

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

5.0 Introduction

5.1 Stock and Flow of Kidney Transplantation

- Stock and flow
- Transplant rates
- Places of transplant

5.2 Recipients' Characteristics

- Demographics, clinical and serology status
 - Primary causes of ESRF

5.3 Transplant Practices

- Type of transplant
- Immunosuppressive therapy and other medications

5.4 Transplant Outcomes

- Post transplant complications
 - Death and graft loss
 - Patient and graft survival

List of Tables

Table 5.1.1: Stock and Flow of Renal Transplantation, 1975-2004	85
Table 5.1.2: New Transplant Rate per million population (pmp), 1975-2004	87
Table 5.1.3: Transplant Prevalence Rate per million population (pmp), 1975-2004.....	88
Table 5.1.4: Place of Renal Transplantation, 1975-2004.....	89
Table 5.2.1: Renal Transplant Recipients' Characteristics, 1975-2004.....	91
Table 5.2.2: Primary causes of end stage renal failure, 1975-2004.....	92
Table 5.3.1: Type of Renal Transplantation, 1975-2004	94
Table 5.3.2: Biochemical data, 2004	95
Table 5.3.3: Medication data, 2004	96
Table 5.4.1: Post transplant complications, 2004	97
Table 5.4.2: Transplant Patients Death Rate and Graft Loss, 1975-2004.....	98
Table 5.4.3: Causes of Death in Transplant Recipients, 1975-2004.....	100
Table 5.4.4: Causes of Graft Failure, 1975-2004.....	101
Table 5.4.4: Causes of Graft Failure, 1975-2004.....	102
Table 5.4.5: Patient survival, 1993-2004	103
Table 5.4.6: Graft survival, 1993-2004.....	104
Table 5.4.7: Patient survival by type of transplant, 1993-2004	105
Table 5.4.8: Graft survival by type of transplant, 1993-2004.....	106
Table 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)	107
Table 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004).....	108
Table 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2004)	109
Table 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2004)	110

List of Figures

Figure 5.1.1: Stock and Flow of Renal Transplantation, 1975-2004.....	86
Figure 5.1.2: New Transplant Rate per million population (pmp), 1975-2004	87
Figure 5.1.3: Transplant Prevalence Rate per million population (pmp), 1975-2004	88
Figure 5.4.2(i): Transplant Recipient Death Rate, 1975-2004.....	99
Figure 5.4.2(ii): Transplant Recipient Graft Loss Rate, 1975-2004	99
Figure 5.4.5: Patient survival, 1993-2004.....	103
Figure 5.4.6: Graft survival, 1993-2004	104
Figure 5.4.7: Patient survival by type of transplant, 1993-2004.....	105
Figure 5.4.8: Graft survival by type of transplant, 1993-2004	106
Figure 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004).....	107
Figure 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004)	108
Figure 5.4.11: Patient survival by year of transplant (Commercial cadaver transplant, 1993-2004)	109
Figure 5.4.12: Graft survival by year of transplant (Commercial cadaver transplant, 1993-2004)	110

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 31 st 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 31 st 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 31 st December	1080	1111	1172	1249	1333	1428	1501	1587

