

CHAPTER 1

BLOOD AND MARROW TRANSPLANTATION

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1.0 INTRODUCTION

This is the third report on Blood and Marrow Transplant activities in Malaysia up to December 2006 as recorded by the Blood and Marrow Transplant Registry under the umbrella of the National Transplant Registry.

The registry continues to be vital as it would serve the following purpose:

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 enable national and international comparisons.
4. Provide data which could guide future needs and directions in the field of haematopoietic stem cell transplantation.

Data collected in our Blood and Marrow Transplant Registry had enabled participation in the data collection of the Asia Pacific Blood and Marrow Transplantation Group in 2005 and 2006.

1.1 STOCK AND FLOW

At the time of the third report, a cumulative total of 1174 transplants had been conducted by transplant centres in the country. The number of transplants recorded in 2006 was 124, which was a slight decrease from the previous year's total of 147. In 2006, Ampang Puteri Specialist Hospital began transplantation services to add to the number of transplant centres. Meanwhile Hospital Kuala Lumpur (adult transplants) moved to a new premise in Hospital Ampang.

Table 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2006

Year	87	88	89	90	91	92	93	94	95	96
New transplant patients	8	6	22	5	12	21	19	25	30	28
Deaths	1	1	6	6	1	2	9	5	17	11
Lost to follow-up	0	0	0	0	0	0	0	0	0	0
Alive at 31 st December	7	12	28	27	38	57	67	87	100	117

Year	97	98	99	00	01*	02	03	04	05	06
New transplant patients	33	49	62	94	108	114	128	139	147	124
Deaths	15	16	15	31	47	30	51	45	40	25
Lost to follow-up	0	0	0	0	0	0	0	0	0	0
Alive at 31 st December	135	168	215	278	338	422	499	592	698	797

*1 patient in year transplant 2001 with no death date

*Out of 1174 patients who underwent transplantation, there were 49 patients with early death before day 30 of transplant

Figure 1.1.1: Stock and Flow of Blood and Marrow Transplantation, 1987-2006

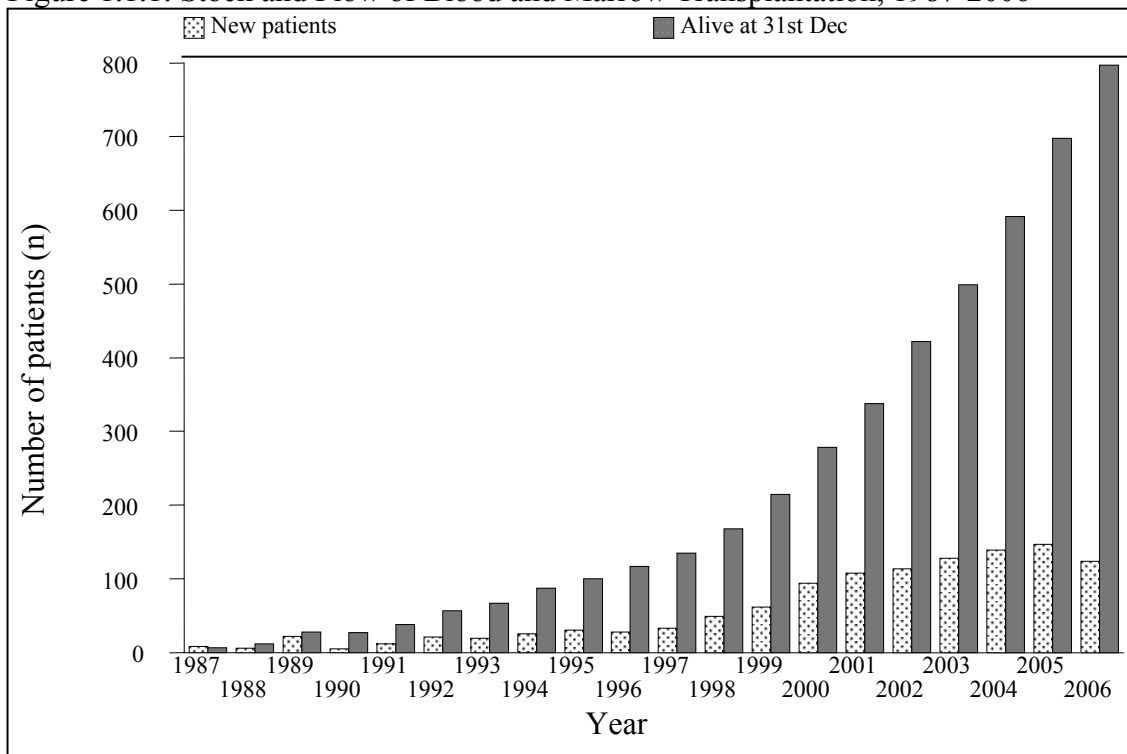


Table 1.1.2: New Transplant Rate per million population (pmp), 1987-2006

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

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
New transplant patients	33	49	62	94	108	114	128	139	147	124
New transplant rate pmp	2	2	3	4	4	5	5	5	6	5

Figure 1.1.2: New Transplant Rate per million population (pmp), 1987-2006

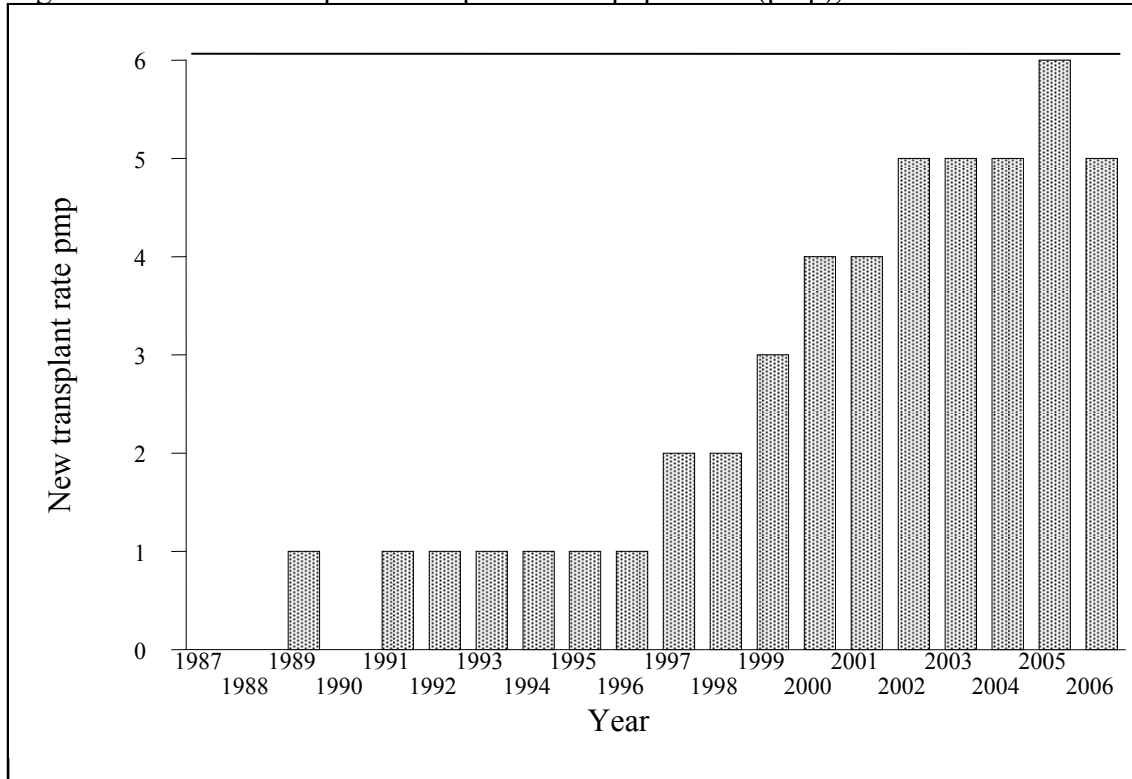


Table 1.1.3: Distribution of Patients by Centre, 1987-2006

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

Year	1994		1995		1996		1997		1998		1999		2000	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	0	0	0	0	0	0	0	0	0	0	6	10	15	16
KLP	4	16	10	33	10	36	9	27	16	33	19	31	16	17
UKM	0	0	0	0	0	0	0	0	0	0	2	3	9	10
SJA	0	0	0	0	0	0	0	0	0	0	5	8	19	20
UMA	4	16	7	23	6	21	9	27	15	31	11	18	13	14
UMP	17	68	13	43	11	39	15	45	18	37	19	31	22	23
GMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SJP	0	0	0	0	1	4	0	0	0	0	0	0	0	0
ASH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hospital Ampang	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

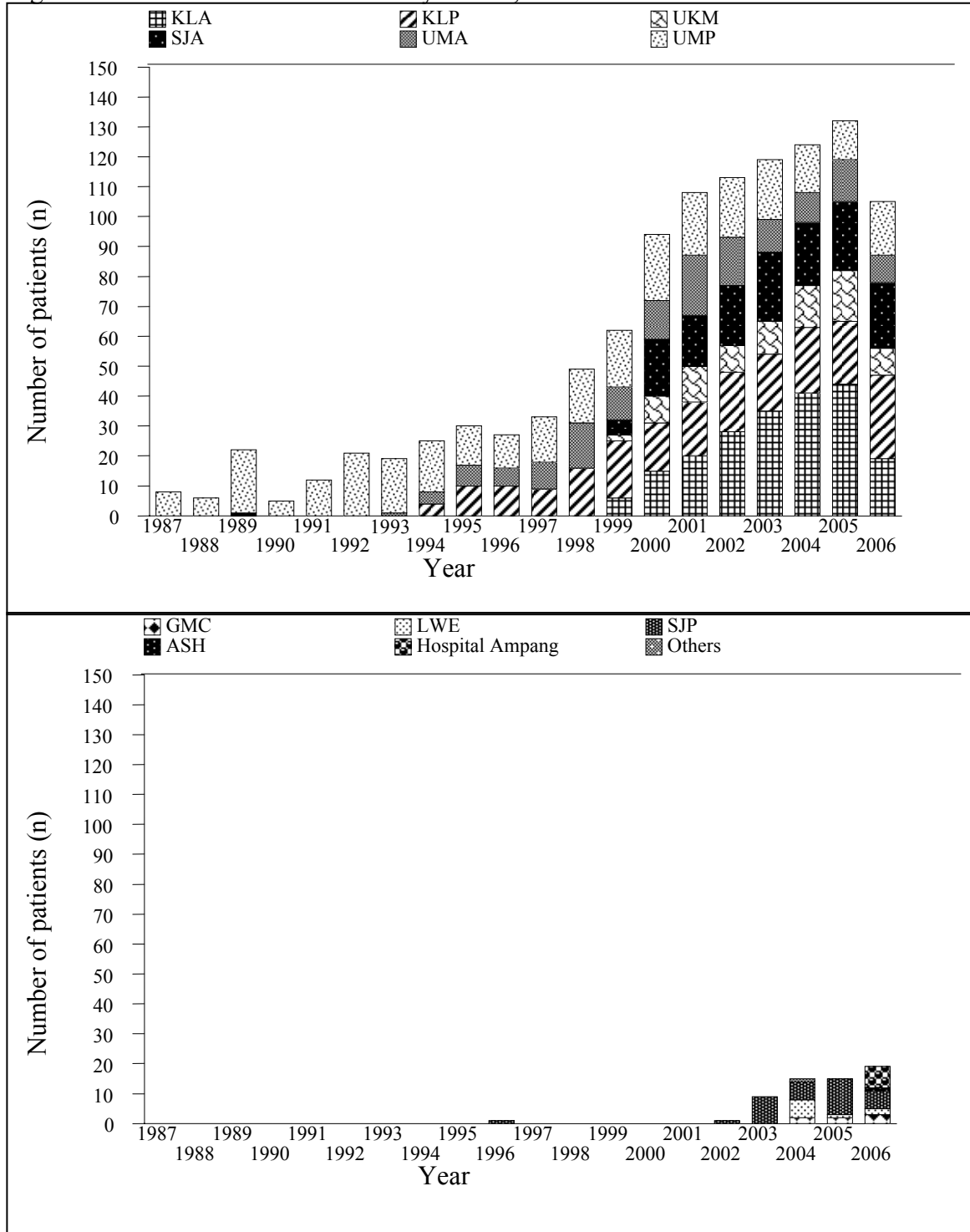
Year	2001		2002		2003		2004		2005		2006		TOTAL	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
KLA	20	19	28	25	35	27	41	29	44	30	19	15	208	18
KLP	18	17	20	18	19	15	22	16	21	14	28	23	212	18
UKM	12	11	9	8	11	9	14	10	17	12	9	7	83	7
SJA	17	16	20	18	23	18	21	15	23	16	22	18	151	13
UMA	20	19	16	14	11	9	10	7	14	10	9	7	146	12
UMP	21	19	20	18	20	16	16	12	13	9	18	15	314	27
GMC	0	0	0	0	0	0	2	1	2	1	3	2	7	1
LWE	0	0	0	0	0	0	6	4	1	1	2	2	9	1
SJP	0	0	1	1	9	7	6	4	12	8	6	5	35	3
ASH	0	0	0	0	0	0	0	0	0	0	1	1	1	0
Hospital Ampang	0	0	0	0	0	0	0	0	0	0	7	6	7	1
Others*	0	0	0	0	0	0	1	1	0	0	0	0	1	0
TOTAL	108	100	114	100	128	100	139	100	147	100	124	100	1174	100

