KIDNEY DIALYSIS FOUNDATION

ANNUAL REPORT

MEDICAL

2006

Prepared by

Dr Choong Hui Lin
Medical Director

With input from:

Theresa Soh
Manager, Patient Services

Lay Kwee Chin
Sr Executive, Patient Services

Aton Din
Nurse Educator

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

2. INTRODUCTION

3. THE DIALYSIS CENTRES

- Bishan
- Kreta Ayer - San Wang Wu Ti
- Peritoneal Dialysis Centre

I. HAEMODIALYSIS PROGRAMME

4. STAFFING

5. EQUIPMENT

6. PATIENT CARE

7. PATIENT POPULATION

- Intake and Exits
- Demographic characteristics
- Survival
- Dialysis Parameters
- Dialysis Adequacy
- Vascular Access
- Anemia
- Nutrition
- Renal Bone Disease
- Diabetic
- Hypertension
- Hyperlipidemia
- Infection - Hepatitis
- Transplant Waiting List

8. CONCLUSON

1. EXECUTIVE SUMMARY (to do when the whole report is finished)

The Kidney Dialysis Foundation runs 3 dialysis centres at Alexandra Hospital from 1996, Bishan 1997 and Kreta Ayer Road – San Wang Wu Ti centre, September 2003. The Alexandra Hospital centre closed down in April 2005 with patients transferred to the other two centres.

Two dialysis providers, Asia Renalcare and Fresenius, have been contracted to provide dialysis care. Medical care is provided by private sector as well as public sector nephrologists. Majority of the patients originate from SGH. In 2006, there were 13 new entrants.

Twenty four patients exited the programme (10 transplants, 11 deaths, 3 transfers to PD programme). In the prevalent population, average age was 52.3 $\pm$ 10 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 59.6%, diabetic nephropathy 17.4%. Overall first year survival of patients was 95.5% and five year survival 84.3%. 5 year survival in diabetics was 75.5% compared with 86.5% in non diabetics.

All patients are using high flux dialysers. Average blood flow was 274 $\pm$ 34 ml/min. 73.3% of patients dialyse 4 hours or more. 81.2% of patients use a native arteriovenous fistula. Dialysis adequacy as measured by single pool KT/V is >1.2 in 99.4% of patients.

Mean hemoglobin was 10.8 g/dl. About 83% of all patients are on EPO. Less than 10% of patients (6.7%) are considered Fe deficient.

77.6% of patients have a S Albumin of <40 g/l. Hyperparathyroidism and hyper-phosphatemia remains a problem. More patients are on intravenous Vitamin D.

Diabetes as a comorbidity was present in 21.1% of the population. 68.3% were on treatment for hypertension.

There was no significant changes in virology status. Hep B positivity was 6.2%, HCV 10.6%, HepB and HCV 1.2%.

Less patients were registered on the National Transplant waiting list (30.4%), likely due to more patients having comorbidities in an aging population.

2. INTRODUCTION

The Kidney Dialysis Foundation started operations in 1996 with only one centre at Alexandra Hospital. This was a centre originally managed jointly by the Renal Department at the SGH providing medical cover and nursing staff from Alexandra Hospital under the Ministry of Health (MOH). On 17 April 96 when the center was taken over from MOH, the care of twenty-eight (28) patients was transferred to the KDF. Bishan Dialysis Centre commenced operation on November/December 1997 with forty- three (43) patients from the former Tan Tock Seng Dialysis Centre.

Originally Renalcare Holdings Pte Ltd provided the dialysis service by contract. They also won the first tender to supply haemodialysis services in 1997 for a period of three years. In 2000, the tender was opened with an option to quote for three and 5 years. After much deliberation, the tender for Alexandra Hospital Centre was awarded to Fresenius Medicare and Bishan Centre to Asia Renal Care (the company which had absorbed Renalcare Holdings).

KDF started operations in its third centre called the San Wang Wu Ti - KDF Centre on 1 Sept 03. It was built from funds donated from Sang Wan Wu Ti Religious Society. The idea was first mooted in 2000. Numerous site visits were made to assess suitability as the location was an old HDB block with many physical constraints. Tenders were called in the second half of 2001. Fresenius Medical Care was awarded the tender for supply of dialysis machines and Baxter Healthcare the dialysis chairs. A local company, Memiontec Pte Ltd, was awarded the tender for the RO water treatment system. Renovation works were started in October 2002 after all the necessary approvals were obtained. Fresenius Nephrocare was awarded the tender as dialysis provider. Eight patients were subsequently transferred from Alexandra Hospital Centre.

KDF's first Peritoneal Dialysis Centre is also located at the Kreta Ayer Centre and was renovated with generous donations from the Khoo Foundation and Singapore Pools Pte Ltd. The Khoo Foundation also continues to contribute to the deficit funding of the Centre. The PD Centre obtained its license on 7 May 2003 but because of the SARS outbreak, it only became operational on 1 July 2003. The dialysis service is contracted out to a dialysis provider and the current provider is Baxter Healthcare Pte Ltd.

In January 2005, KDF was informed of the decision by Alexandra Hospital that the lease for the premises on which the dialysis centre was situated will not be renewed. The last day of operation was on 25 April 2005.

Dialysis medical care is provided by a team of 14 doctors who are all practicing nephrologists from SGH, NUH, TTSH and the private sector.

Paramedical support for the past year was from Ms Theresa Soh (Manager of Patient Services), Ms Lay Kwee Chin (Senior Executive, Patient Services) and Ms Aton Din (Nurse Educator). Ms Janice Soon (Welfare Executive) was in charge of patient administration and welfare until Oct 2006. Ms Diana Lee (Welfare Executive) joined in Mar 06.
Dietetic counseling was provided for under the contract with the dialysis providers. The dieticians assigned were Ms Wong Yue Feng by Asia Renalcare and Ms Liow Min Choo by Fresenius Medical Care.

This report covers medical data collated at the end of 2006.

3. THE DIALYSIS CENTRES

.
The location and prevalent number of patients are listed below:

	Centre	Location	Patient No
1	KDF-Bishan Centre	Block 197, Bishan Street 13 #01-575/583	88
2	San Wang Wu Ti – KDF Centre	Block 333, Kreta Ayer Road #03-33	73
3	KDF-Peritoneal Dialysis Centre	Block 333, Kreta Ayer Road #03-33	75

All haemodialysis centres operate 6 days a week, 3 shifts a day from Monday to Saturday inclusive of Public Holidays.

KDF will be setting up another haemodialysis centre at Ghim Moh to replace the Alexandra Hospital centre by mid 2007.

HAEMODIALYSIS PROGRAMME

4. STAFFING

MEDICAL

The medical staff comprises a pool of 14 nephrologists from both the restructured hospitals as well as the private sector. They are rostered to do rounds in the centre as well as screen new patients for medical suitability for entry into the dialysis programme if there has been no assessment performed at the restructured hospitals. Routinely, dialysis patients are seen once every month.

The nephrologists include:

1. Dr Chan Choong Meng
2. Dr Stephen Chew
3. A/Prof Lina Choong
4. Dr Marjorie Foo
5. Dr Ho Chee Khun
6. Dr Terence Kee
7. Dr Titus Lau
8. Dr Grace Lee
9. Dr Pary Sivaraman
10. Dr Pwee Hock Swee
11. Dr Tan Han Khim
12. Dr Tan Seng Hoe
13. Dr Yeoh Lee Ying
14. A/Prof A. Vathsala

Drs Beatrice Chen and Fred Lam decided against continuing their appointments as Visiting Nephrologist.