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

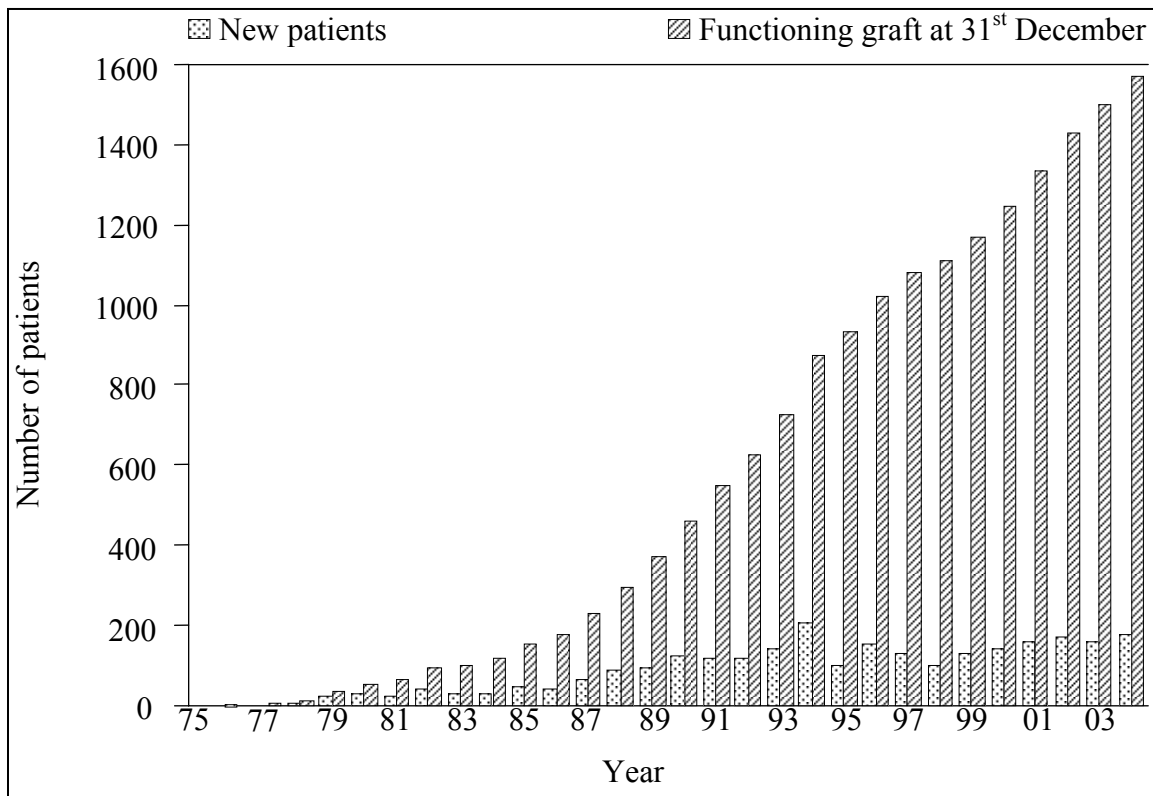


Table 5.1.2: New Transplant Rate per million population (pmp), 1975-2004

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

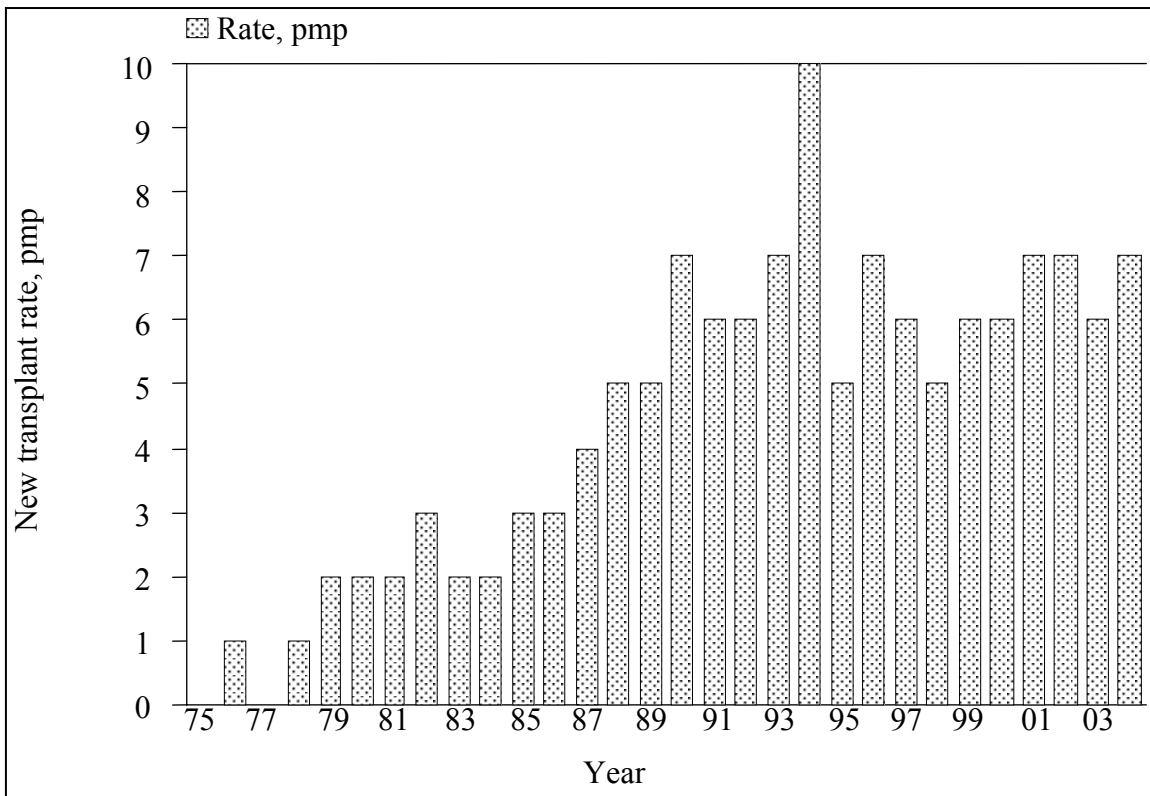


Table 5.1.3: Transplant Prevalence Rate per million population (pmp), 1975-2004

Year	75	76	77	78	79	80	81	82	83	84	85
Functioning graft at 31 st 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 31 st 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 31 st 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

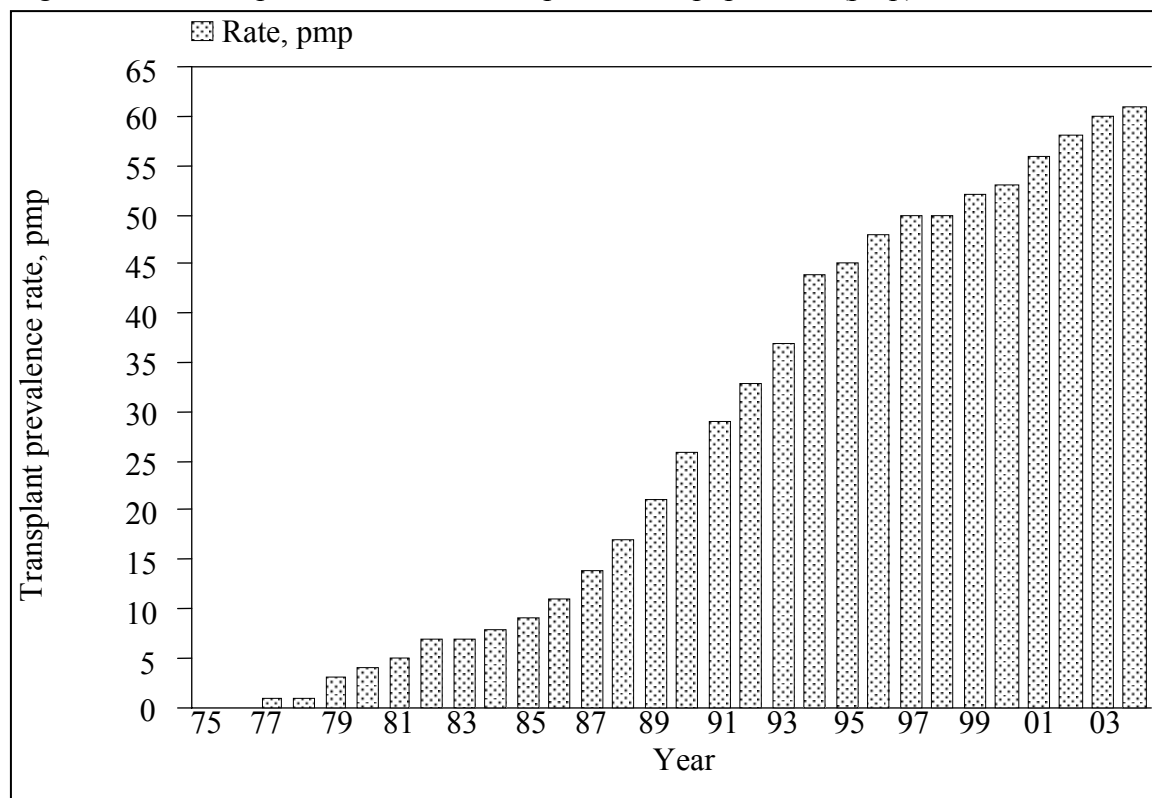


Table 5.1.4: Place of Renal Transplantation, 1975-2004

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	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

