaedics Department

Bandar Baru
13700 Seberang Jaya
Pulau Pinang

Tel :(04)3983333

Hospital Sultanah Aminah
Orthopaedics Department

80100 Johor Bahru
Johor Darul Takzim

Tel :(07)2231666

Hospital Taiping
Department of Orthopaedic Surgery

Jalan Taming Sari
34000 Taiping
Perak Darul Ridzuan

Tel :(05)8408037
Fax :(05)8073894

Hospital Tengku Ampuan Rahimah
Orthopaedic Clinic

41200 Klang
Selangor Darul Ehsan

Tel :(03)33723333 Ext.: 1225
Fax :(03)33729089

Hospital Umum Sarawak
Orthopaedic Department

93586 Kuching
Sarawak

Tel :(082)276433
Fax :(082)419495

PRIVATE

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

UNIVERSITY

Hospital Universiti Sains Malaysia
Orthopaedics Department

16150 Kota Bharu
Kelantan Darul Naim

Tel :(09) 7664509
Fax :(09) 7653370

Bone and Tissue Transplant Services

UNIVERSITY

International Islamic University Malaysia
Department of Orthopaedics, Traumatology and Rehabilitation

Kulliyah of Medicine
Jalan Hospital
25100 Kuantan
Pahang Darul Makmur

Tel :(09)5132797
Fax :(09)5151518

University of Malaya Medical Centre
Department of Orthopaedics Surgery

Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)79502061
Fax :(03)79535642

TISSUE BANK

Universiti Sains Malaysia
National Tissue Bank

Health Campus
16150 Kota Bharu
Kelantan Darul Naim

Tel :(09)7664344
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)26155534
Fax :(03)26927281

University of Malaya Medical Centre

Bank Tulang
Jabatan Surgeri Ortopedik
Pusat Perubatan Universiti Malaya
Lembah Pantai
59100 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)79502863
Fax :(03)79535642

IRRADIATION CENTRE

Malaysian Institute For Nuclear Technology Research

Kompleks MINT, Jalan Dengkil
Bangi
43000 Kajang
Selangor Darul Ehsan

Tel :(03)89250510
Fax :(03)89282956

Cornea Transplant Services

MOH

Hospital Alor Setar
Ophthalmology Department

05100 Alor Setar
Kedah Darul Aman

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

Hospital Batu Pahat
Ophthalmology Department

83000 Batu Pahat
Johor Darul Takzim

Tel :(07)4341999
Fax :(07)4322544

Hospital Bukit Mertajam
Ophthalmology Department

Jalan Kulim
14000 Bukit Mertajam
Pulau Pinang

Tel :(04)5383333 Ext.: 256 / 259
Fax :(04)5388435

Hospital Ipoh
Ophthalmology Department

Jalan Hospital
30990 Ipoh
Perak Darul Ridzuan

Tel :(05)5222034
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 Kota Bharu
Ophthalmology Department

Jalan Hospital
15586 Kota Bharu
Kelantan Darul Naim

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

Hospital Kuala Lipis
Ophthalmology Department

27200 Kuala Lipis
Pahang Darul Makmur

Tel :(09)3123333 Ext.: 114
Fax :(09)312 1787

Hospital Kuala Lumpur
Opthalmology Department

Jalan Pahang
50586 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26155555
Fax :(03)26925276

Hospital Kuala Pilah
Ophthalmology Department

72000 Kuala Pilah
Negeri Sembilan Darul Khusus

Tel :(06)4818001 Ext.: 170 / 175
Fax :(06)4818010

Cornea Transplant Services

MOH

Hospital Kuala Terengganu
Ophthalmology Department

Jalan Sultan Mahmud
20400 Kuala Terengganu
Terengganu Darul Iman

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

Hospital Melaka
Ophthalmology Department

Jalan Mufti Haji Khalil
75400 Melaka
Melaka

Tel :(06)2707215
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

Hospital Pulau Pinang
Eye Clinic

Jalan Residensi
10990 Georgetown
Pulau Pinang

Tel :(04)2002283
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
Fax :(088)252827

Hospital Sandakan (Duchess of Kent)
Ophthalmology Department

KM 3.2 Jalan Utara
90000 Sandakan
Sabah

Tel :(089)212111
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

Cornea Transplant Services

MOH

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 Sibu
Sarawak

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

Hospital Sultan Ismail
Opthalmology Department

Jalan Persiaran Mutiara Emas Utama
81100 Johor Bahru
Johor Darul Takzim

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

Hospital Sultanah Aminah
Ophthalmology Department

80100 Johor Bahru
Johor Darul Takzim

Tel :(07)2231666 Ext.: 2018
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
Opthalmology Department