Urgent medical cover was arranged as follows:

Bishan Centre:

1. Dr Goh Ming Kiong – Lifeline Medical Group
2. Dr Woo Kim Fatt – Agape Clinic

Kreta Ayer Centre:

1. Dr Chua Thiam Eng – Cambridge Clinic
2. Dr Lai Li Cheng – Chinatown Clinic
3. Dr Chong Foong Chong – Grace Clinic

NURSING

The overall standard of nursing is overseen by Ms Theresa Soh as Patient Services Manager and assisted by Ms Lay Kwee Chin (Patient Services, Senior Executive) and Aton Din (Nurse Educator). Routine audits are performed on the provider to maintain standards. The Dialysis Providers are:

- Fresenius Medicare at Alexandra Hospital Centre (AH) until it closed down and San Wang Wu Ti (Kreta Ayer) Centre
- Asia Renalcare Pte Ltd at Bishan Centre

The current dialysis provider contract for Bishan Centre awarded to Asia Renalcare was renewed in March 2006. This will be for another 5 years till February 2011.

The Dialysis Provider is responsible for rostering of the nursing personnel as at 31 Dec 2006 is listed as follows:

Centre	Renal trained	SN	AN	DT	Total
Bishan	2	8	2	5	17
SWWT	1	7	5	2	15
Grand total					32

Training & Education

The Nurse Educator together with the Patient Services Manager and Senior Nursing Sisters are responsible for Training & Education for the Nursing staff. This is discussed in the Nursing report.

DIETETICS

One of the provisions in the latest tender for dialysis provider was that of a dietetic service to our patients. Patients are seen at least once in 3 months at the centre. The dieticians assigned were Ms Wong Yue Feng by Asia Renalcare and Ms Liow Min Choo by Fresenius Medical Care.

5. EQUIPMENT

DIALYSIS MACHINES

There are in total 40 dialysis machines.

These were located as follows:

	Baxter 1550	Baxter Tina	Fresenius 4008S
Bishan	5	11	7
Kreta Ayer	0	0	17

WATER TREATMENT SYSTEMS

The water treatment system in Bishan Centres is serviced by Waterman Pte Ltd while that in Kreta Ayer SWWT center is by Memiontec Pte Ltd.

Both centres use the Reverse Osmosis System. Pretreatment comprises of backwashable multimedia, activated carbon filter, regenerable water softener and pre cartridge filter before entering the RO membranes via high pressure pumps to allow reverse osmosis to take place. This removes most of the dissolved solids from the feed water. The product water then passes through 0.2 micron filter to be distributed to the dialysis stations. The distribution piping is a closed loop system.

At the end of each dialysis day the system undergoes auto-washing and flushing before going onto standby mode.

REUSE EQUIPMENT

Reuse is practiced using the Renatron Reprocessing machines. Dialysers from hepatitis positive patients are not mixed with those from serologically negative patients during washing.

There are in total 6 Renatron machines in the two centres (three each) linked to the Renalog Reprocessing Management (RM).

The Renalog RM dialyzer reprocessing management software is a window-based system that provides capabilities to analyze and manage automatic and manual dialyzer reuse operations. Renalog RM is able to provide different standard or specific reports that can be printed, viewed and exported to editable file formats.

The Renalog RM dialyzer reprocessing management software is a window-based system that provides capabilities to analyze and manage automatic and manual dialyzer reuse operations. Renalog RM is able to provide different standard or specific reports that can be printed, viewed and exported to editable file formats.

6. PATIENT CARE

SOCIAL WELFARE

Patients continue to receive subsidies for dialysis fees and erythropoietin and Calcijex on a case by case basis.

Five received civil service benefits.

DIALYSIS REVIEWS

Apart from the rounds which are carried out on a monthly basis by the doctors, a yearly dialysis review performed for every patient with the Medical Director, Patient Services Manager or designee and Staff Nurse in charge of the patient.

7. THE PATIENT POPULATION

As at 31 December 2006, we had 161 patients dialysing in 2 centres – 88 patients at Bishan Centre (BS) and 73 patients at Kreta Ayer (SWWT).

In certain reports, the prevalent population has been listed as 165 compared with the actual figure of 161. The data will include 4 patients who were transplanted at the end of the year.

INTAKE AND EXITS

The following table shows the intake and exit of patients by year.

Table 1 – Patient Stock & Flow

ENTRY	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
New Cases	32	51	25	18	27	16	10	5	18	5	10
New Cases (interim)									1	6	3
Transfers in from SDDU	28	43	1	0	0	0	0	0	0	0	0
Re-enter KDF	0	1	1	0	2	1	0	3	0	0	0
Total Entries	**60**	**96**	**27**	**18**	**29**	**17**	**10**	**8**	**19**	**11**	**13**
EXIT											
Transfer Out to non-KDF Programs	1	1	2	7	3	5	2	2	2	3	0
Transfer Out to KDF PD										5	3
Transplant	0	0	4	7	7	2	2	2	3	6	10*
Withdraw from Dialysis/Default	0	1	3	1	0	1	1	0	0	1	0
Deaths	2	8	3	2	9	4	5	4	6	5	11
Total Exits	**3**	**10**	**12**	**17**	**19**	**11**	**10**	**8**	**11**	**20**	**24**
Total No of Pt	**57**	**143**	**158**	**159**	**169**	**174**	**174**	**174**	**182**	**172**	**161**

* Local deceased donor

.

Table 2 – Source of Referral

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SDDU	28	43	1	0	0	0	0	0	0	0	0
SGH	26	45	26	17	25	15	6	5	19	8	10
NUH	5	2	0	1	4	2	3	3	0	0	2
TTSH										2	1
Private	1	5	0	0	0	0	1	0	0	1	0
Total Entries	**60**	**95**	**27**	**18**	**29**	**17**	**10**	**8**	**19**	**11**	**13**

We supported patients on interim haemodialysis while awaiting living related transplant as well as patients waiting to enter the KDF Peritoneal Dialysis program as long as they were suitable for satellite dialysis

Thirteen (13) patients were admitted to the programme in 2006: one transferred from a private centre, another failed peritoneal dialysis (peritonitis); the rest initiated dialysis only recently. Of the latter group, three had interim hemodialysis while awaiting peritoneal dialysis.

DEMOGRAPHIC & PATIENT CHARACTERISTICS

Etiology of Renal Failure

The etiology of renal failure in new and prevalent patients was as follows:

Table 3 – Etiology of Renal Failure in New Patients

	2002		2003		2004		2005		2006	
Etiology	**N**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chronic glomerulonephritis	3	*30.0*	5	*62.5*	6	*31.6*	*1*	*9.1*	4	*30.8*
Diabetic nephropathy	2	*20.0*	0	*0*	7	*36.8*	*6*	*54.5*	6	*46.2*
Lupus nephritis	0	*0*	0	*0*	1	*5.3*	*1*	*9.1*	0	*0*
Obstructive uropathy	1	*10.0*	0	*0*	0	*0*	*0*	*0*	0	*0*
PCKD	0	*0*	0	*0*	1	*5.3*	*1*	*9.1*	0	*0*
TB kidney	0	*0*	1	*12.5*	0	*0*	*0*	*0*	0	*0*
Hypertension									2	*15.4*
Others	2	*20.0*	2	*25.0*	0	*0*	*2*	*18.2*	1	*7.7*
Unknown Etiology	2	*20.0*	0	*0.0*	4	*21.1*	*0*	*0*	0	*0*
Total	10	*100.0*	8	*100.0*	19	*100.0*	*11*	*100.0*	13	*100.0*

As in last year, the majority of new cases were patients with diabetes mellitus (46.2%).