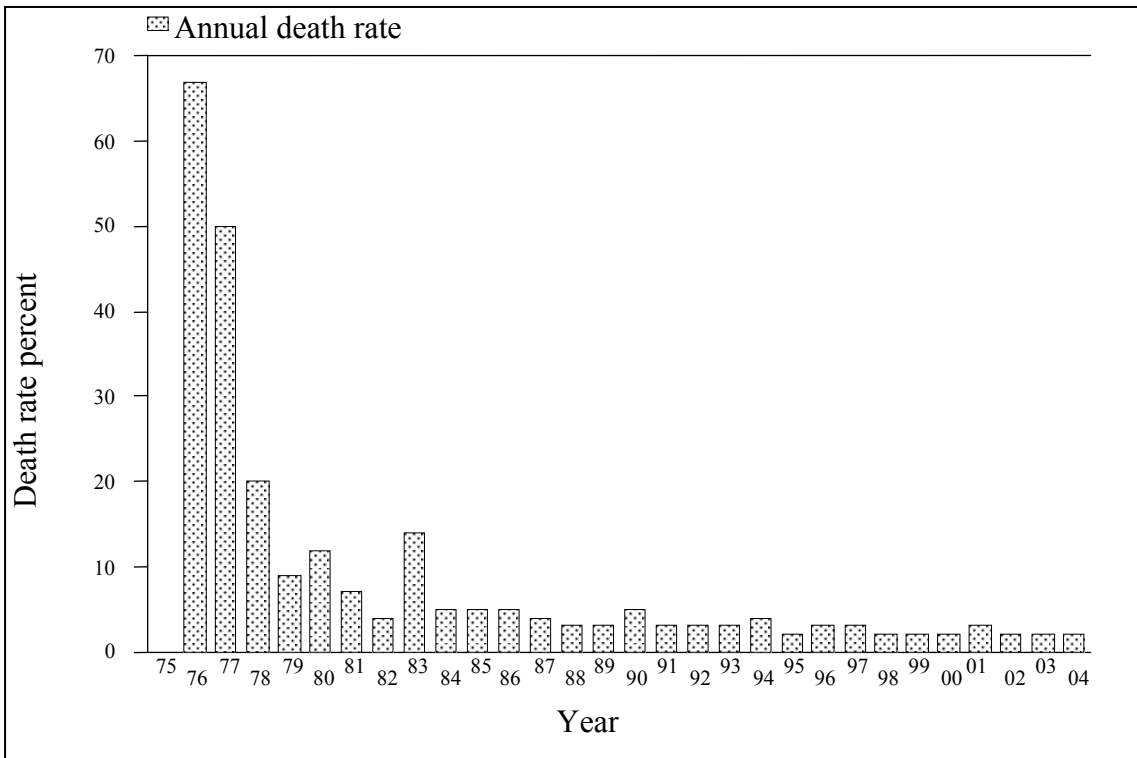


Figure 5.4.2(ii): Transplant Recipient Graft Loss Rate, 1975-2004

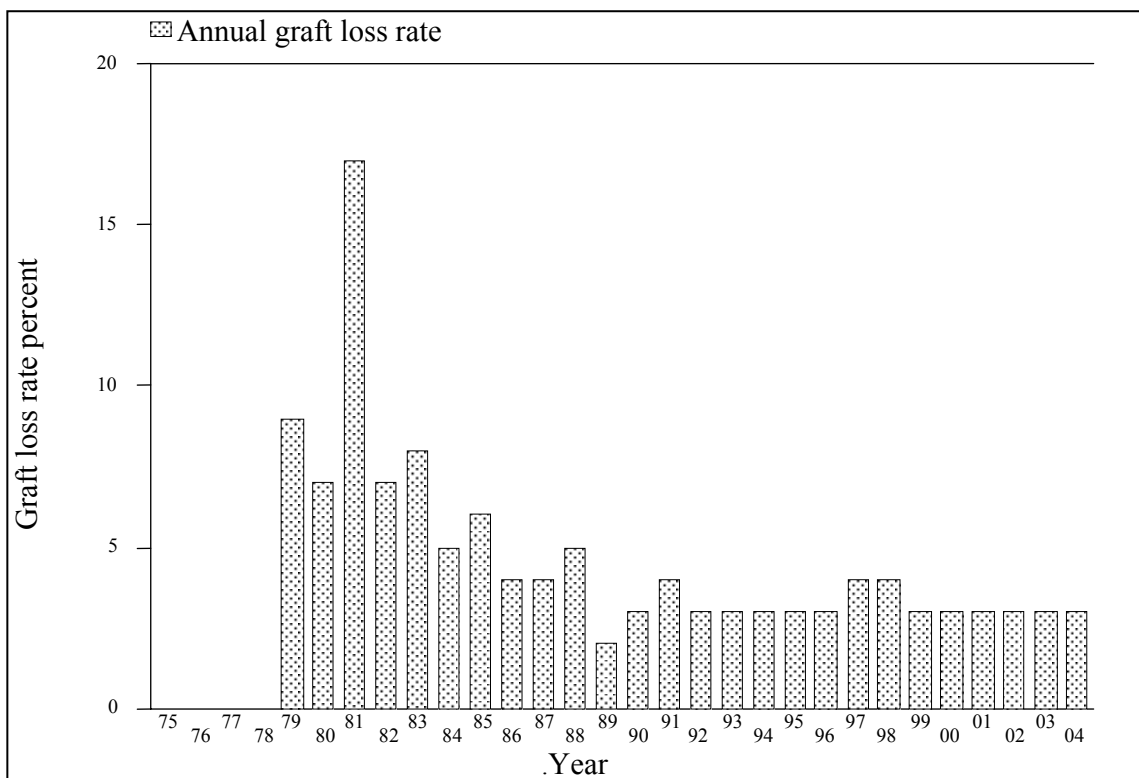


Table 5.4.3: Causes of Death in Transplant Recipients, 1975-2004

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	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	0		
Infection	0	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	0		
Cancer	0	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	0	1	14		
Accidental death	0	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	0	1	20	0	0	1	33	1	7	1	14		
Unknown	0	1	50	2	67	2	100	2	100	2	100	3	60	3	75	1	33	8	57	2	29	
TOTAL	0	2	100	3	100	2	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			
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	
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