25100 Kuantan
Pahang Darul Makmur

Tel :(09)5133333 Ext.: 2454
Fax :(09)5142712

Hospital Tengku Ampuan Rahimah
Opthalmology Department

Jalan Langat
41200 Klang
Selangor Darul Ehsan

Tel :(03)33723333 Ext.: 1336
Fax :(03)33729089

Cornea Transplant Services

MOH

Hospital Umum Sarawak
Opthalmology Department

Jalan Tun Ahmad Zaidi Adruce
93586 Kuching
Sarawak

Tel :(082)276513
Fax :(082)419495

ARMED FORCES

94 Hospital Angkatan Tentera Kem Terendak
Ophthalmology Department

76200 Melaka
Melaka

Tel :(06)3573201 Ext.: 1134
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
Fax :(03)42576112

Hospital Pantai Indah
Ophthalmology Department

Jalan Perubatan 1
Pandan Indah
55100 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)42892947
Fax :(03)42892926

Sri Kota Medical Centre
Ophthalmology Department

Jalan Mohet
41000 Klang
Selangor Darul Ehsan

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

Gleneagles Medical Centre, Penang
Ophthalmology Department

Pulau Pinang Clinic Sdn Bhd
1, Jalan Pangkor
10050 Pulau Pinang
Pulau Pinang

Tel :(04)2202127
Fax :(04)2272498

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

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

Cornea Transplant Services

PRIVATE

Tun Hussein Onn National Eye Hospital

Lorong Utara B
46200 Petaling Jaya
Selangor Darul Ehsan

Tel :(03)76561511
Fax :(03)79576128

UNIVERSITY

Hospital Universiti Kebangsaan Malaysia
Ophthalmology Department,
Faculty of Medicine

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

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

Hospital Universiti Sains Malaysia
Ophthalmology Department

16150 Kubang Kerian
Kelantan Darul Naim

Tel :(09)7664370
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
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
Fax :(03)40218807

Institute Jantung Negara
Cardiothoracic Department

145, Jalan Tun Razak
50400 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26178200
Fax :(03)26928418

Heart Valve Transplant Services

MOH

Institute Jantung Negara
Cardiovascular Tissue Bank
Department Of Cardiothoracic Surgery

145, Jalan Tun Razak
50400 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26178200
Fax :(03)26928418

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
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
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 Kota Bharu
Renal Transplant Clinic
c/o Haemodialysis Unit

15590 Kota Bharu
Kelantan Darul Naim

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

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

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

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

Tel :(06)2707648
Fax :(06)2841590

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

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

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

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

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

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

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

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

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 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

Kidney Transplant Services

MOH

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 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 Sibu
Renal Transplant Clinic
c/o Haemodialysis Unit
96000 Sibu
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
c/o Haemodialysis Unit
Paediatric Ward
80590 Johor Bahru
Johor Darul Takzim
Tel :(07)2257121
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

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

Kidney Transplant Services

MOH

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
Fax :(09)5164272

Hospital Tengku Ampuan Rahimah
Renal Transplant Clinic
c/o Haemodialysis Unit
Jalan Langat
41200 Kelang
Selangor Darul Ehsan

Tel :(03)33723333 Ext.: 1448 / 1411
Fax :(03)33729089

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

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

Kidney Transplant Services

PRIVATE

Gleneagles Intan Medical Centre KL

Suite 7.01, 7th Floor, Medical Office Building
282, Jalan Ampang
50450 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)42578822
Fax :(03)42523823

Tan Medical Renal Clinic

No. 41, Tingkat 1
Jalan 6/31
46300 Petaling Jaya
Selangor Darul Ehsan

Tel :(03)77836423
Fax :(03)77836422

Renal Care (Ipoh Specialist), Tx Unit

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
Fax :(03)56330618

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
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

Sabah Medical Centre

P.O. Box 13393
88838 Kota Kinabalu
Sabah

Tel :(088)424333
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

Subang Jaya Medical Centre

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

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

Kidney Transplant Services

PRIVATE

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

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

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

UNIVERSITY

Hospital Universiti Kebangsaan Malaysia

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

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

Hospital Universiti Sains Malaysia

16150 Kubang Kerian
Kelantan Darul Naim

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

University of Malaya Medical Centre

8th Floor,
Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan

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

Liver Transplant Services

MOH

Hospital Kuala Lumpur
Institute Paediatric, Surgery Department

Jalan Pahang
50586 Kuala Lumpur
Wilayah Persekutuan

Tel :(03)26906211
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
Fax :(03)56306209

UNIVERSITY

University of Malaya Medical Centre
Department of Paediatrics

Jalan Universiti
59100 Kuala Lumpur
Wilayah Persekutuan

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