Table 4 – Etiology of Renal Failure in Prevalent Patients

	2002		2003		2004		2005		2006	
Etiology	**N**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chr glomerulonephritis	102	*58.6*	105	*60.3*	103	*56.6*	100	*58.4*	96	*59.6*
Diabetic nephropathy	22	*12.6*	21	*12.1*	27	*14.8*	29	*16.8*	28	*17.4*
Lupus nephritis	10	*5.7*	10	*5.7*	10	*5.5*	10	*5.8*	9	*5.6*
Obstructive uropathy	3	*1.7*	1	*0.6*	1	*0.5*	1	*0.6*	0	*0.0*
PCKD	7	*4.0*	5	*2.9*	5	*2.7*	4	*2.3*	2	*1.2*
TB kidney	1	*0.6*	2	*1.1*	2	*1.1*	2	*1.2*	1	*0.6*
VUR	3	*1.7*	5	*2.9*	5	*2.7*	3	*1.7*	2	*1.2*
Others	5	*2.9*	5	*2.9*	5	*2.7*	2	*1.2*	9	*5.6*
Unknown Etiology	21	*12.1*	20	*11.5*	24	*13.2*	21	*12.1*	14	*8.7*
Total	174	*100*	174	*100*	182	*100*	172	*100*	161	*100*

Majority of patients (60%) have chronic glomerulonephritis as the primary etiology of renal failure. Patients with diabetic nephropathy have remained at around 17%.

Gender

Table 5 – Gender of New Patients

	2002		2003		2004		2005		2006	
Gender	**n**	**%**	**N**	**%**	**N**	**%**	**n**	**%**	**n**	**%**
Males	6	*60.0*	4	*50.0*	4	*21.1*	6	*54.5*	4	30.8
Females	4	*40.0*	4	*50.0*	15	*78.9*	5	*45.4*	9	69.2
Total	10	*100.0*	8	*100.0*	19	*100.0*	11	*100.0*	13	*100.0*

Table 6 – Gender of Prevalent Patients

	2002		2003		2004		2005		2006	
Gender	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Males	92	*52.9*	89	*51.1*	88	*48.4*	83	*48.0*	72	*44.7*
Females	82	*47.1*	85	*48.9*	94	*51.6*	90	*52.0*	89	*55.3*
Total	174	*100.0*	174	*100.0*	182	*100.0*	173	*100*	161	*100*

At the end of 2006, the ratio of male to female patients was 72:89. Males number less than females.

Ethnic Distribution

Table 7 – Ethnic Distribution of New Patients

	2001		2002		2003		2004		2005		2006	
Race	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*
Chinese	15	*88.2*	9	*90.0*	4	*50.0*	17	*89.5*	10	*90.9*	10	*76.9*
Malay	2	*11.8*	1	*10.0*	4	*50.0*	1	*5.3*	1	*9.1*	1	*7.7*
Indian	0	*0*	0	*0*	0	*0*	1	*5.3*	0	*0*	2	*15.4*
Others	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*
Total	17	*100.0*	10	*100.0*	8	*100.0*	19	*100.0*	11	*100.0*	13	*100.0*

Table 8 – Ethnic Distribution of Prevalent Patients

	2001		2002		2003		2004		2005		2006	
Race	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*	**n**	*%*
Chinese	138	*79.4*	139	*79.9*	137	*78.7*	144	*79.1*	133	*77.5*	126	78.30
Malay	25	*14.3*	24	*13.8*	27	*15.5*	27	*14.8*	28	*16.2*	23	14.3
Indian	11	*6.3*	11	*6.3*	10	*5.7*	11	*6.0*	11	*6.4*	12	7.4
Others	0	*0*	0	*0.0*	0	*0.0*	0	*0*	0	*0*	0	0
Total	174	*100.0*	174	*100.0*	174	*100.0*	182	*100.0*	172	*100.0*	161	100

The ethnic distribution of our prevalent patients was 77.0% Chinese, 15.8% Malays and 7.3% Indians.

Age

Table 9: Average age of entry into the Programme

The mean age at entry in 2006 was 62.6 $\pm$ 11.8 years. This has increased significantly over the last 2 years.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mean Age (years)	43	47.9	37.3	42.3	42.1	43.1	43.4	41.5	46.6	52.7	62.6
SD	8.2	6.7	9.2	10.0	11	10.6	12.1	7.3	8.8	15.1	11.8

Table 10: Average age of Prevalent patients on the Programme

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mean Age (years)	44.2	42.8	45.1	46.0	47.2	46.7	47.3	48.1	48.7	50.1	52.3
SD	7.7	8.2	8.5	8.7	9.5	9.3	9.4	9.3	9.3	9.3	10.0

Age of the prevalent dialysis population at the end of 2006 was 52.3 $\pm$ 10.0 years. The mean prevalent age continues to rise as the existing population ages with a low turnover with influx of elderly new patients.

COMORBIDITY

Table 11: Common Comorbidities in Prevalent patients

Year	2004		2005		2006	
	n	%	N	%	n	%
Diabetics		17.6	31	17.9	36	21.8
IHD n other			18	10.4	33	20.0
CVA					7	4.2
PVD					5	3.0

There were a higher proportion of diabetics in the prevalent dialysis population compared with the previous year.

More patients also had cardiac problems.

This probably reflects the older population coming on to dialysis together with the aging prevalent patients.

DEATHS AND WITHDRAWALS

22 patients left the programme.

There were 11 deaths - 4 from cardiac causes including acute myocardial infarction, 4 from septicaemia, 1 - cardio respiratory failure, 1 - diabetic nephropathy, 1 - unknown.

Three patients were on interim haemodialysis while awaiting start of peritoneal dialysis.

8 patients were transplanted. All were cadaveric (deceased donor) transplants.

SURVIVAL

Patient survival was analysed by the Kaplan Meier method. There were a total of 308 entries (including re-entries) into the programme.

Overall first year survival was 95.5% and 5 year survival 84.3%.

Table 12 – Survival of entire program as analysed in years 1997 - 2005

Yr of analysis	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1 yr	89%	91%	95%	94.4%	94.9%	94.8%	94.9%	95.2%	95.4%	95.5%
2 yr	NA	88%	92%	90.6%	91.5%	91.6%	91.9%	92.3%	93.0%	92.9%
3 yr	NA	NA	91%	88.6%	89.7%	90.0%	89.8%	90.4%	91.3%	91.2%
4 yr	NA	NA	NA	88.6%	88.9%	87.2%	87.9%	87.6%	88.3%	87.8%
5 yr	NA	NA	NA	NA	83.4%	82.5%	83.0%	83.3%	84.5%	84.3%
10 yr	NA	NA	NA	NA	NA	NA	NA	NA	NA	63.8%