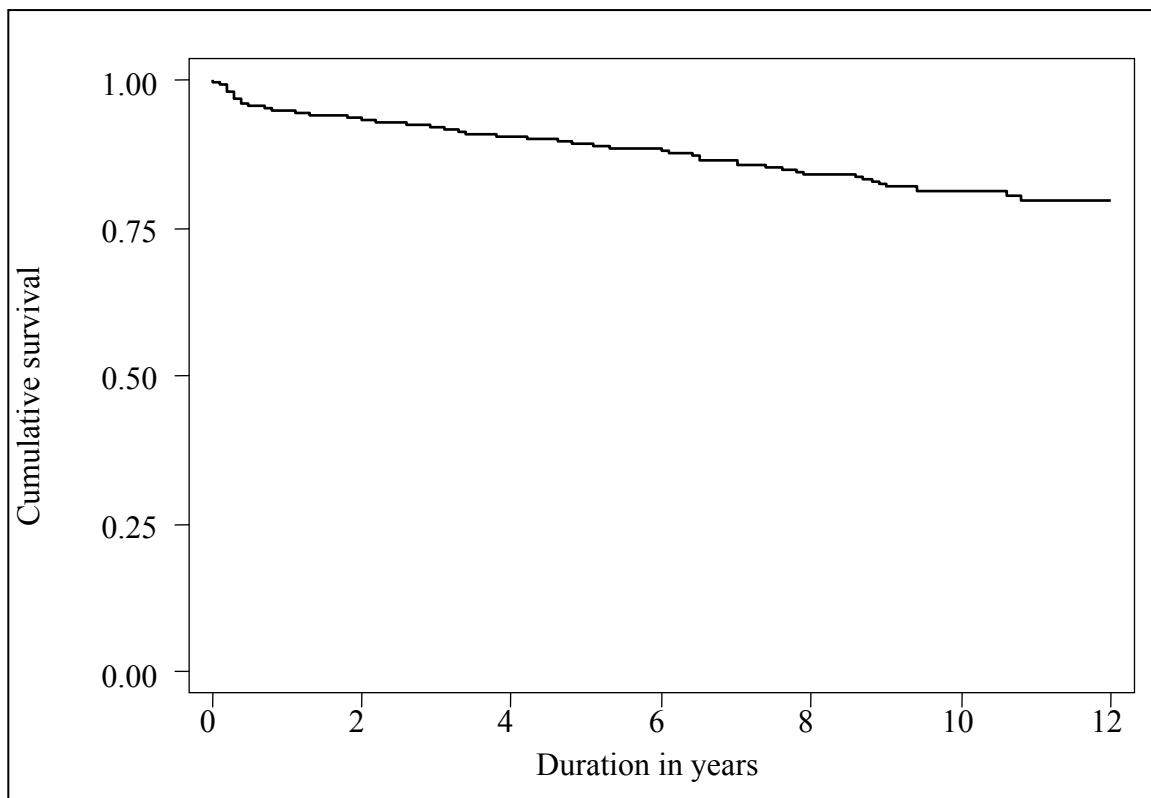


Table 5.4.6: Graft survival, 1993-2004

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

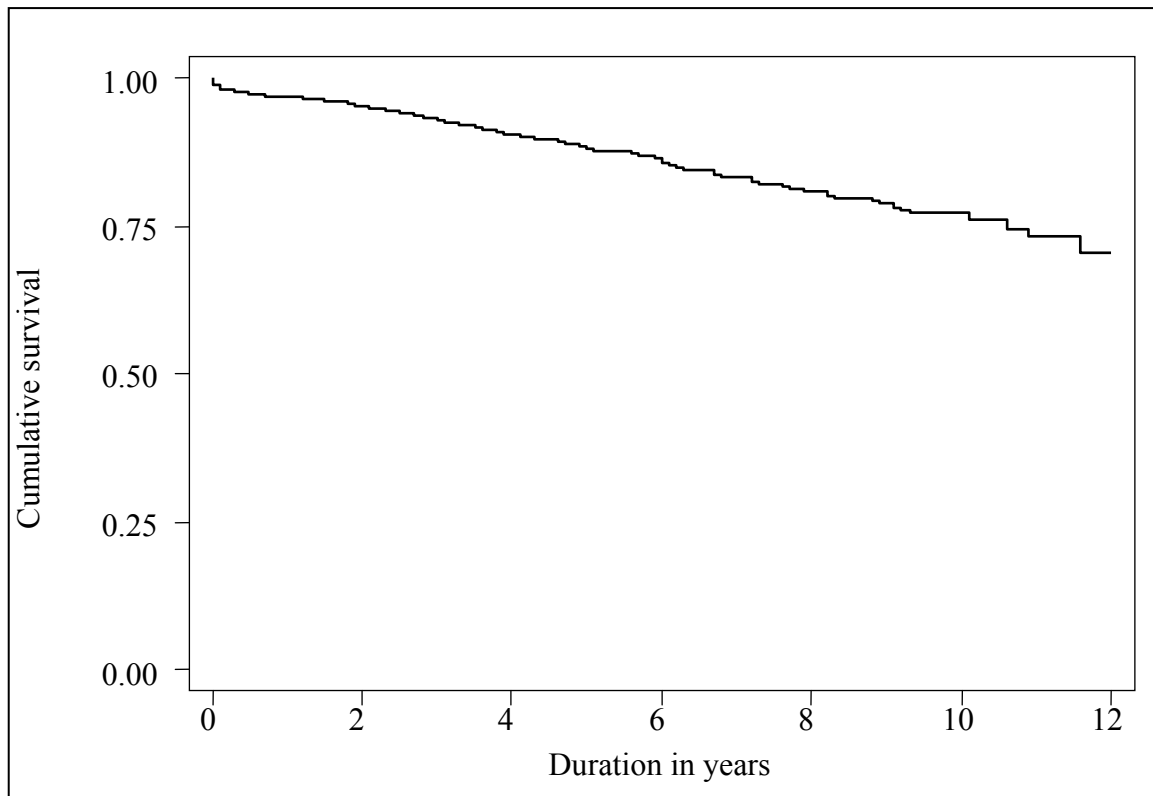
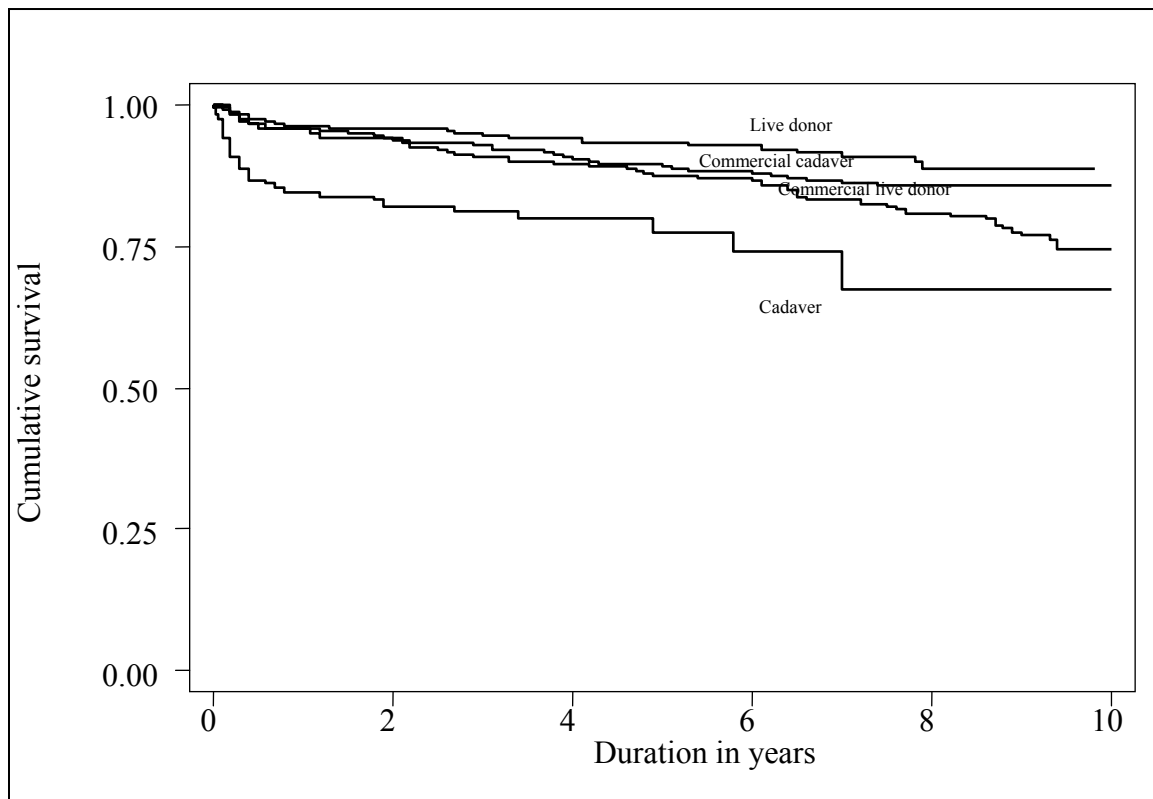