Note: Distribution is according to transplant centre

*Others include Royal Perth Hospital

KLA	Hospital Kuala Lumpur, (Adult)
KLP	Hospital Kuala Lumpur, Institute Paediatrics (Paed)
UKM	Hospital Universiti Kebangsaan Malaysia
SJA	Subang Jaya Medical Centre (Adult)
UMA	University of Malaya Medical Centre (Adult)
UMP	University of Malaya Medical Centre (Paed)
GMC	Gleneagles Medical Centre, Penang
LWE	Lam Wah Ee Hospital, Penang
SJP	Subang Jaya Medical Centre (Paed)
ASH	Ampang Puteri Specialist Hospital

Figure 1.1.3: Distribution of Patients by Centre, 1987-2006



1.2 RECIPIENTS' CHARACTERISTICS

Recipients were predominantly male (59% males, 41% females) (Table 1.2.1). The largest ethnic group of transplant recipients was Malay (44%) followed by Chinese and Indians (Table 1.2.2). The young median age reflected the paediatric bias in the registry as transplants first started in paediatric patients while the adult centres started later in 1993 (Table 1.2.3). However over the past 10 years there has been a gradual increase in the median age of recipients and patients older than 60 years of age have had access to transplantation.

The majority of transplants (about two-thirds) were for malignant disorders and most of these were haematological malignancies like leukaemia and lymphoma (Table 1.2.4). The number of patients transplanted for chronic leukaemia (mostly chronic myeloid leukaemia) showed a steady decline over the past few years. This probably reflected the preferential usage of imatinib mesylate as first line management of chronic myeloid leukaemia. The bulk of non-malignant disorders requiring transplants were thalassaemia and aplastic anaemia.

Table 1.2.1: Distribution of Patients by Gender, 1987-2006

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

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

Year	2003		2004		2005		2006		TOTAL	
Gender	No.	%	No.	%	No.	%	No.	%	No.	%
Male	71	55	83	60	69	47	73	59	666	57
Female	57	45	56	40	78	53	51	41	508	43
TOTAL	128	100	139	100	147	100	124	100	1174	100

Figure 1.2.1: Distribution of Patients by Gender, 1987-2006

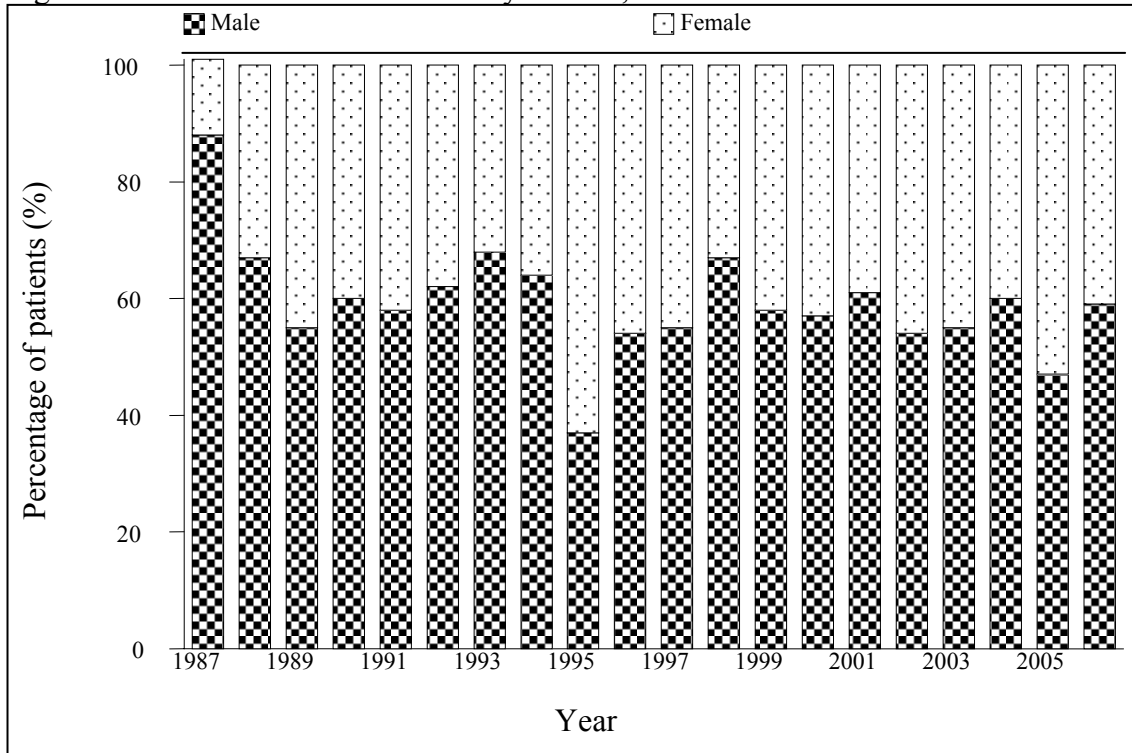


Table 1.2.2: Distribution of Patients by Ethnic Group, 1987-2006

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	3	11	0	0	0	0	0	0	0	0
Others	0	0	5	17	0	0	3	9	1	2	1	2	3	3
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

Year	2001		2002		2003		2004		2005		2006		TOTAL	
Race	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Malay	47	44	37	32	46	36	51	37	54	37	54	44	438	37
Chinese	48	44	65	57	65	51	63	45	67	46	47	38	555	47
Indian	8	7	8	7	6	5	9	6	14	10	9	7	85	7
Bumiputra Sabah	1	1	1	1	4	3	8	6	5	3	7	6	41	3
Bumiputra Sarawak	1	1	1	1	4	3	7	5	5	3	2	2	25	2
Others	3	3	2	2	3	2	1	1	2	1	5	4	30	3
TOTAL	108	100	114	100	128	100	139	100	147	100	124	100	1174	100

Figure 1.2.2: Distribution of Patients by Ethnic Group, 1987-2006

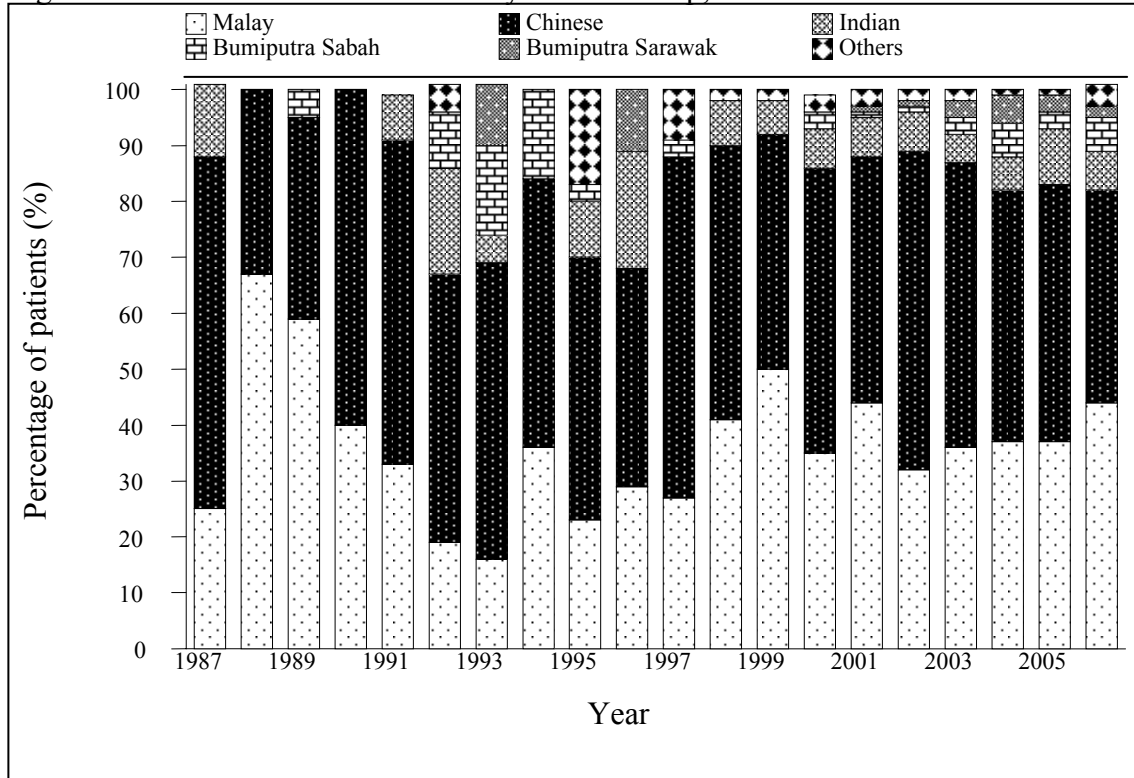


Table 1.2.3: Distribution of Patients by Age Group, 1987-2006

Year	1987		1988		1989		1990		1991		1992		1993	
Age group	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	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	11	44	12	40	13	46	19	58	21	43	28	45	27	29
10-19	11	44	13	43	12	43	8	24	16	33	15	24	27	29
20-39	3	12	4	13	3	11	5	15	12	24	12	19	19	20
40-59	0	0	1	3	0	0	1	3	0	0	7	11	20	21
≥60	0	0	0	0	0	0	0	0	0	0	0	0	1	1
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100
Mean	11		13		11		12		13		17		23	
SD	7		9		9		12		10		15		17	
Median	11		11		11		6		10		11		18	
Minimum	1		3		1		1		5 months		1		1	
Maximum	29		41		37		45		39		57		61	

Year	2001		2002		2003		2004		2005		2006		Total	
Age group	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-9	23	21	30	26	42	33	26	19	29	20	41	33	386	33
10-19	28	26	25	22	18	14	41	29	31	21	24	19	298	25
20-39	40	37	36	32	47	37	52	37	51	35	31	25	315	27
40-59	16	15	23	20	21	16	18	13	35	24	24	19	166	14
≥60	1	1	0	0	0	0	2	1	1	1	4	3	9	1
TOTAL	108	100	114	100	128	100	139	100	147	100	124	100	1174	100
Mean	23		23		22		23		26		24		20	
SD	16		16		15		15		16		19		16	
Median	22		22		23		20		25		18		16	
Minimum	1 month		1		5 months		1		1		2 months		1 month	
Maximum	64		55		52		70		66		69		70	