Fig 1: Overall Patient Survival

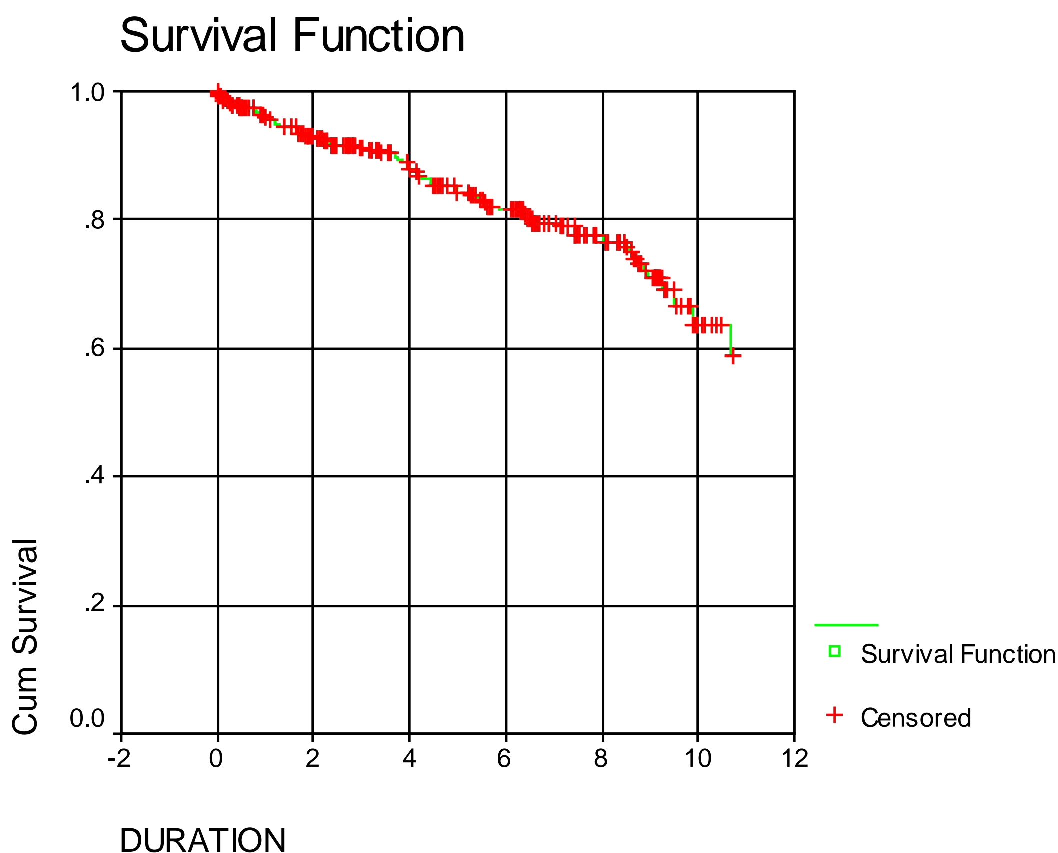
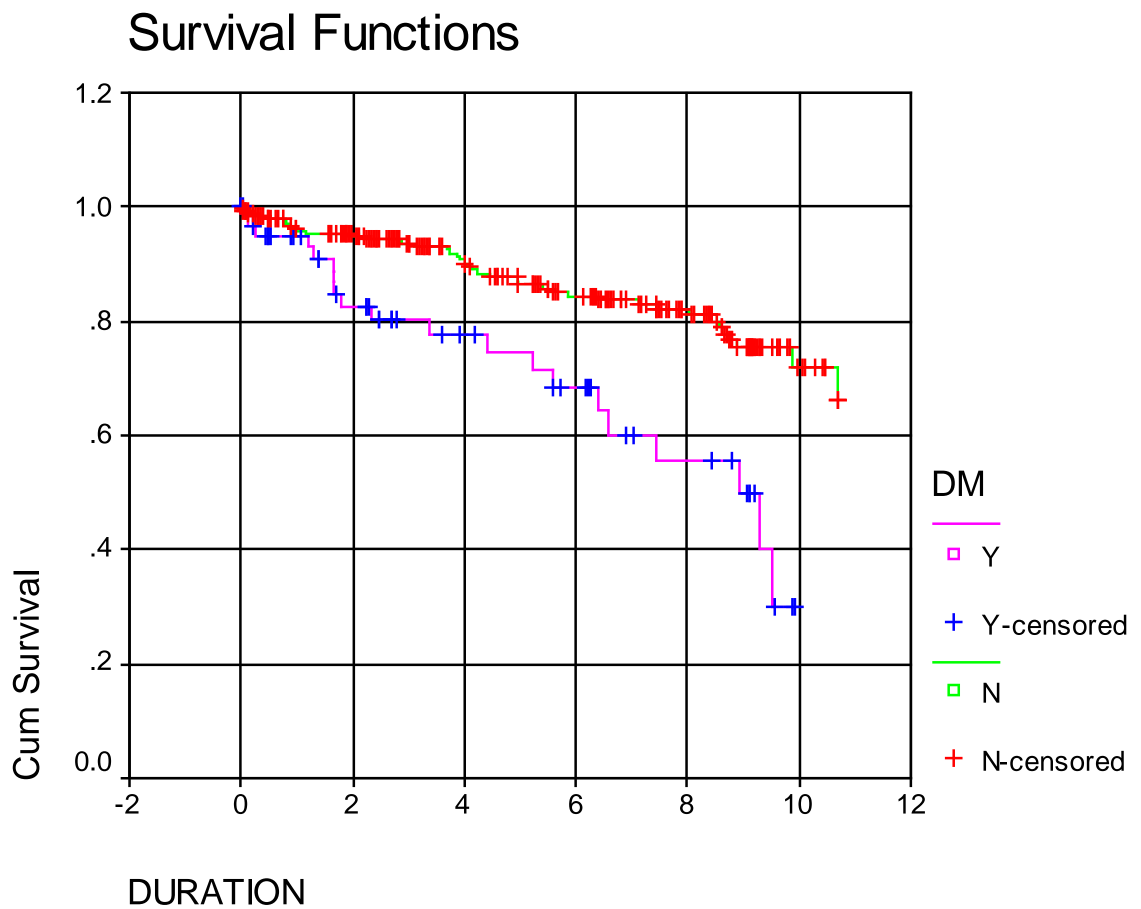


Table 13 - Survival Difference between Diabetics and Non diabetics 1996- 2006

Survival	Non-DM	DM
1 yr	95.7%	94.9%
5 yr	86.5%	75.5%
10 yr	71.9%	No data

As expected, diabetics have worse survival than non diabetics.

Fig 2: Patient Survival – Diabetic vs Non Diabetic



DIALYSIS PARAMETERS

All patients are on high flux dialyzers, majority being made up of Fresenius Polysulfone membrane unless a larger dialyzer size is required. Maximum reuse is 15 times. There are separate reuse facilities for Hepatitis B and HCV positive dialyzers in Bishan while in SWWT, dialysers used by HepB positive patients are not reused.

Table 14: Types of Dialyzers used

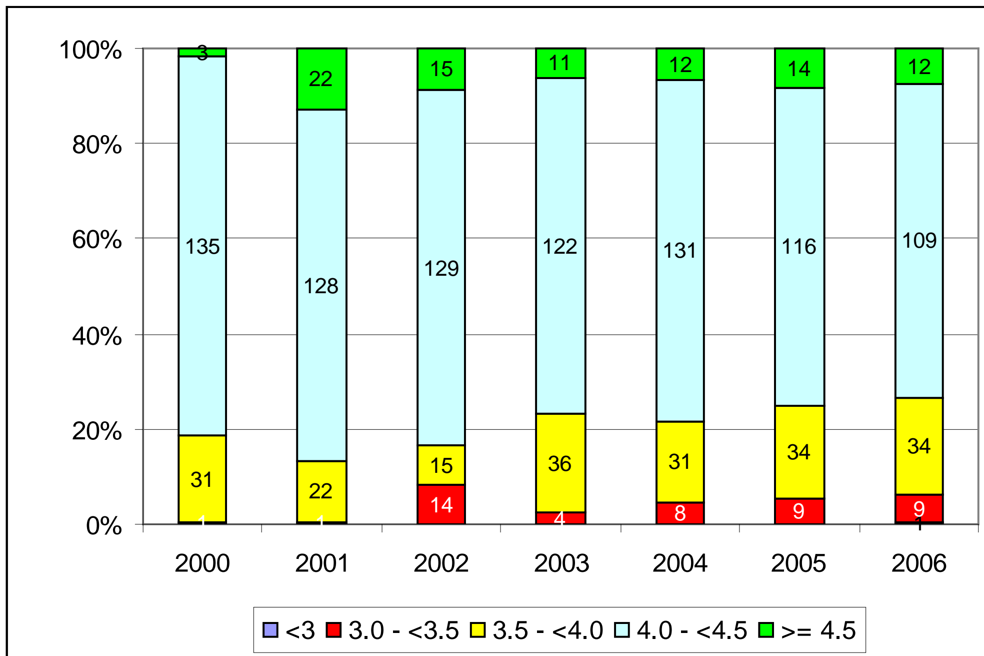
	2003		2003		2004		2005		2006	
	N	%	N	%	n	%	n	%	n	%
F6	2	*1.2*	0	*0*			2	*1.20*	1	*0.6*
F7	1	*0.6*	1	*0.6*	0	*0*	0		0	*0*
HF50	14	*8.1*	17	*9.8*	10	*5.5*	10	*5.8*	13	*7.9*
HF60	96	*55.5*	92	*53.2*	54	*29.7*	44	*25.4*	42	*25.5*
HF80	49	*28.3*	47	*27.2*	30	*16.5*	18	*10.4*	14	*8.5*
HF100	2	*1.2*	7	*4*	7	*3.8*	7	*4.0*	7	*4.2*
POLYFLUX11					7	*3.8*			1	*0.6*
POLYFLUX14					39	*21.4*	48	*27.7*	47	*28.5*
POLYFLUX17					23	*12.6*	26	*15.0*	24	*14.5*
POLYFLUX21	7	*5.2*	9	*5.2*	11	*6.0*	17	*9.8*	15	*9.1*
FB210U					1	*0.6*	1	*0.6*	1	*0.6*
TOTAL	171	*100*	173	*100*	182	*100*	173	*100*	165	*100*