Table 5.4.7: Patient survival by type of transplant, 1993-2004

Type of Transplant	Commercial Cadaver		Commercial Live Donor		Live Donor		Cadaver	
	% 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	
	% 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

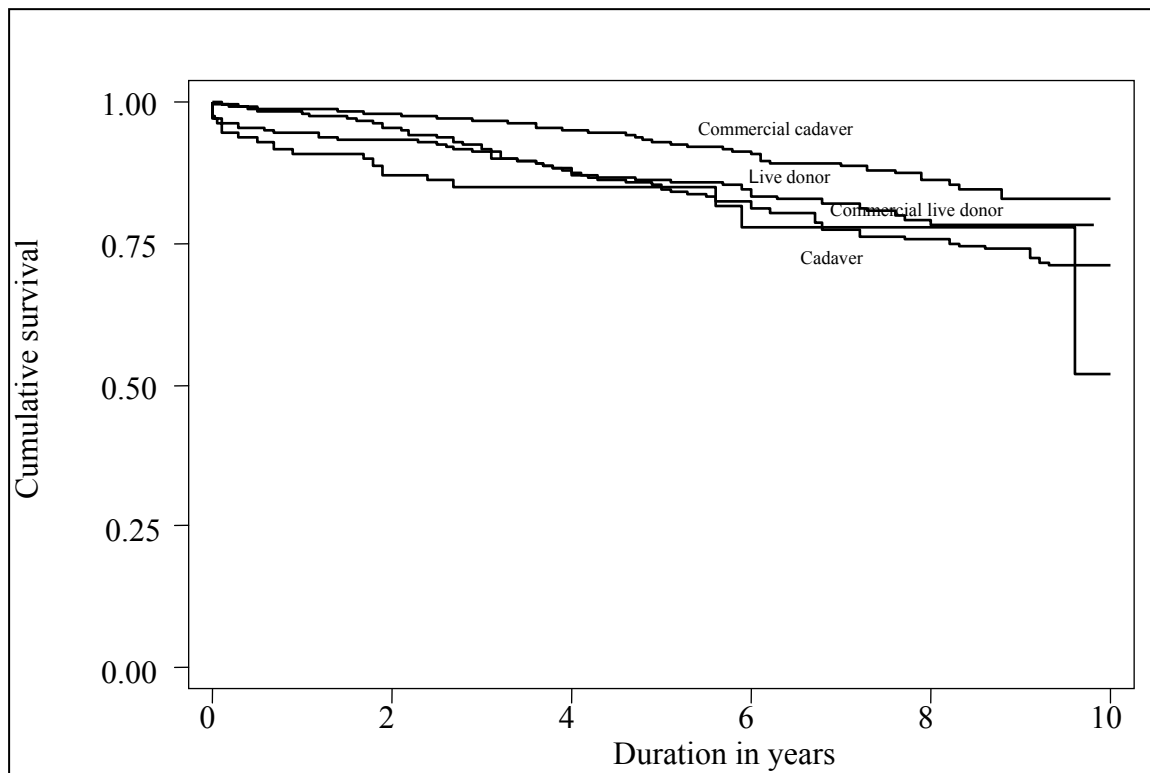
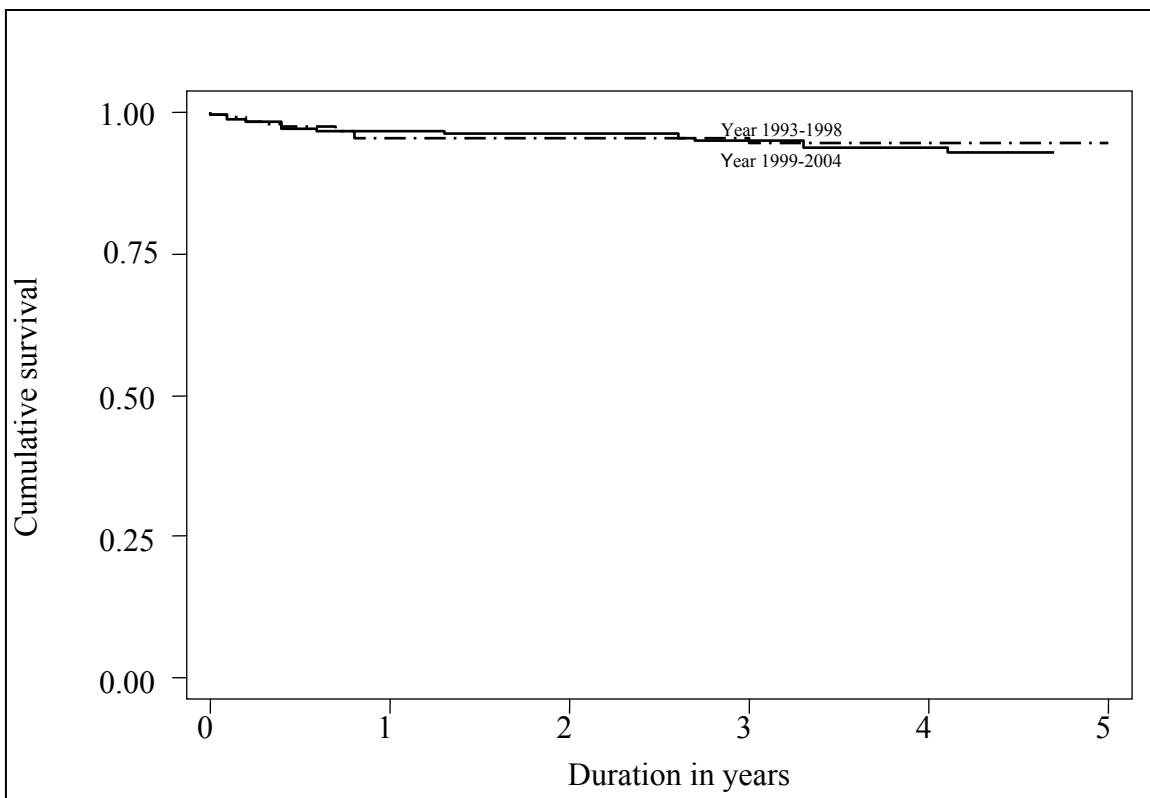