Age=date of transplant – date of birth

Figure 1.2.3: Distribution of Patients by Age Group, 1987-2006

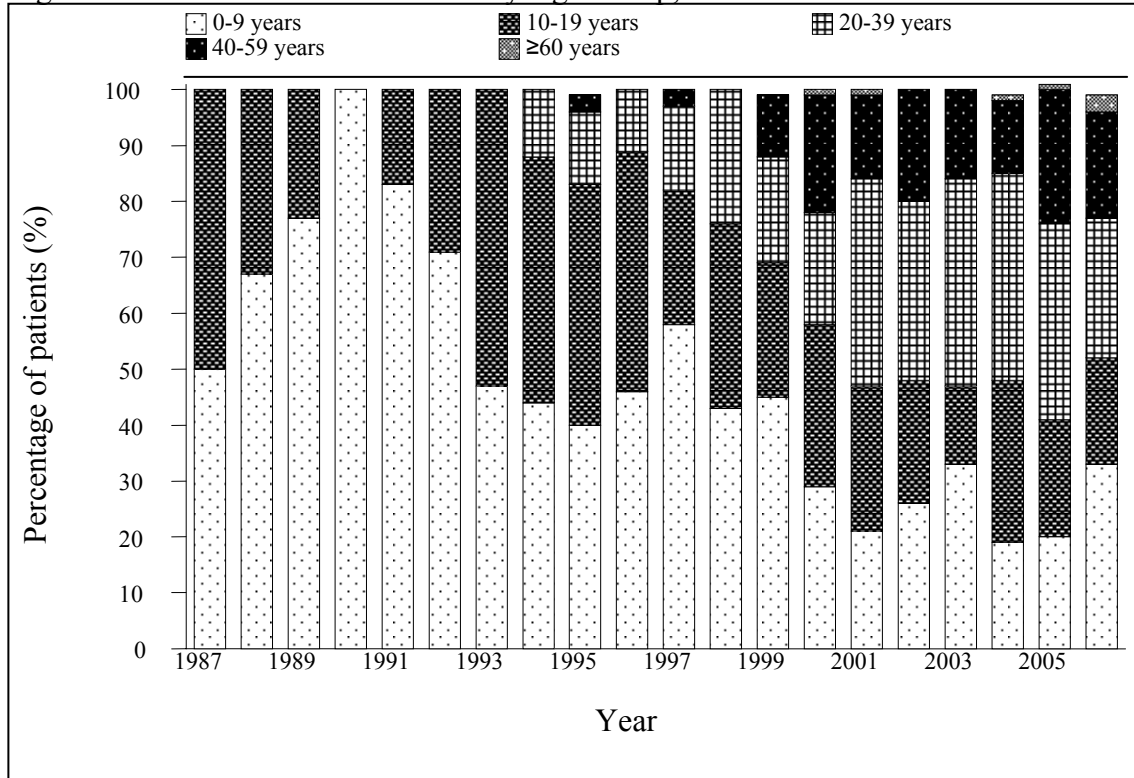


Table 1.2.4: Distribution of Patients by Primary Diagnosis, 1987-2006

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

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

Year	2001		2002		2003		2004		2005		2006		TOTAL	
Diagnosis	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Acute leukaemia	48	44	48	42	42	33	46	33	54	37	38	31	436	37
Chronic leukaemia	18	17	19	17	19	15	22	16	13	9	11	9	158	13
Hypoplastic anaemia	7	6	4	4	5	4	12	9	5	3	14	11	108	9
Erythrocytic disorders	0	0	1	1	2	2	0	0	0	0	0	0	8	1
Lymphoma	23	21	20	18	28	22	35	25	34	23	23	19	195	17
Solid tumors	0	0	3	3	2	2	0	0	2	1	3	2	26	2
Myelodysplasia	4	4	4	4	3	2	6	4	4	3	4	3	30	3
Haemoglobinopathy	4	4	8	7	17	13	9	6	16	11	11	9	120	10
Multiple myeloma	1	1	4	4	4	3	3	2	8	5	10	8	34	3
Others	3	3	3	3	6	5	6	4	11	7	10	8	59	5
TOTAL	108	100	114	100	128	100	139	100	147	100	124	100	1174	100

Diagnosis list in the web-application

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

1.3 TRANSPLANT PRACTICES

The majority of transplants (67%) done remained allogeneic with 83 patients transplanted compared with 41 patients who underwent autologous transplants. Donors for allogeneic transplants were HLA matched in 93% of cases while 1 and 2 antigen mismatches made up the remaining 7%. No patient received a graft with > 2 antigen mismatches. Although most donors were siblings, the number of unrelated donors had increased and contributed to 13% of all allogeneic transplants performed in 2006. There was a predilection to use of peripheral blood stem cells compared with bone marrow or cord blood and this was reflected in the 78% of transplants using this stem cell source. Not unlike global trends, the number of cord blood transplantations also showed a slight increase.

Table 1.3.1: Distribution of Patients by Graft Number, 1987-2006

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	47	96	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	1	2	0	0	0	0
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

Year	2001		2002		2003		2004		2005		2006		TOTAL	
Graft number	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	103	95	113	99	125	98	134	98	121	98	111	97	1101	97
2	5	5	1	1	3	2	3	2	2	2	2	2	33	3
3	0	0	0	0	0	0	0	0	0	0	1	1	4	0
TOTAL	108	100	114	100	128	100	137	100	123	100	114	100	1138	100

Figure 1.3.1: Distribution of Patients by Graft Number, 1987-2006

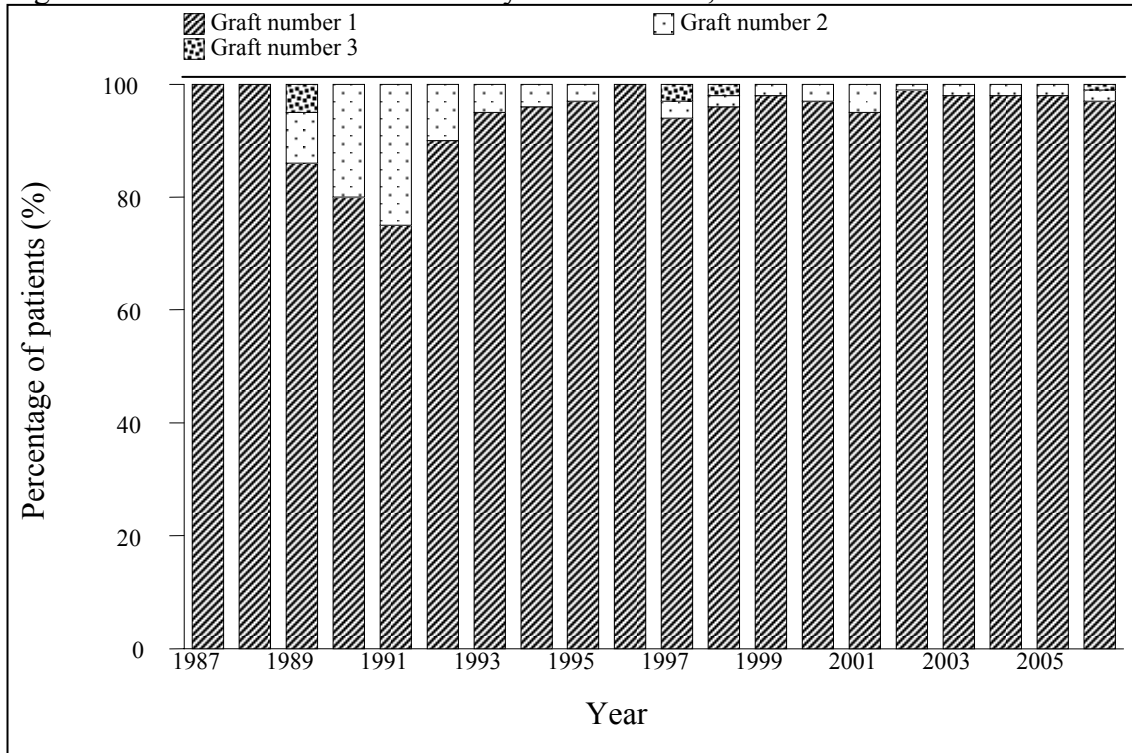


Table 1.3.2: Distribution of Patients by Transplantation Type, 1987-2006

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

Year	1994		1995		1996		1997		1998		1999		2000	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	24	96	29	97	26	93	27	82	32	65	44	71	56	60
Autologous	1	4	1	3	2	7	6	18	17	35	18	29	38	40
TOTAL	25	100	30	100	28	100	33	100	49	100	62	100	94	100

Year	2001		2002		2003		2004		2005		2006		TOTAL	
Type of transplant	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Allogeneic + Syngeneic	75	69	75	66	84	66	90	65	90	61	83	67	825	70
Autologous	33	31	39	34	44	34	49	35	57	39	41	33	349	30
TOTAL	108	100	114	100	128	100	139	100	147	100	124	100	1174	100

Note: 6 patients with syngeneic type of transplant

Figure 1.3.2: Distribution of Patients by Transplantation Type, 1987-2006

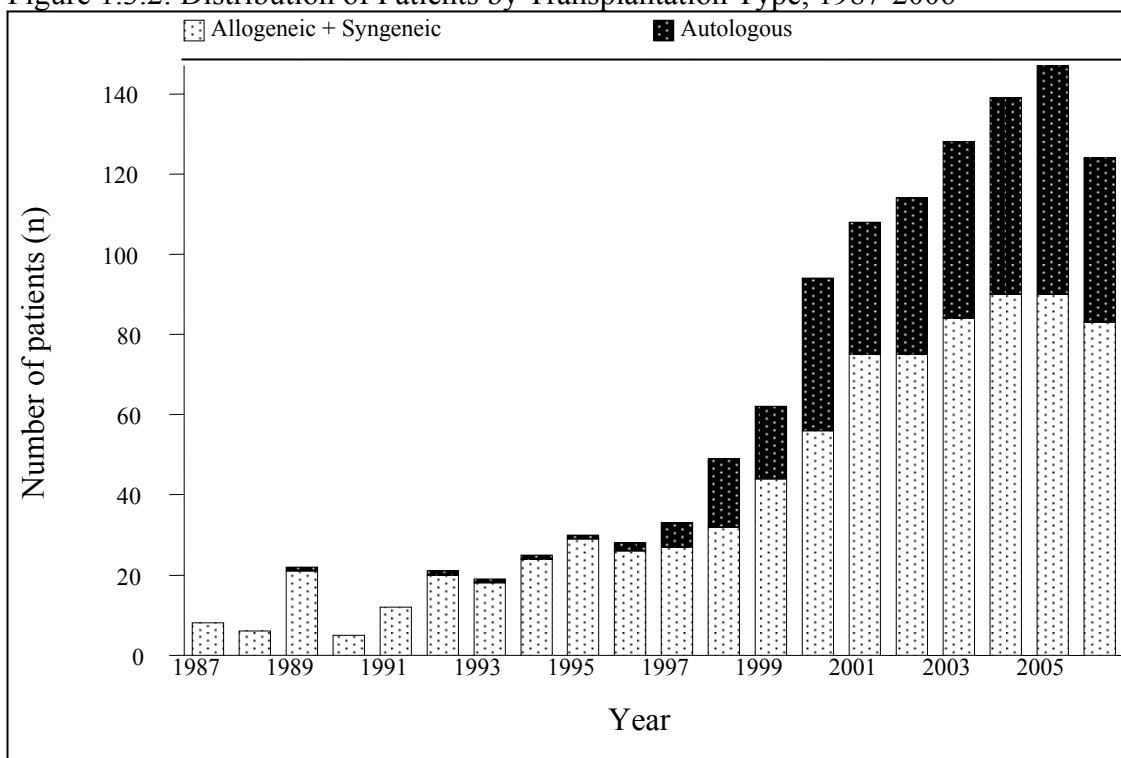


Table 1.3.3: Type of Transplant by Centre, 1987-2006

Type of transplant Centre	Allogeneic + Syngeneic		Autologous		TOTAL	
	No.	%	No.	%	No.	%
KLA	106	13	102	29	208	18
KLP	184	22	28	8	212	18
UKM	50	6	33	9	83	7
SJA	57	7	94	27	151	13
UMA	102	12	44	13	146	12
UMP	281	34	33	9	314	27
GMC	3	0	4	1	7	1
LWE	8	1	1	0	9	1
SJP	31	4	4	1	35	3
ASH	1	0	0	0	1	0
Hospital Ampang	1	0	6	2	7	1
Others*	1	0	0	0	1	0
TOTAL	825	100	349	100	1174	100