Table 15: Average Blood flow Used (ml/min)

ml/min	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Mean	264	274	281	280	278	276	274
Std Dev	29	30	33	35	33	36	34
Min	133	200	200	208	208	180	180
Max	323	350	353	364	364	400	400

Blood flow is set at a minimum of 200 ml/min averaging 274 ± 34 ml/min range (180-400).

Figure 3: Dialysis Time Per Session



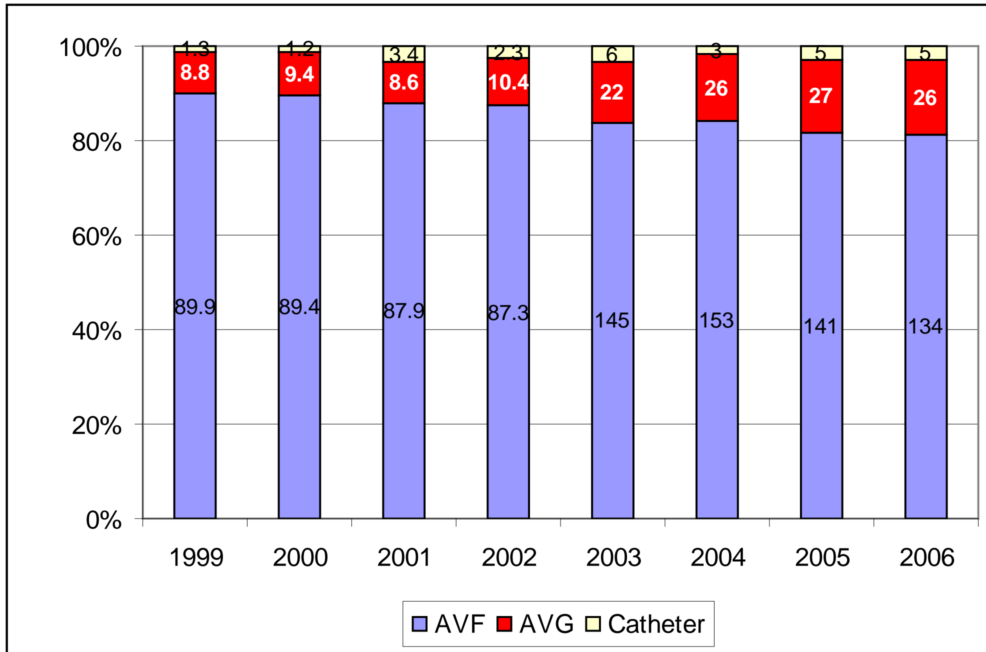
Most patients (73.3%) dialyze for 4 hours or more.

DIALYZER REUSE

Maximum reuse is 15 times. All centres use the Renatron System. There are separate reuse facilities for washing of dialyzers used by Hepatitis B and HCV positive patients in Bishan. SWWT centre started accepting hepatitis positive patients when AH centre closed down.

VASCULAR ACCESS

Fig 4: Vascular Access



Twenty six patients or 15.8 % (26/165) were using grafts for vascular access, approximately the same proportion as last year. Five patients were on catheters (3.0%). The rest were using AV fistulae (81.2%).

We continue to use the Transonic machine for monitoring the access flows and recirculation in the vascular access. This performed every 6 months unless the flows are below 600 ml/min. The average flow was 1097 $\pm$ 623 ml/min. Only one patient had recirculation above 5%.

Any recirculation above 5% or persistently low access flow with reduction of 25% below the previous reading was referred back to the surgeon.

DIALYSIS ADEQUACY

This assessment is performed every 2 months using a pre and post blood urea performed on a midweek dialysis session to calculate the single pool KT/V as follows:

$$KT/V = -\ln (R - 0.03) + (4 - 3.5 \times R) \times UF/W$$

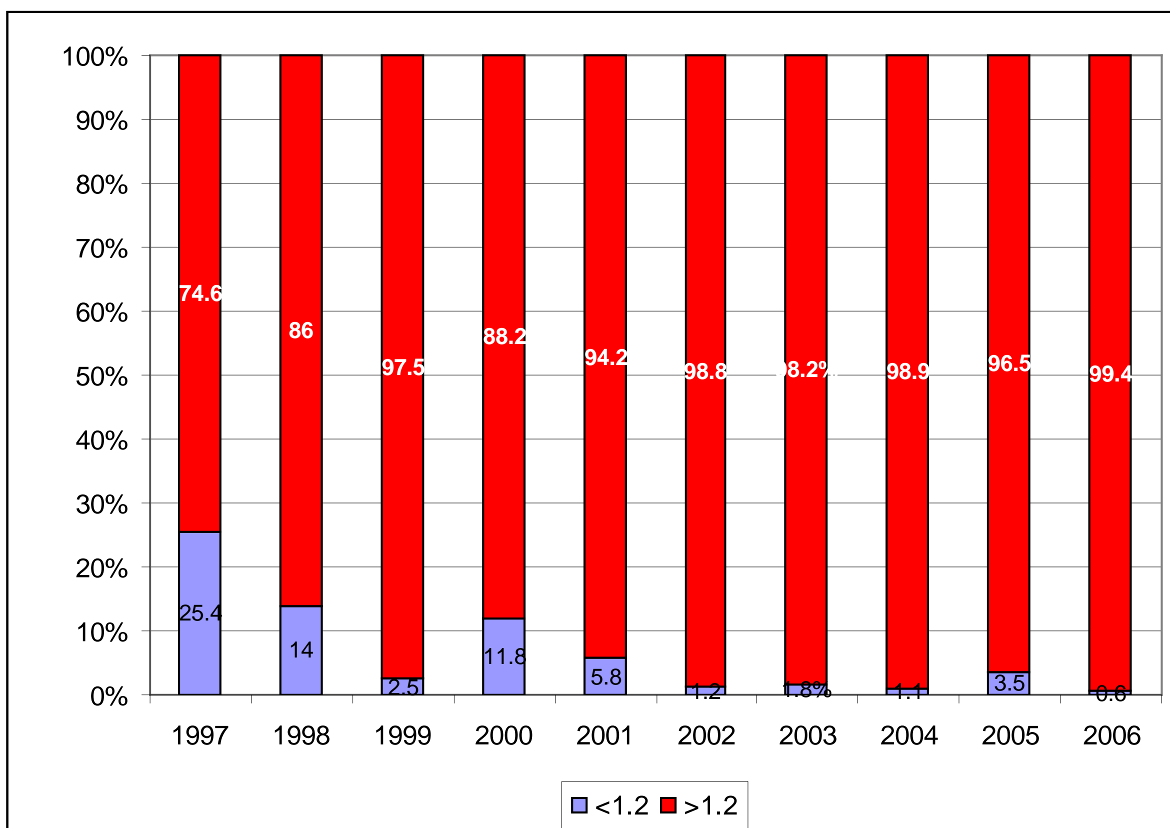
where	R	=	post/pre urea
	UF	=	ultrafiltration in litres
	W	=	post dialysis weight

The formula used is that adapted from “Handbook of Dialysis” Ed JT Daugirdas & TS Ing.