Table 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)

Year of Transplant Interval (years)	1993-1998		1999-2004	
	% 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.

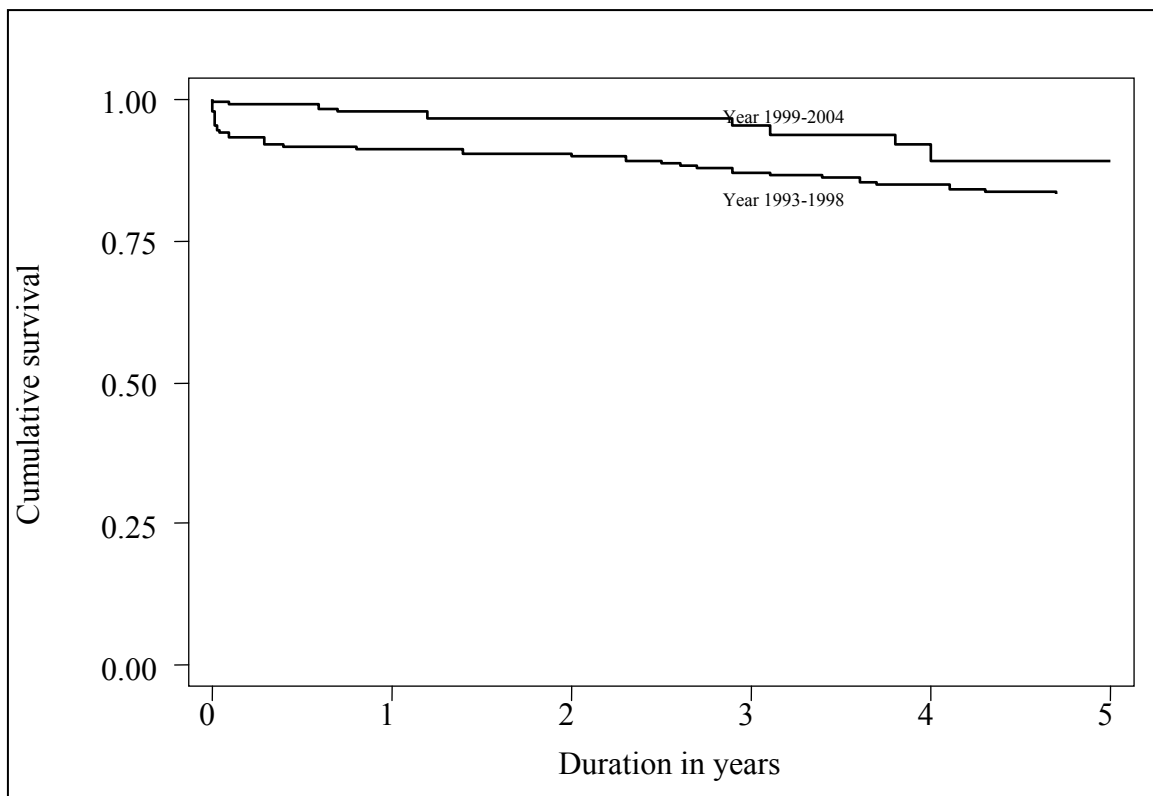
We found that patient survival rate for living related donor renal transplants has remained excellent and unchanged for these two cohorts (Figure 5.4.9).

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

Year of Transplant	1993-1998		1999-2004	
	% 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)