* Others include Royal Perth Hospital

Figure 1.3.3: Type of Transplant by Centre, 1987-2006

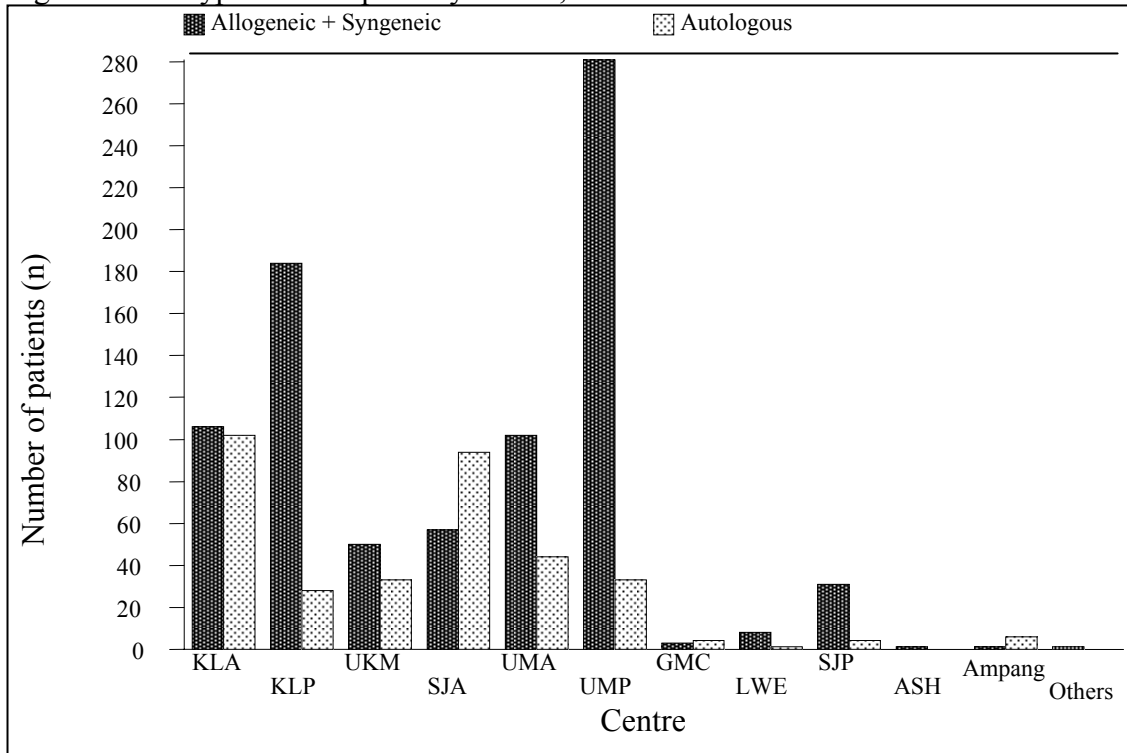


Table 1.3.4: Source of Transplant, 1987-2006

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	74	69
Cord blood / Marrow + cord	2	6	1	2	2	3	6	6	4	4
TOTAL	33	100	49	100	62	100	94	100	108	100

Year	2002		2003		2004		2005		2006		TOTAL	
Transplant source	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Marrow	31	27	44	34	30	22	24	16	17	14	469	40
PBSC / Marrow + PBSC	79	69	79	62	100	72	116	79	97	78	655	56
Cord blood / Marrow + cord	4	4	5	4	9	6	7	5	10	8	50	4
TOTAL	114	100	128	100	139	100	147	100	124	100	1174	100

PBSC = Peripheral Blood Stem Cells

Figure 1.3.4: Source of Transplant, 1987-2006

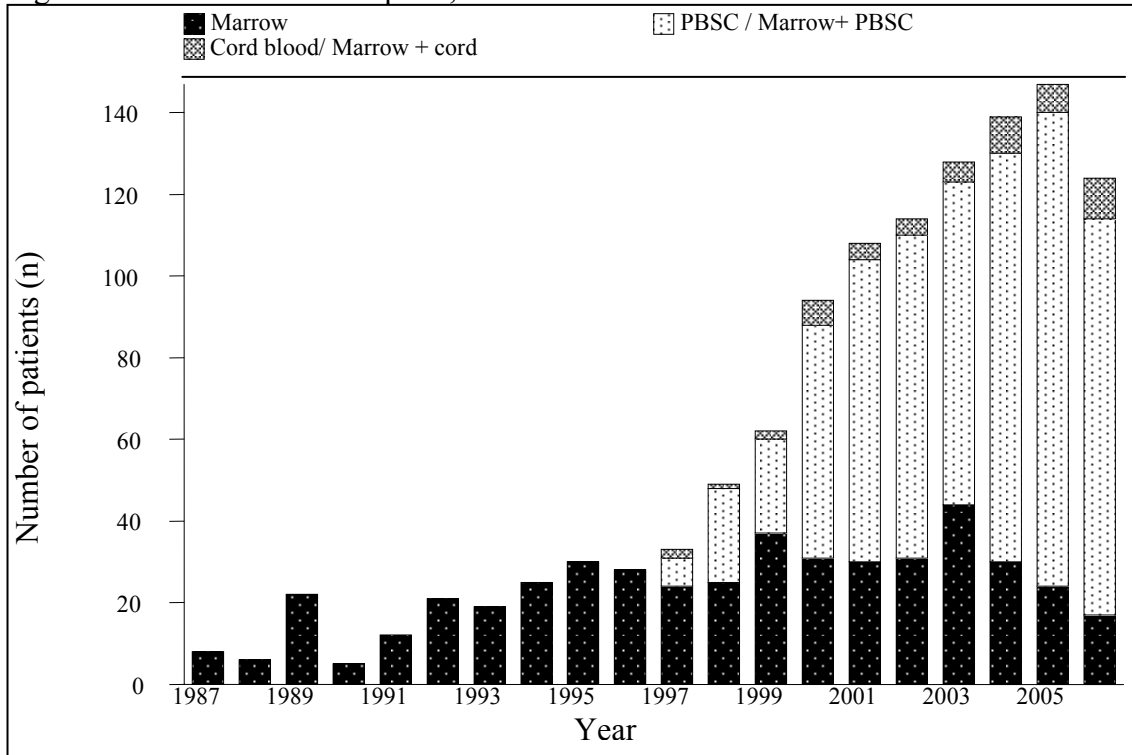


Table 1.3.5: Distribution of Patients by HLA Match, 1987-2006

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

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

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

Year	2002		2003		2004		2005		2006		TOTAL	
HLA Match	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Identical	70	93	79	94	83	92	85	94	77	93	779	94
1 AG	3	4	3	4	3	3	4	4	4	5	27	3
2 AG	2	3	2	2	4	4	1	1	2	2	18	2
≥3 AG Disparate	0	0	0	0	0	0	0	0	0	0	1	0
TOTAL	75	100	84	100	90	100	90	100	83	100	825	100

*excluding autologous

Table 1.3.6: Distribution of Patients by Allogeneic Donor Relationship, 1987-2006

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

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

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

Year	2002		2003		2004		2005		2006		TOTAL	
Allogeneic Donor Relationship	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sibling	71	95	81	96	81	90	82	91	72	87	782	95
Unrelated	4	5	3	4	9	10	8	9	11	13	40	5
▪ Marrow	0	0	0	0	1	11	2	25	2	18	5	13
▪ PBSC / Marrow + PBSC	0	0	0	0	2	22	1	13	1	9	4	10
▪ Cord blood / Marrow + cord	4	100	3	100	6	67	5	63	8	73	31	78
Others	0	0	0	0	0	0	0	0	0	0	3	0
TOTAL	75	100	84	100	90	100	90	100	83	100	825	100

*excluding autologous, including syngeneic

1.4 TRANSPLANT OUTCOMES

The major cause of death continued to be relapse/underlying disease (44%) with sepsis (32%) being the second commonest cause of death. Surprisingly veno-occlusive disease of the liver contributed 12% of deaths while graft-versus-host disease became the fourth most common cause of death (8%) (Table 1.4.1). Overall Kaplan Meier survival analysis showed a trend in favour of younger patients (Fig 1.4.3).

Table 1.4.1: Distribution of Patients by Cause of Death, 1987-2006

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

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

Year	1997		1998		1999		2000		2001	
Cause of death	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	5	33	1	6	6	40	2	6	4	9
GVHD	0	0	2	13	1	7	2	6	4	9
Underlying disease	9	60	11	69	7	47	22	71	33	70
Haemorrhage	0	0	1	6	0	0	3	10	2	4
VOD	0	0	0	0	0	0	1	3	2	4
Organ Failure	1	7	0	0	1	7	0	0	0	0
Interstitial pneumonitis	0	0	1	6	0	0	1	3	2	4
Secondary malignancy	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0
TOTAL	15	100	16	100	15	100	31	100	47	100

Year	2002		2003		2004		2005		2006		TOTAL	
Cause of death	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sepsis	4	13	14	27	10	22	9	23	8	32	79	21
GVHD	3	10	5	10	9	20	6	15	2	8	39	10
Underlying disease	19	63	28	55	23	51	16	41	11	44	205	55
Haemorrhage	0	0	0	0	2	4	2	5	1	4	16	4
VOD	0	0	0	0	0	0	0	0	3	12	8	2
Organ Failure	3	10	2	4	0	0	1	3	0	0	12	3
Interstitial pneumonitis	0	0	1	2	0	0	2	5	0	0	7	2
Secondary malignancy	0	0	0	0	0	0	0	0	0	0	1	0
Others	0	0	0	0	0	0	2	5	0	0	2	1
Unknown	1	3	1	2	1	2	1	3	0	0	4	1
TOTAL	30	100	51	100	45	100	39	100	25	100	373	100