Our patients weighed 57.1 $\pm$ 13.6 kg (range 35.1 – 101.3 kg).

Majority of our patients (99.4 %) had a KT/V of 1.2 or greater in November / December 2006.

Fig 5: Percentage with KT/V index > 1.2



ANAEMIA

The mean Hb was calculated to be 10.8 ± 1.8 g/dl. This has been stable over the past few years. The percentage of patients with a haemoglobin count of less than 10 g/dl was 29.7%.

Fig: 6: Average Hemoglobin

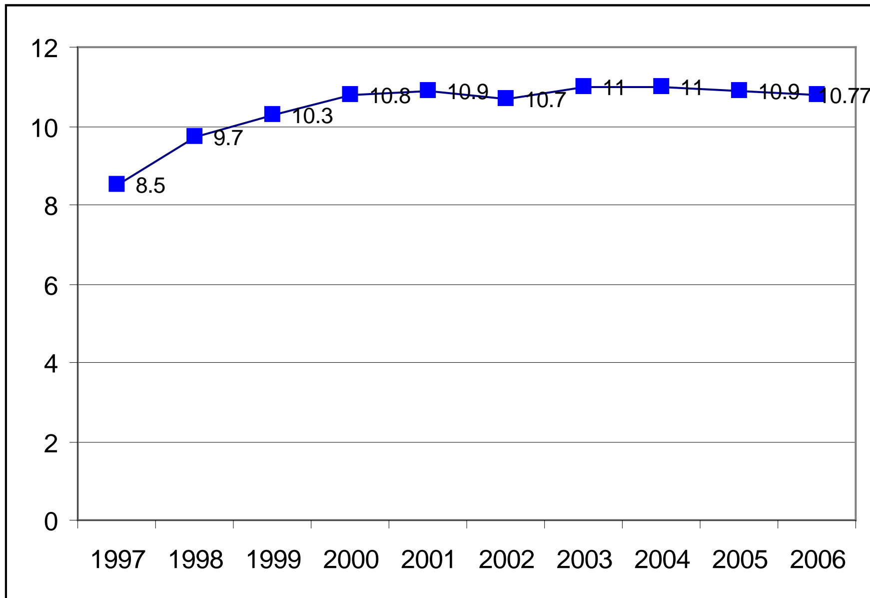
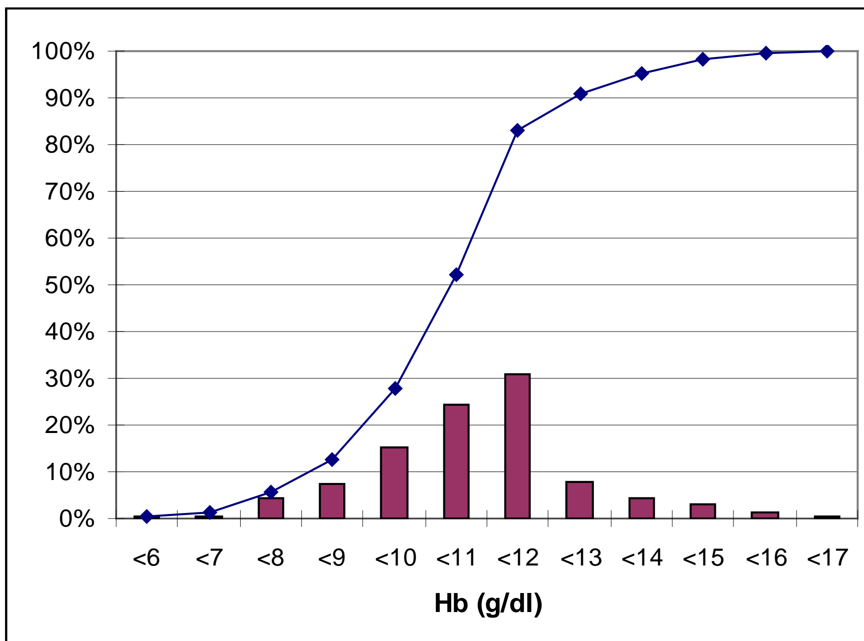


Fig: 7: Cumulative Incidence of Hemoglobin



ERYTHROPOIETIN

Patients are advised to start erythropoietin when their Hb falls below 10 g/dl. Target Hb while on erythropoietin is 12 g/dl. More patients (137, 83.0 %) were on erythropoietin, higher than last year's figure of 79.2%.

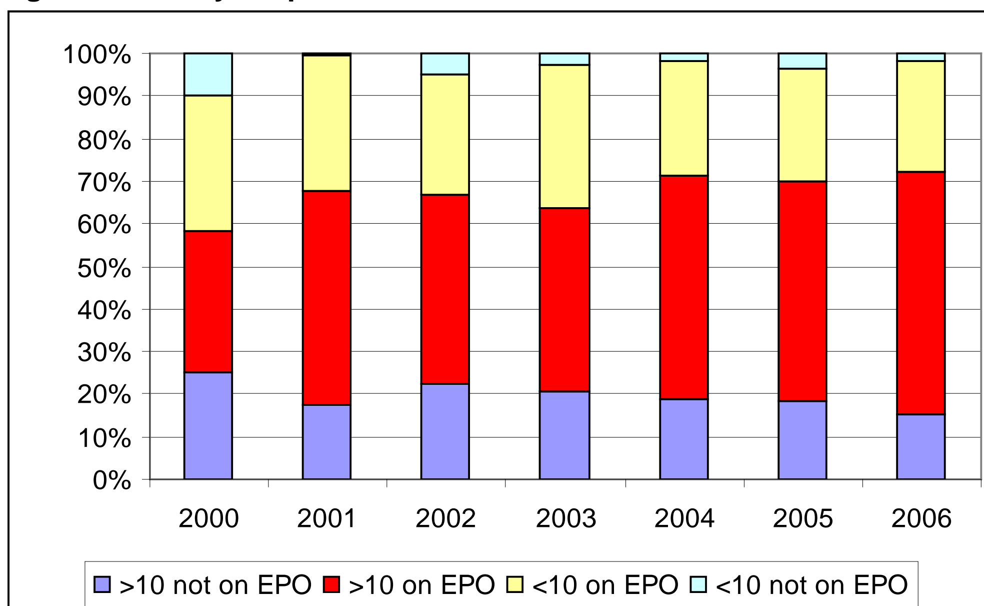
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy

Patients who were on EPO used on the average 88.9 ± 55.2 units/kg body weight per week

Because of the possibility of pure red cell aplasia from erythropoietin administration, all erythropoietin is now administered by the intravenous route. SWWT-Kreta Ayer Centre use Eprex while Bishan uses Recormon.