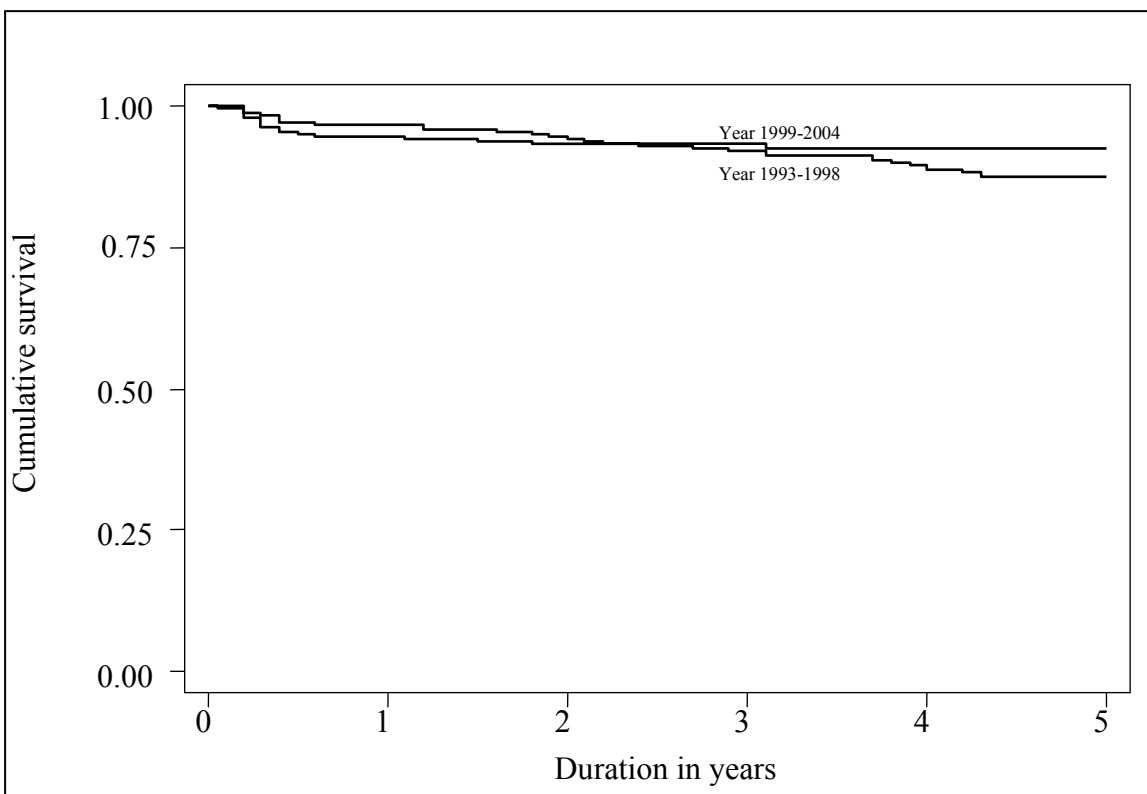
However, the risk of graft failure for living related donor renal transplantation improved for the 1999-2004 cohort compared to the 1993-1998 cohort (Table & Figure 5.4.10). One possible explanation, among others, is the increasing use of newer immunosuppressive agents such as MMF and FK506 in recent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