Note: 1 patient with missing cause of death reported

Figure 1.4.1: Patient Survival by Year of Transplant, 1987-2006

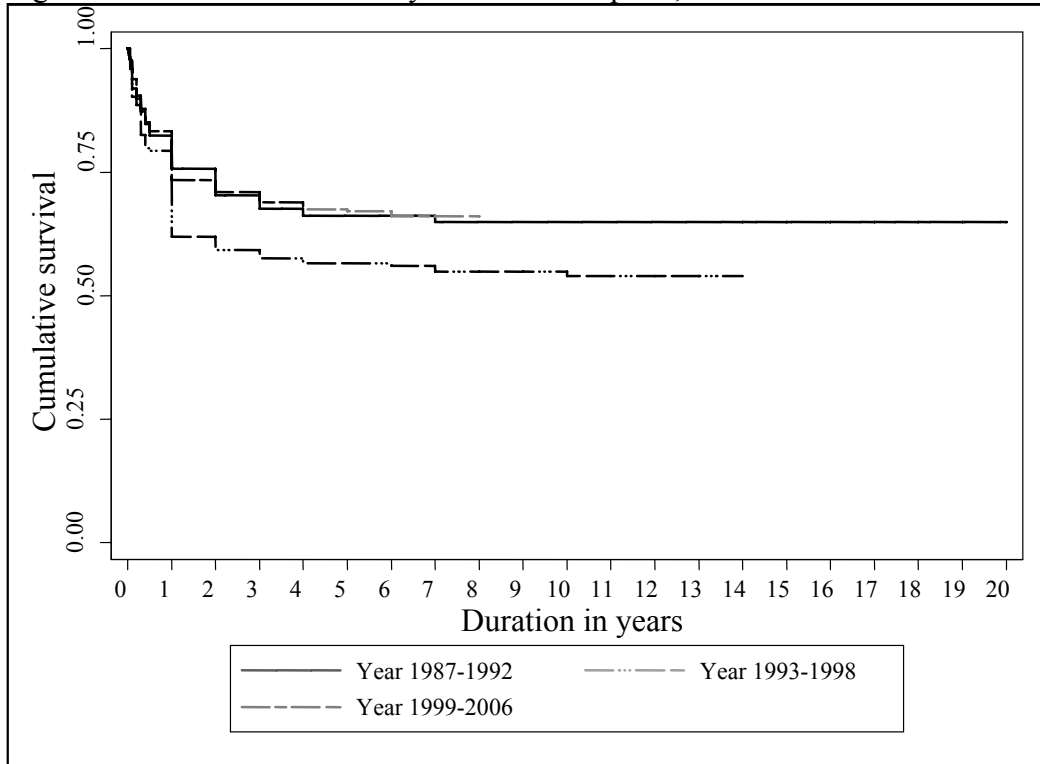


Figure 1.4.2: Patient Survival by Gender, 1987-2006

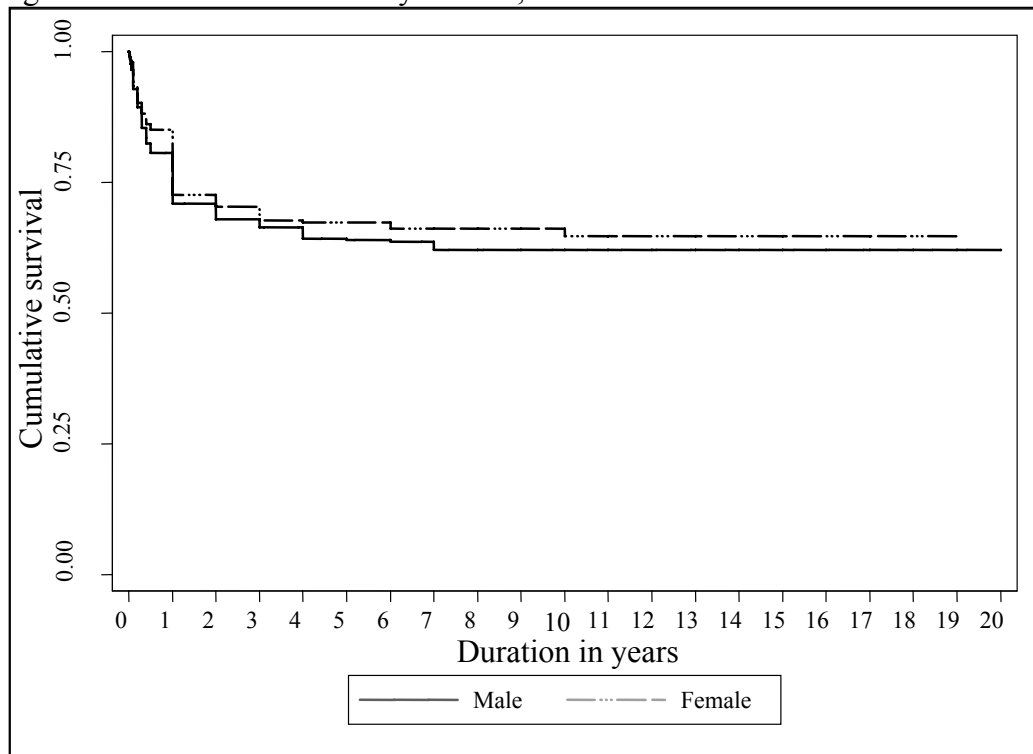


Figure 1.4.3: Patient Survival by Age Group, 1987-2006

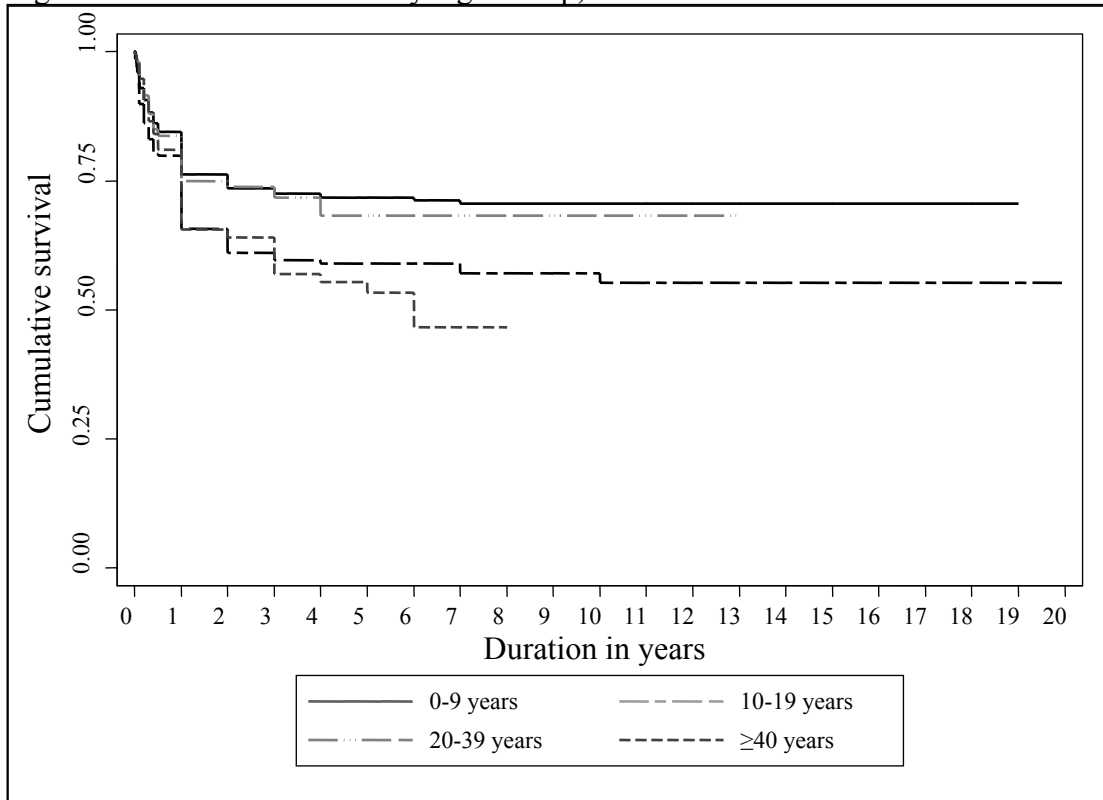
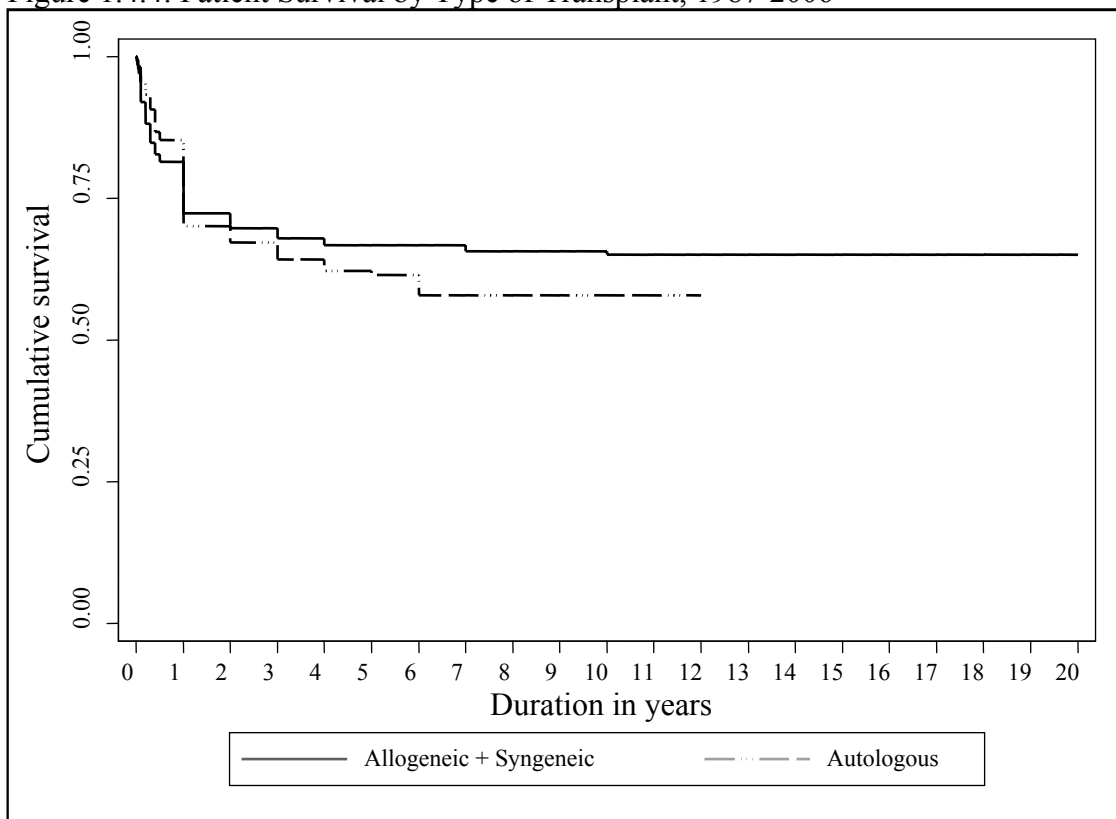


Figure 1.4.4: Patient Survival by Type of Transplant, 1987-2006



1.5 DISEASE-FREE SURVIVAL

This section shows the breakdown of disease-free survival by disease category. For malignant disorders like Acute Myeloid Leukaemia and Non-Hodgkin’s Lymphoma, where there were allogeneic or autologous donors, the outcome with allogeneic transplants was superior to autologous transplants. The remaining malignant disorders were all treated with allogeneic transplants.

Generally outcome for paediatric patients was superior to adult patients for most diseases except for Acute Lymphoblastic Leukaemia and Aplastic Anaemia.

Figure 1.5.1: Disease-free Survival for Acute Myeloid Leukaemia, 1987-2006 (Allogeneic vs. Autologous)

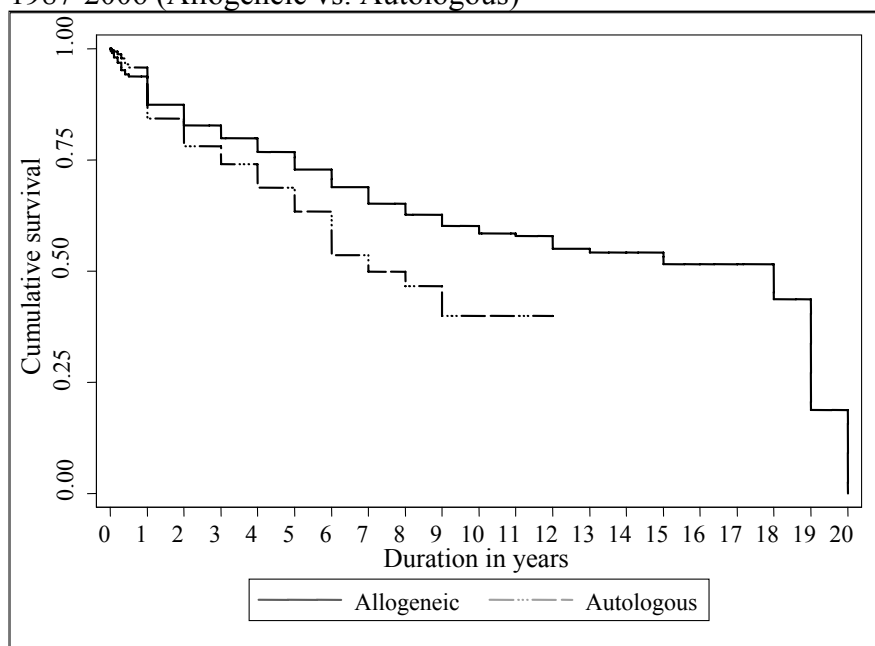


Figure 1.5.2: Disease-free Survival for Acute Lymphoblastic Leukaemia, 1987-2006 (Allogeneic)