10.7% of the patients were not on EPO had a Hb of > 10 g/dl

Fig 8: Use of Erythropoietin



IRON STATUS

Table 16 : Transferrin Saturation

	1999	2000	2001	2002	2003	2004	2005	2006
Mean (%)	NA	37.4	37.3	40.3	39.0	37.4	36.2	39.2
SD	NA	16.2	16.3	15.9	13.9	14.8	16	16.9
% pats w TFSat <20%	15.1	8.8	9.2	7.5	6.5	6.6	9.2	6.7
Average HB when TFSat<20% (g/dl)	9.5	10.7	10.5	10.4	10.2	11.2	10.6	10.5

% pats w TFSat >20%	84.9	91.2	90.8	92.5	93.5	93.4	90.8	93.3
Average HB when TFSat>20% (g/dl)	10.4	10.8	11.0	10.7	11.0	11	10.9	10.8

As at the end of 2006, mean transferrin saturation was 39.2 ± 16 % (range 8.2 – 92.3). The proportion of patients with transferrin saturation of less than 20% was 6.9% down from 9.2% the previous year. More than half of the 11 patients (54.5%) in this iron deficient group had a Hb of less than 10 g/dl. The average Hb of patients with transferrin saturation was greater or equal to 20% was 10.8 g/dl compared with 10.5 g/dl for those whose TF Sat was <20%

12 patients ever used intravenous iron (Venofer) in 2006. A subsidy scheme for Venofer was started in April 2005

NUTRITION

Mean S Albumin was 37.5 ± 3.4 g/l. The number of patients with Serum albumin less than 40 g/dl was 77.6%.

Table 17: Normalised Protein Catabolic Rate and S Albumin

	1999	2000	2001	2002	2003	2004	2005	2006
NPCR (g/kgBW)								
• Mean ± SD	1.1 ± 0.2	1.12 ± 0.23	1.14 ± 0.24	1.13 ± 0.23	1.14 ± 0.23	1.13 ± 0.23	1.12 ± 0.21	1.13 ± 0.22
• % < 1.2	70.0	62.9	63.6	63.6	62.6	63.5	68.2	63.6
S Albumin (g/l)								
• Mean ± SD	37.8 ± 3.3	37.5 ± 3.6	35.7 ± 3.5	36.9 ± 3.1	36.9 ± 3.1	36.9 ± 3.5	37.5 ± 3.4	36.8 ± 3.1
• % <40	71.7	73.5	87.9	81.5	80.6	81.8	72.3	77.6
• % <35	9.0	14.1	31.6	19.7	22.9	21.0	16.8	24.2

RENAL BONE DISEASE

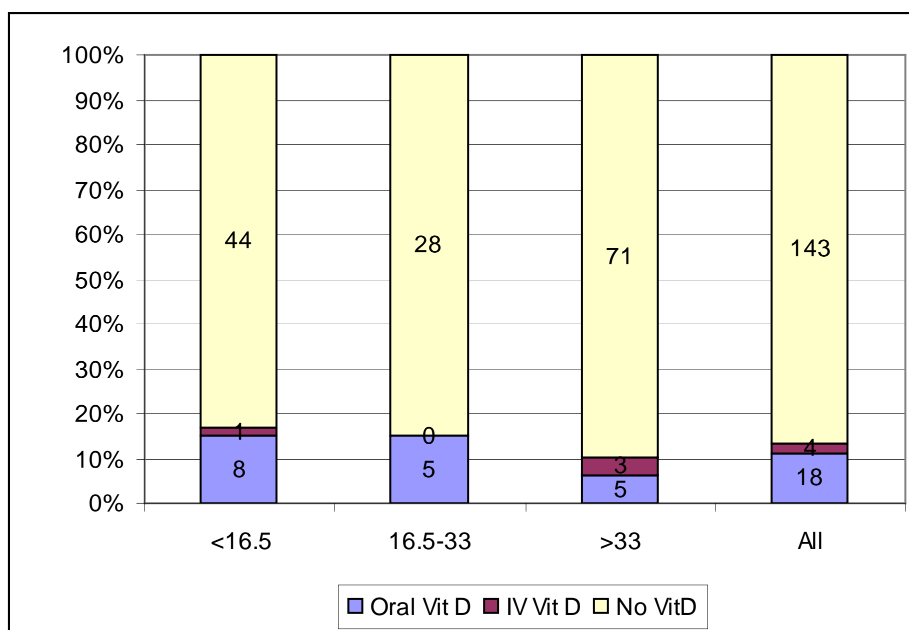
The KDOQI guidelines of 2003 (AJKD Vol 42 October 2003 Suppl 3) recommends treatment for patients on dialysis (CKD Stage 5) when iPTH exceed 33 pmol/ l should be treated with Vit D analogs to main the PTH at 16.5-33 pmol/l.

Table 18: PTH levels

	2003	*%*	**2004**	*%*	**2005**	*%*	**2006**	*%*
<16.5	67	*39.4*	51	*30.6*	46	*26.7*	52	*32.3*
16.5-33	24	*14.1*	26	*15.6*	37	*21.5*	31	*19.3*
>33.0	79	*46.4*	90	*53.8*	89	*51.7*	78	*48.4*
Total	170	*100.0*	167	*100.0*	172	*100.0*	161	*100.0*

Majority (86.7%) of the patients have intact parathyroid hormone levels elevated beyond 33 pmol/l. Hyperparathyroid bone disease is a significant problem in the dialysis population.

Fig 9: Parathyroid Hormone levels and Vit D Treatment



In the group with low PTH (<16.5 pmol/l) which constitutes 32.1% (53) of all cases, only 4.8% (8) were on oral Vit D and one patient on iv Vit D. These were probably on a tailing dose.

K/DOQI now aims for a PTH level of 16.5 – 33 pmol/l. 20% of all patients had PTH values in this range. 10.1% (8/79) of patients with PTH>33 pmol/l being treated with Vit D.

A subsidy scheme for Calcijex was started in April 2005

A total of 33 patients had parathyroidectomy bringing the prevalent rate to 20% (33/165).

Table 19 Serum Phosphate levels

	1999	2000	2001	2002	2003	2004	2005	2006
Mean S PO4 (mmol/L)	1.81	1.84	1.83	1.85	1.92	1.89	1.88	1.75
SD	0.6	0.53	0.52	0.47	0.53	0.49	0.51	0.44
% with S PO4>2.0 mmol/l	NA	36.4	37.9	31.8	42.4	38.1	41.6	29.1
Min						0.4	0.38	0.49
Max						3.3	3.63	3.37

Mean S Phosphate was 1.75 $\pm$ 0.44 mmol/l. A significant proportion (29.1%) of patients have values above 2.0 mmol/l. This is much lower than previous years.

Fig 10: Phosphate binders in use

Majority of patients (62.7%) are on calcium acetate. Non calcium non-aluminum binders are now available to selected patients. They are costly and probably out of reach of most patients. Patients may still be on calcium supplementation with regular calcium carbonate (non chewable formulation).