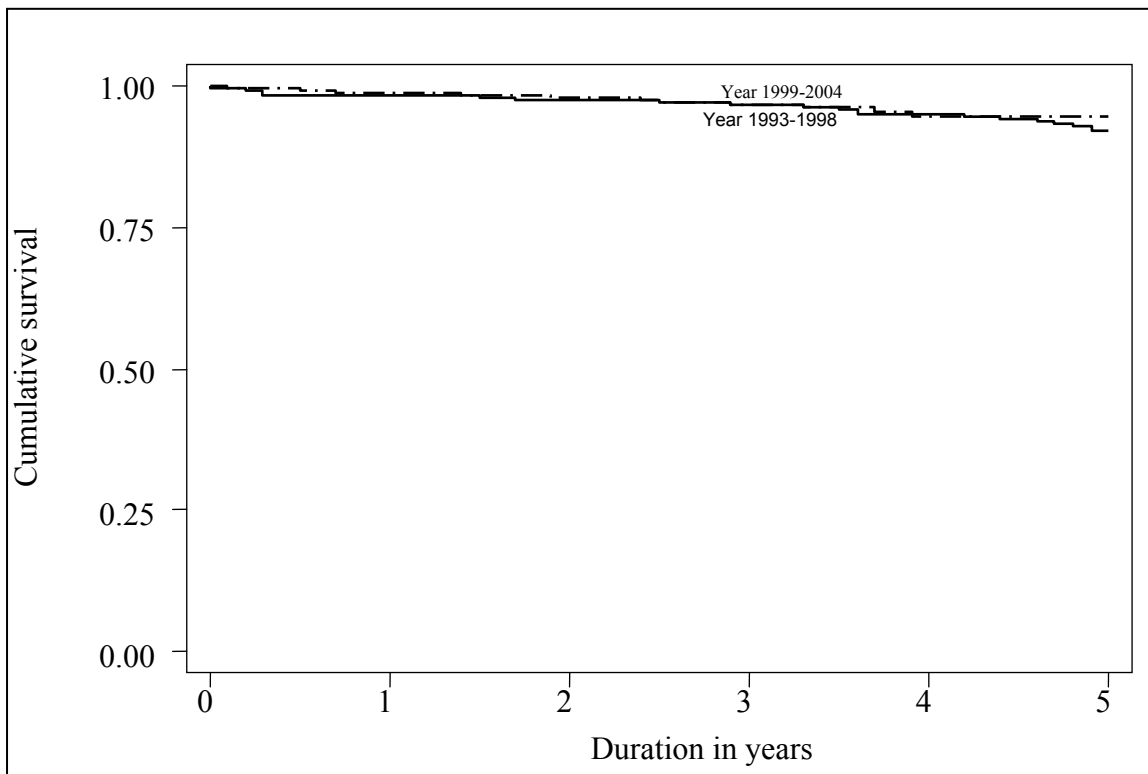


Figure 5.4.7: Patient survival by type of transplant, 1993-2004

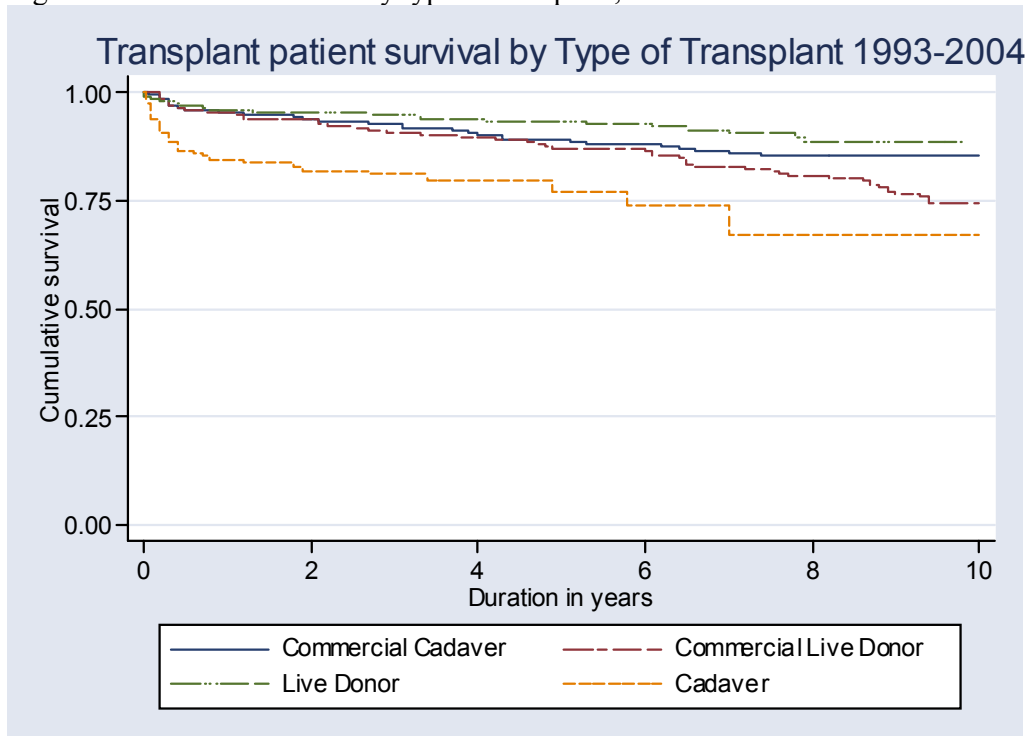


Figure 5.4.8: Graft survival by type of transplant, 1993-2004

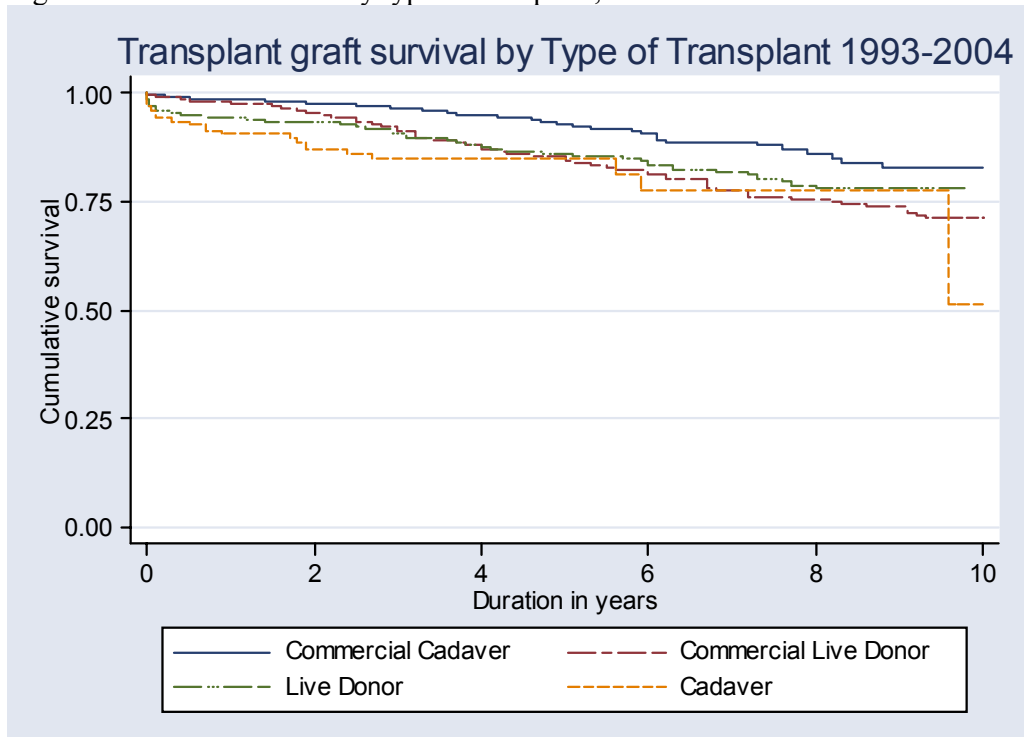


Figure 5.4.9: Patient survival by year of transplant (Living related transplant, 1993-2004)

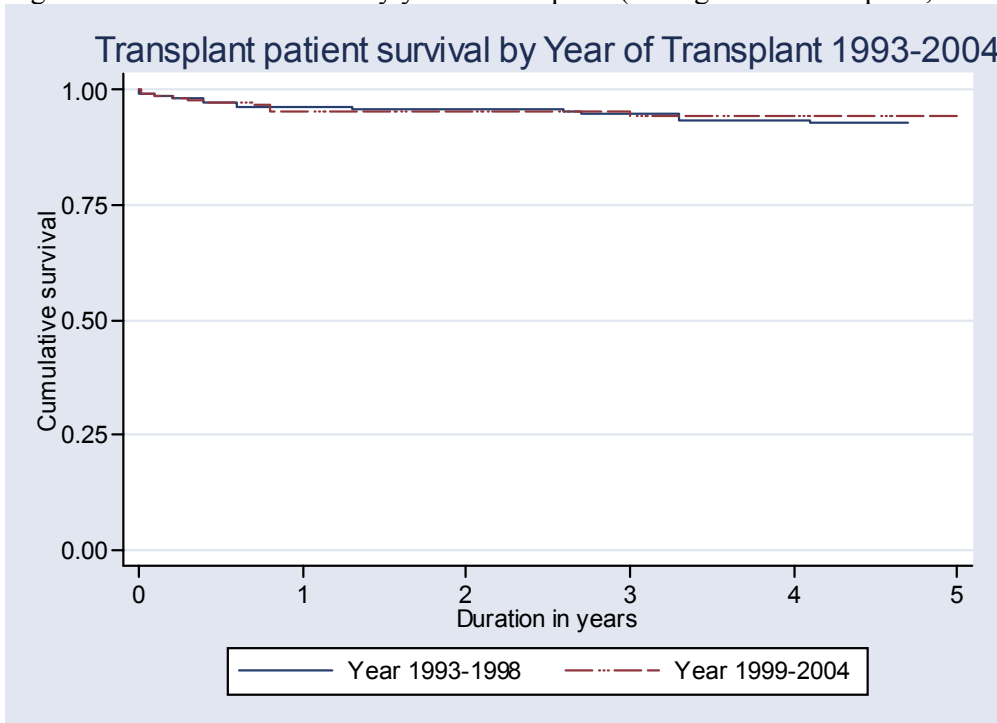


Figure 5.4.10: Graft survival by year of transplant (Living related transplant, 1993-2004)