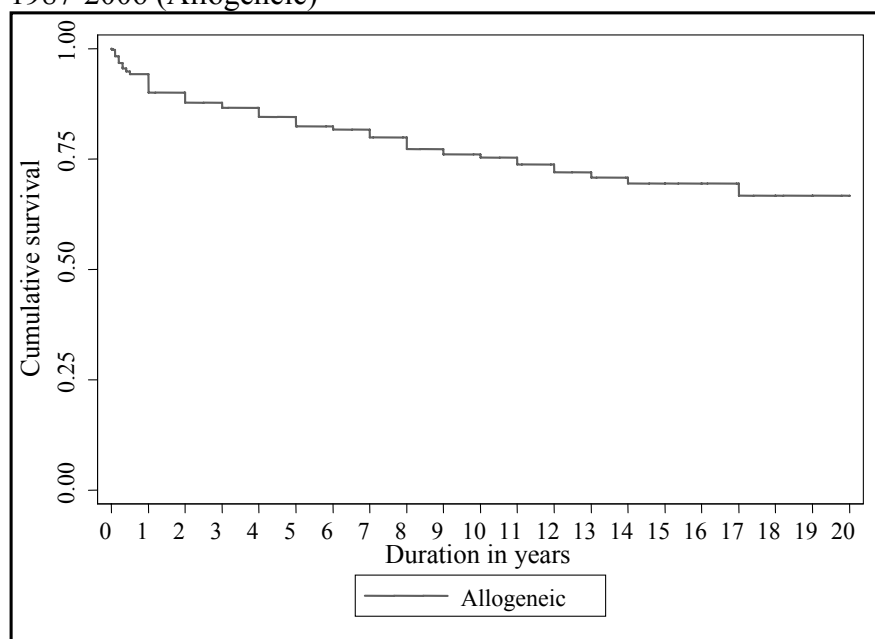


Figure 1.5.3: Disease-free Survival for Thalassaemia, 1987-2006 (Allogeneic)

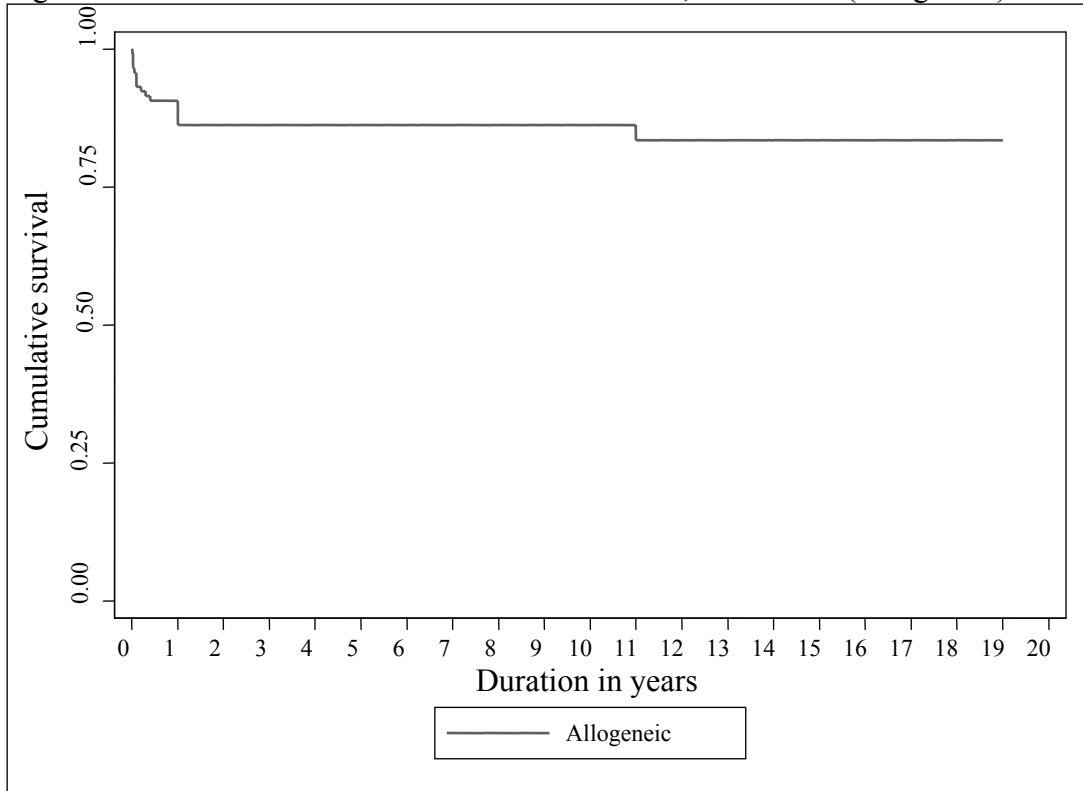


Figure 1.5.4: Disease-free Survival for Non-Hodgkin's Lymphoma, 1987-2006 (Allogeneic vs. Autologous)

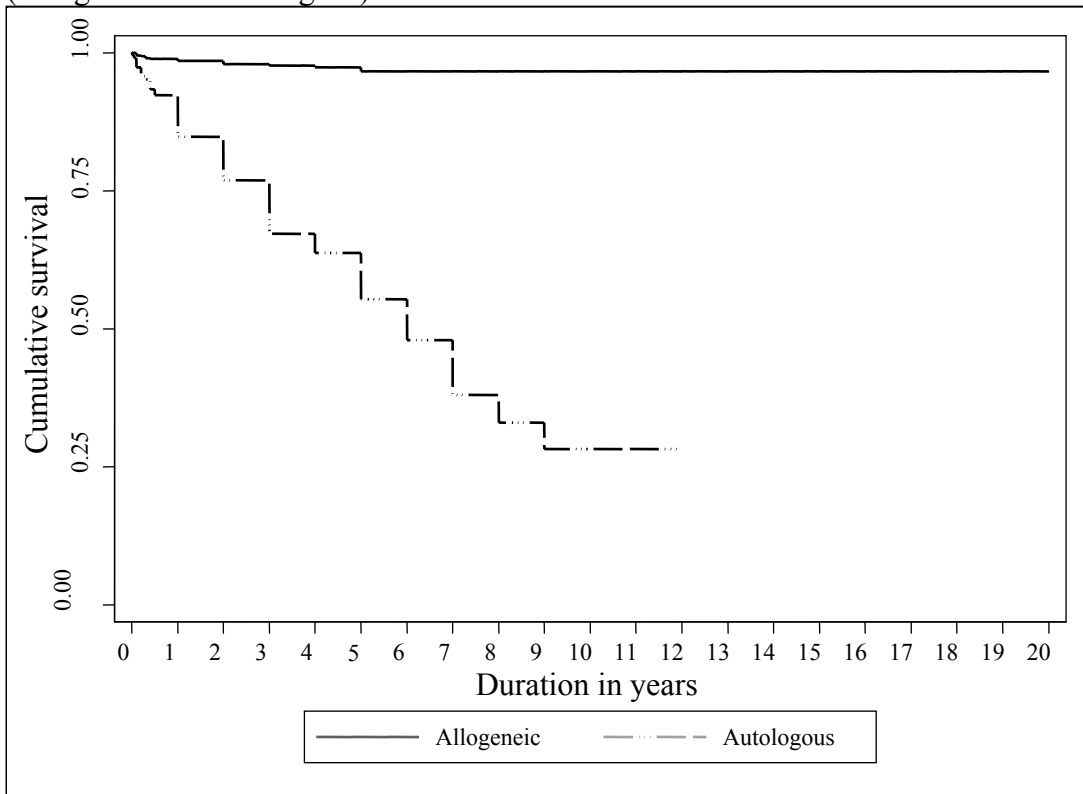


Figure 1.5.5: Disease-free Survival for Hodgkin's Disease, 1987-2006 (Autologous)

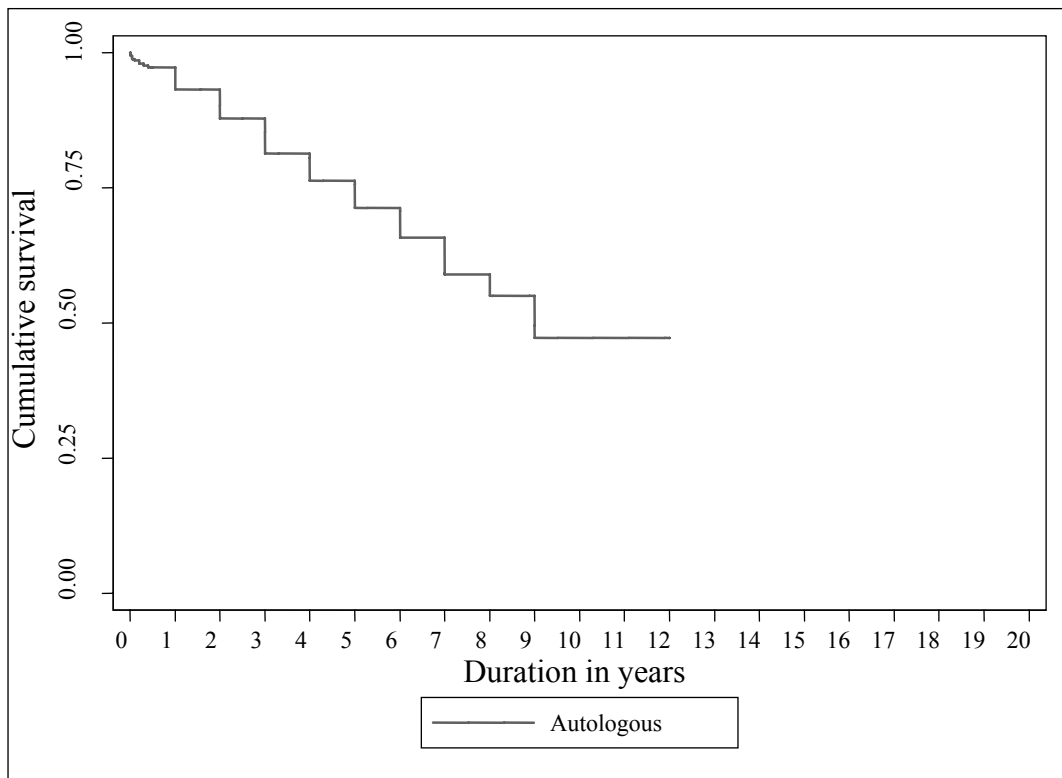


Figure 1.5.6: Disease-free Survival for Chronic Myeloid Leukaemia, 1987-2006 (Allogeneic)

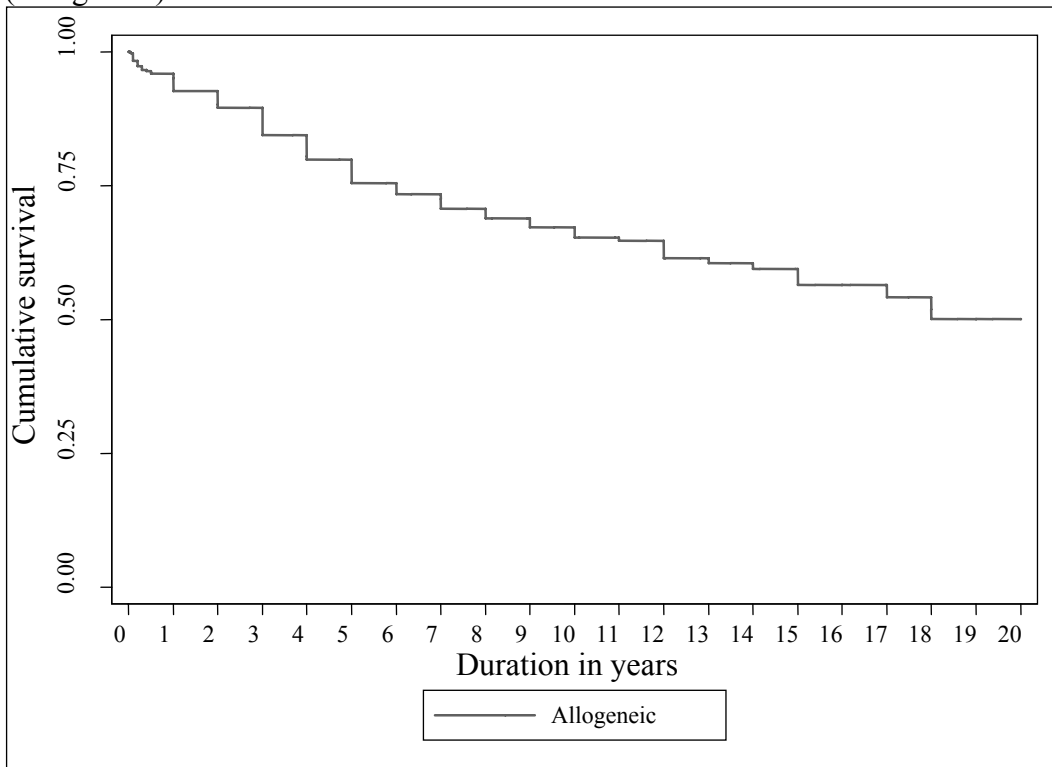


Figure 1.5.7: Disease-free Survival for Aplastic Anaemia, 1987-2006 (Allogeneic)

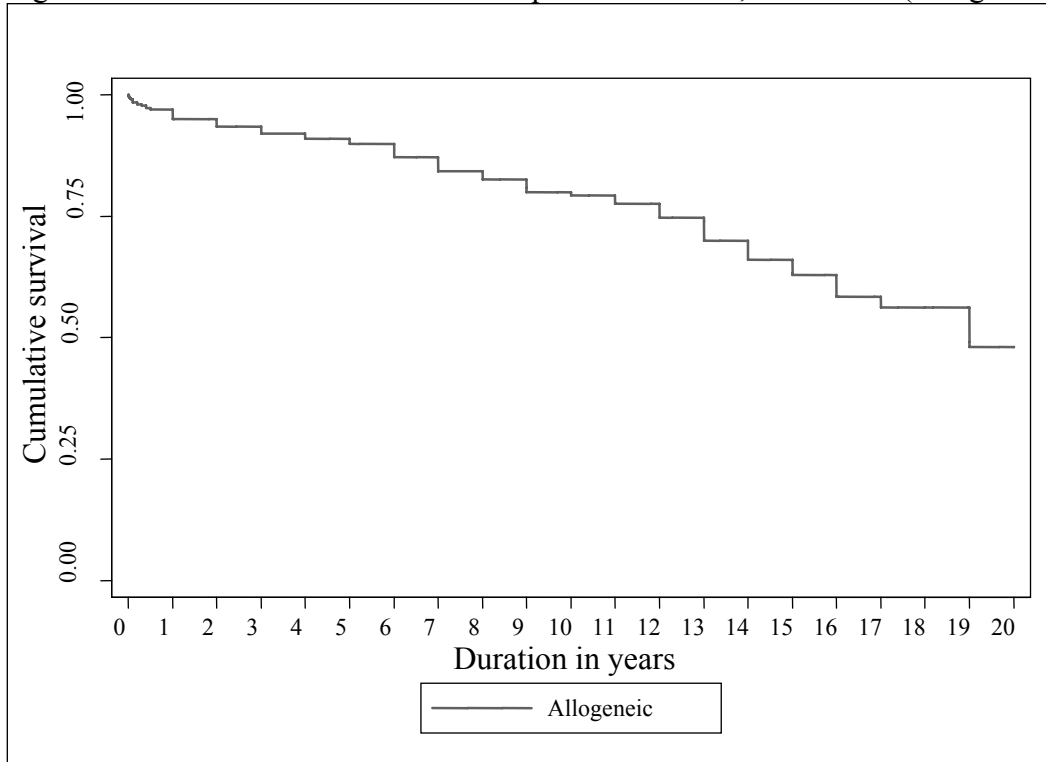
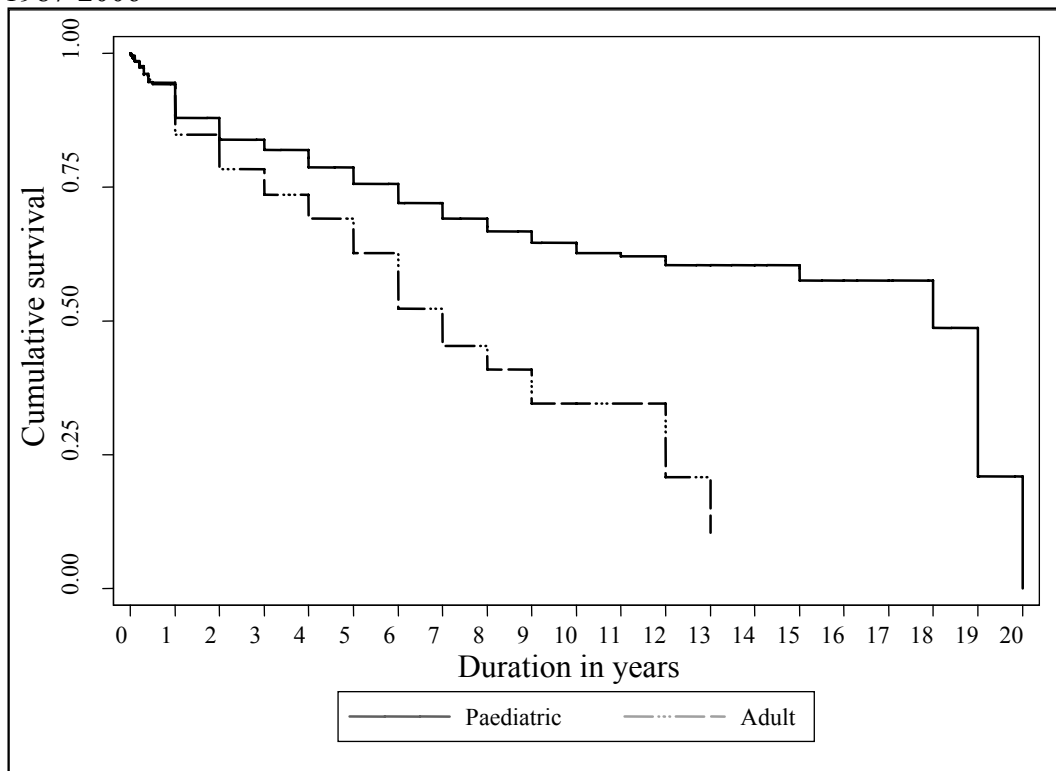
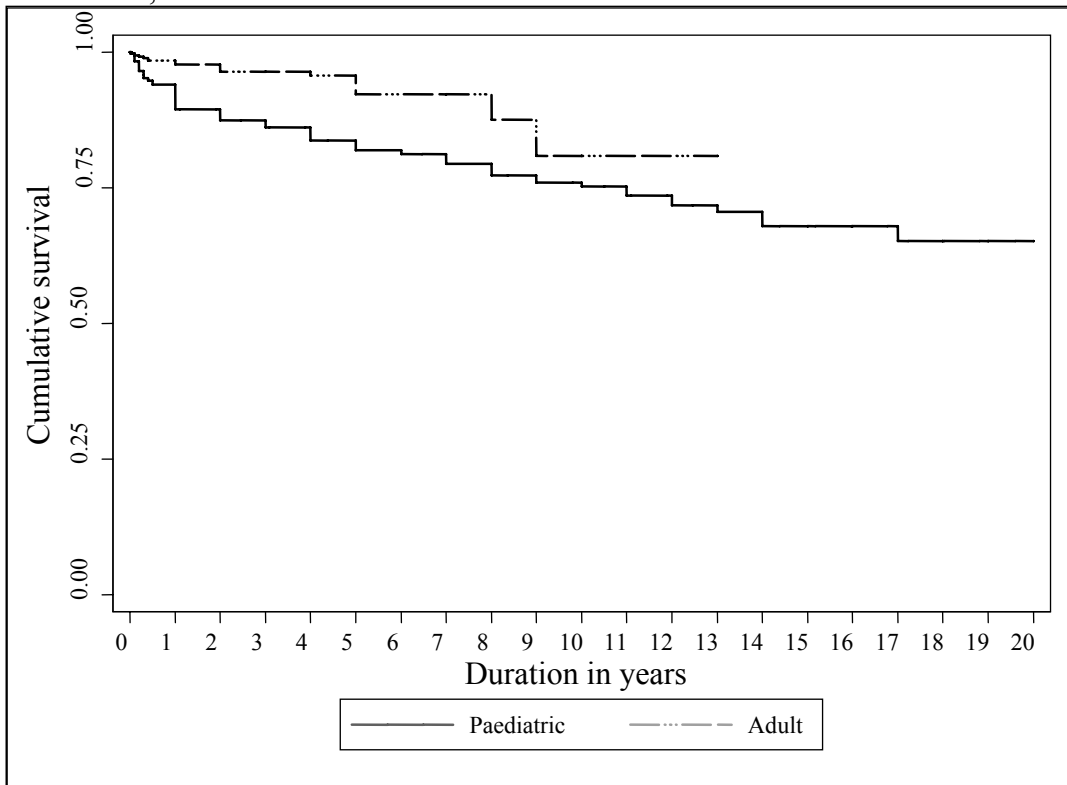


Figure 1.5.8: Disease-free Survival by Age Group for Acute Myeloid Leukaemia, 1987-2006



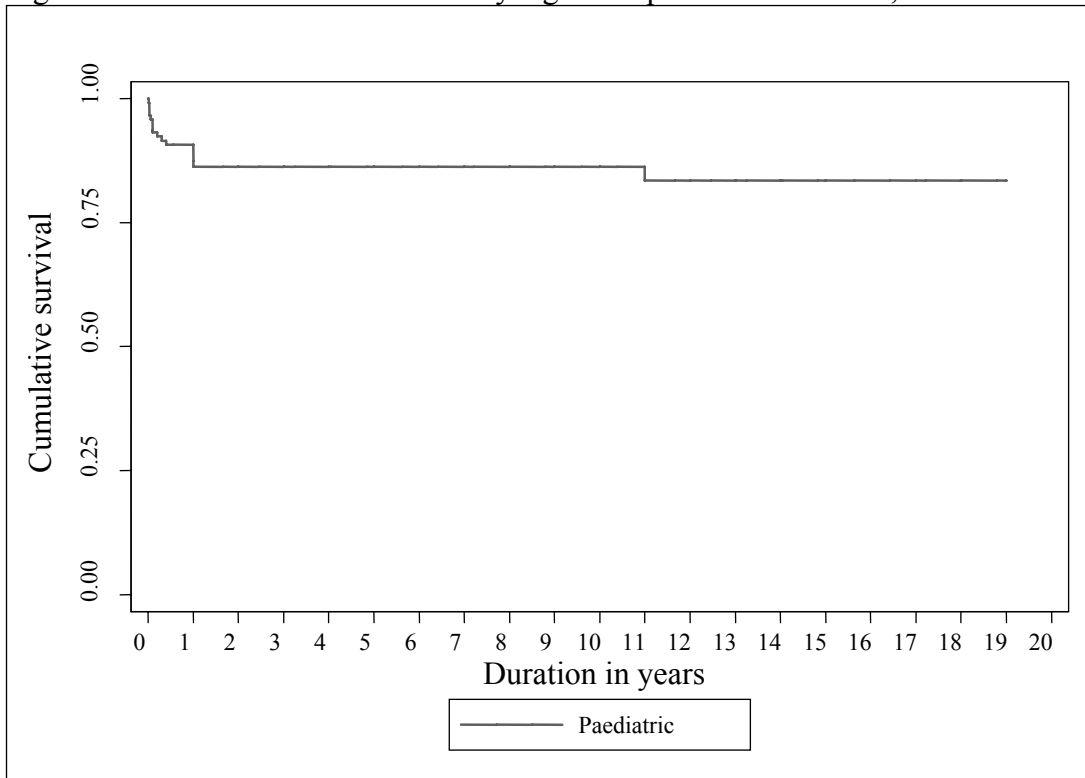
Paediatric is defined as age ≤ 18 years and adult age > 18 years

Figure 1.5.9: Disease-free Survival by Age Group for Acute Lymphoblastic Leukaemia, 1987-2006



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

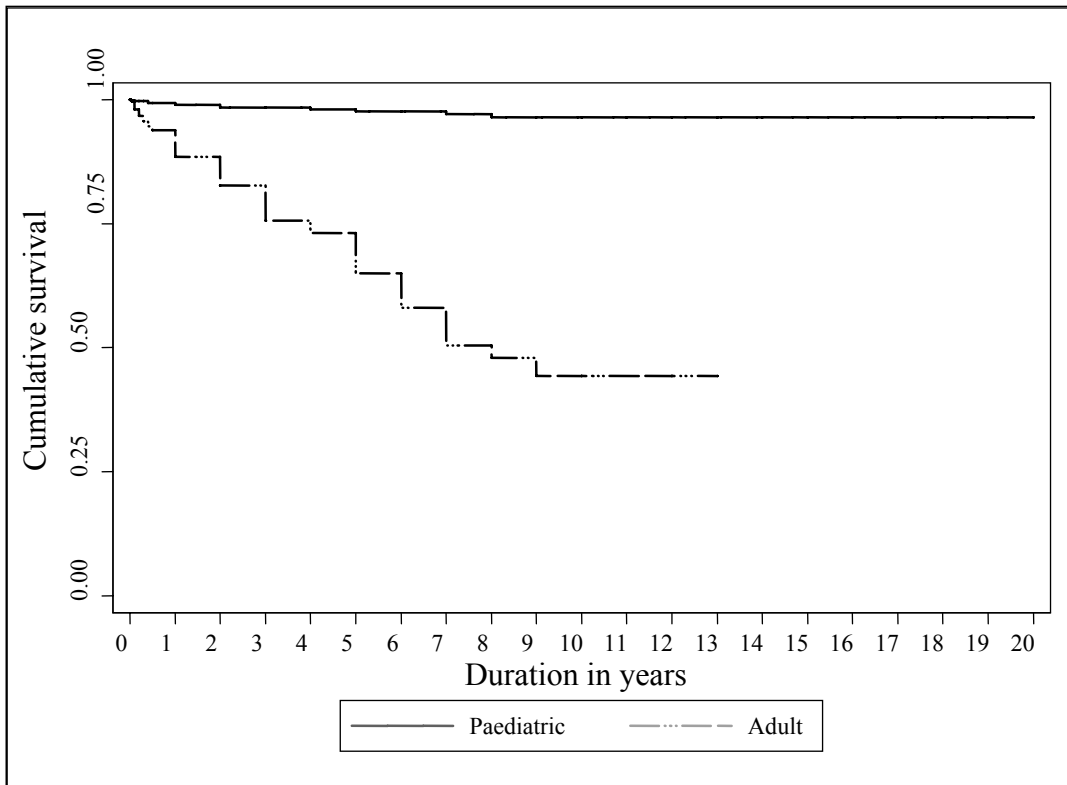
Figure 1.5.10: Disease-free Survival by Age Group for Thalassaemia, 1987-2006



* No adult cases reported for Thalassaemia

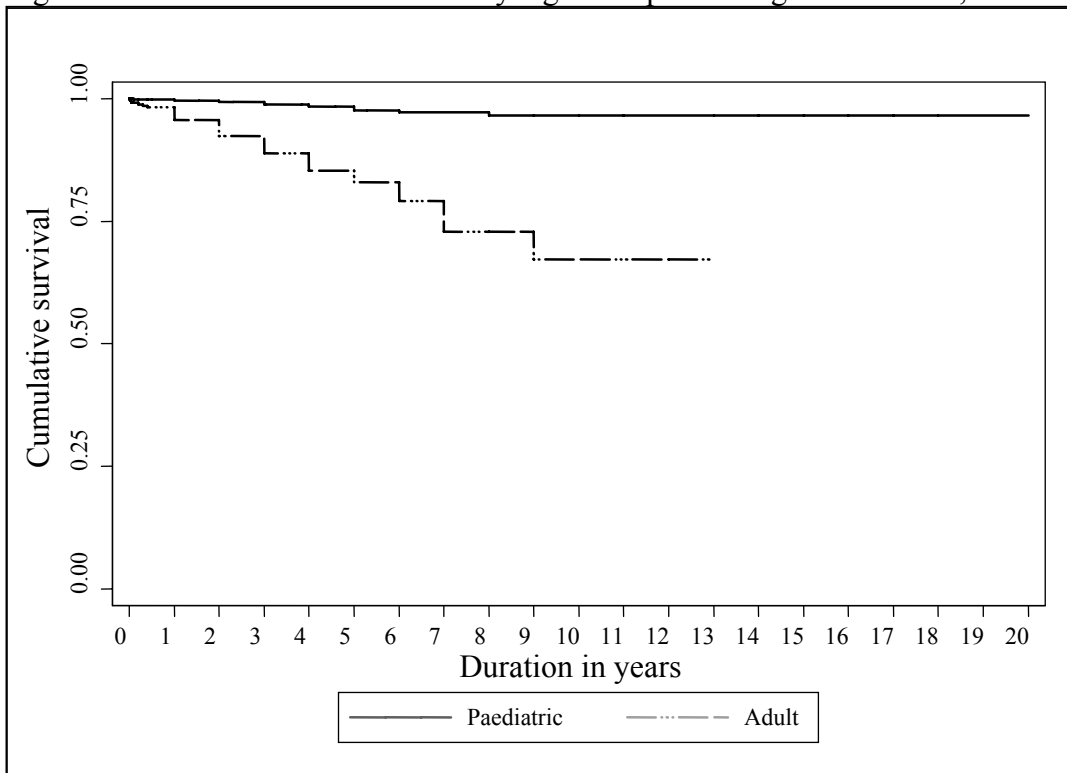
Paediatric is defined as age ≤ 18 years and adult age > 18 years

Figure 1.5.11: Disease-free Survival by Age Group for Non-Hodgkin's Lymphoma, 1987-2006



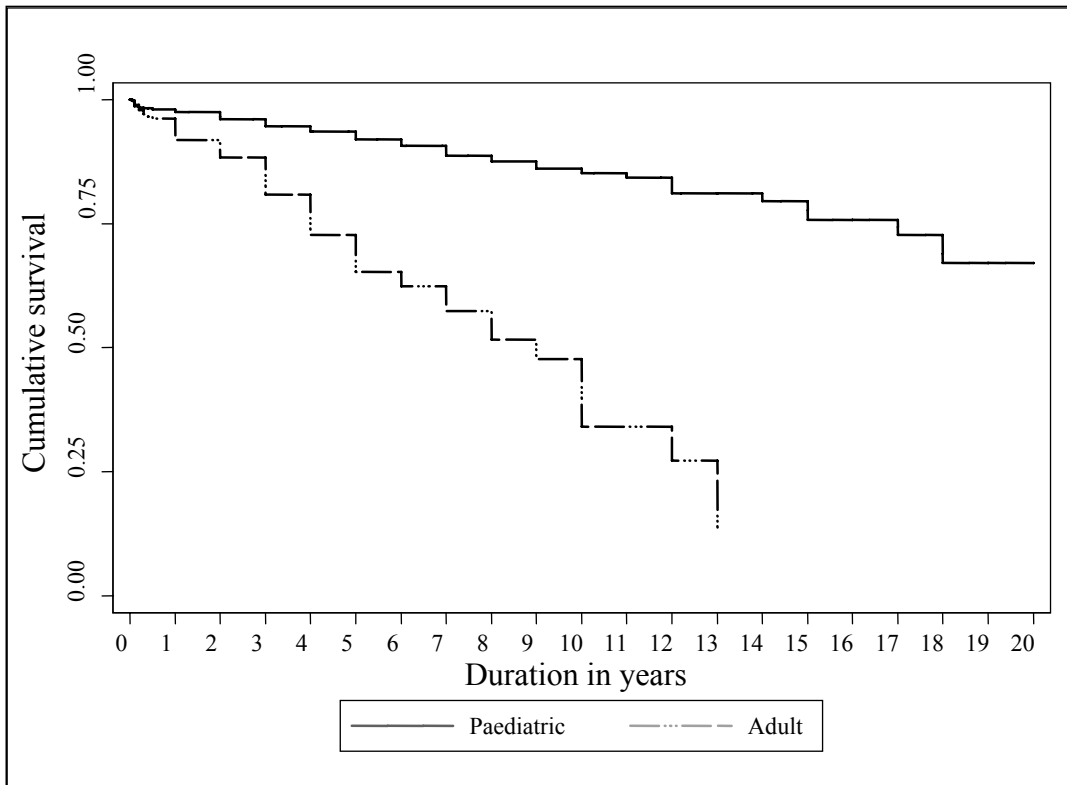
Paediatric is defined as age ≤ 18 years and adult age > 18 years

Figure 1.5.12: Disease-free Survival by Age Group for Hodgkin's Disease, 1987-2006



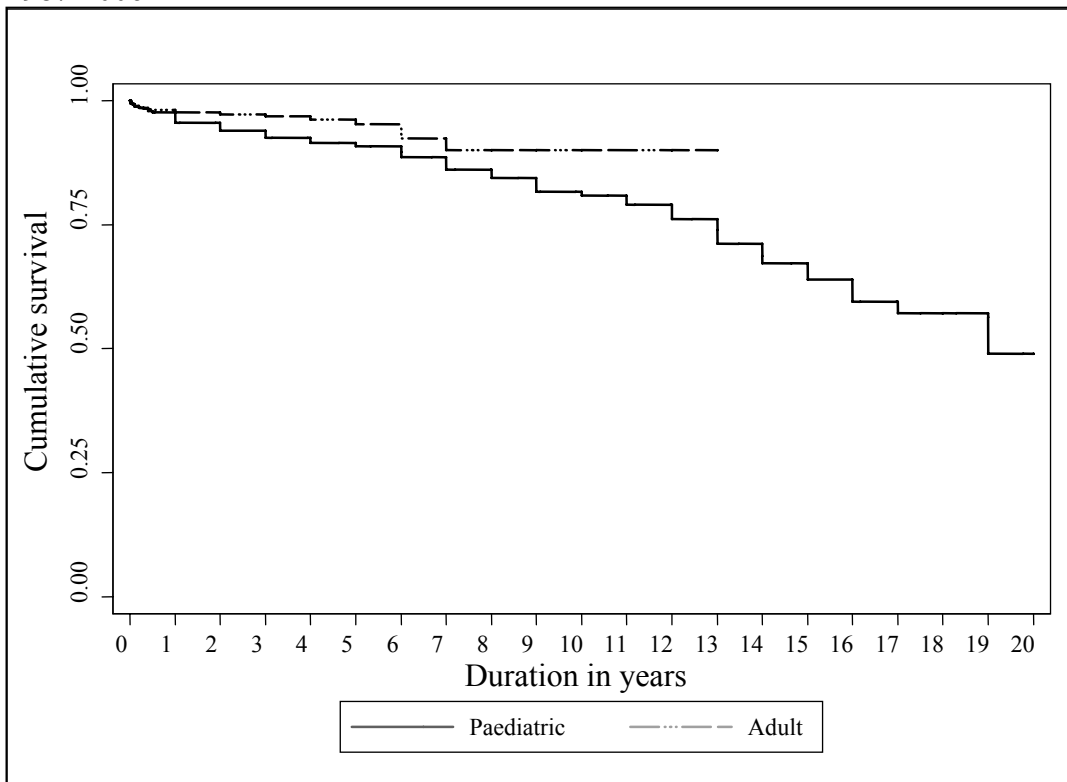
Paediatric is defined as age ≤ 18 years and adult age > 18 years

Figure 1.5.13: Disease-free Survival by Age Group for Chronic Myeloid Leukaemia, 1987-2006



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

Figure 1.5.14: Disease-free Survival by Age Group for Aplastic Anaemia, 1987-2006



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