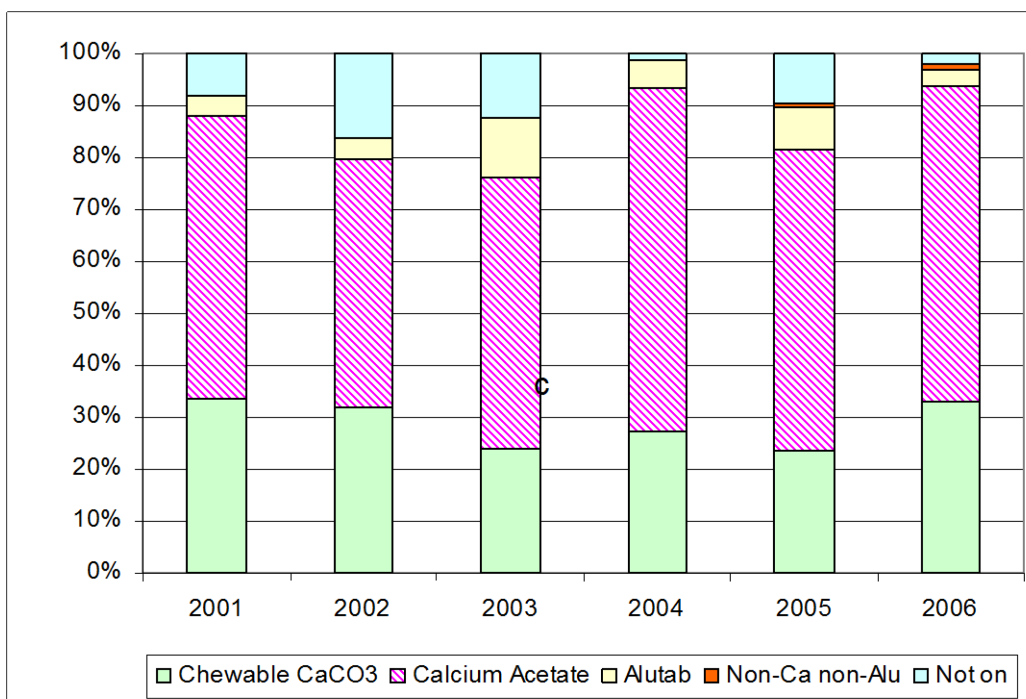


Table 20 Serum Calcium levels

	1999	2000	2001	2002	2003	2004	2005	2006
Mean S Calcium (mmol/L)	2.59	2.59	2.53	2.54	2.56	2.48	2.44	2.38
SD	0.2	0.2	0.21	0.21	0.19	0.23	0.25	0.22
Min								1.26
Max								2.88

The mean calcium value is now lower - 2.38 $\pm$ 0.22 mmol/l. Low calcium dialysate is currently in use for an increasing number of patients (72.8%).

DIABETICS

The prevalent number of diabetic patients was 34 (21.1%). This is not surprising as diabetic nephropathy is the etiology in about half of all new cases.

HYPERTENSION

68.3% have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

Table 21 : Use of Antihypertensive Agents by number of Drugs

	2003	2004	2005	2006
None	42.5%	30.8%	38.7%	31.7%
1 Drug	30.5%	29.1%	28.3%	31.9%
2 Drugs	18.4%	17.6%	22.0%	20.7%
3 Drugs	8.0%	7.7%	8.7%	13.4%
4 drugs	0.6%	3.8%	2.3%	1.2%
	100.0%	100.0	100.0%	100%

About 30% of the patients were not on antihypertensives and another 30% on one drug only.

Calcium channel blockers, beta blockers and ACEI were the most common types of antihypertensives used.

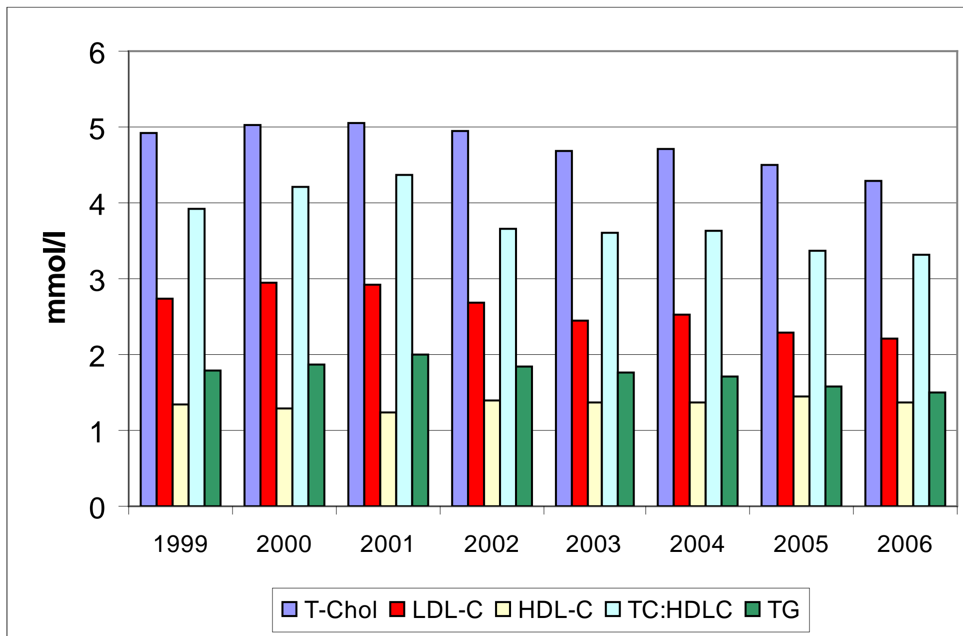
Table 22 : Use of Antihypertensive Agents by Drug Type

	2002	2003	2004	2005	2006
None	41.2%	41.6%	42.5%	38.7%	31.7%
Beta blockers			31.6%	43.9%	44.7%
Calcium channel Blockers			29.3%	31.2%	36.4%
ACEI / ARB			25.3%	26.0%	30.8%
Others			7.7%	5.8%	3.6%
Total			100.0%	100.0%	100%

HYPERLIPIDEMIA

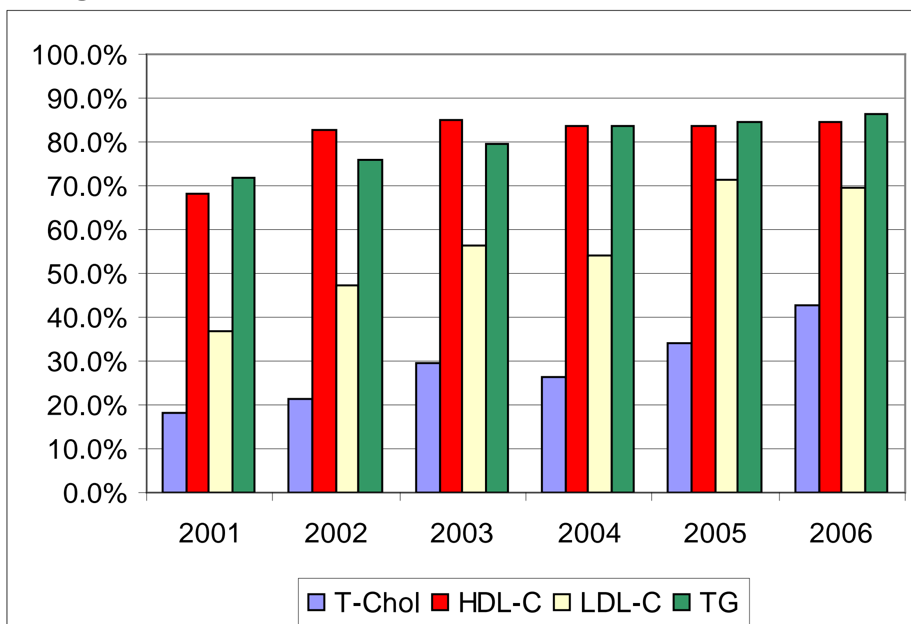
Mean total cholesterol was 4.28 mmol/l improved from last year but LDL cholesterol increased.

Figure 11: Lipids



The percentage of patients achieving MOH targets are as follows: cholesterol (<4.1 mmol/l) 42.7%, HDL-cholesterol (>=1.0 mmol/l) 84.8%, LDL cholesterol (<2.6 mmol/l) 69.5%, and triglycerides (<2.3 mmol/l) 88.4%.

Fig 12: Percentage of patients achieving target levels as recommended by MOH guidelines 2002



More than half the patients were on drug therapy. 53.7% were on one drug and 4.9% on two drugs. HMG-CoA reductase inhibitors were the most commonly used dru (51.6), 7.3% were on fibrates.

HEPATITIS SEROPOSITIVITY

6.2% are hepatitis B carriers, 10.6% are anti-HCV positive for Hepatitis C antibody. Two patients had received interferon treatment and both patients' HCV PCR was negative. Two patients (1.2%) are both anti-HCV and HepBsAg positive.

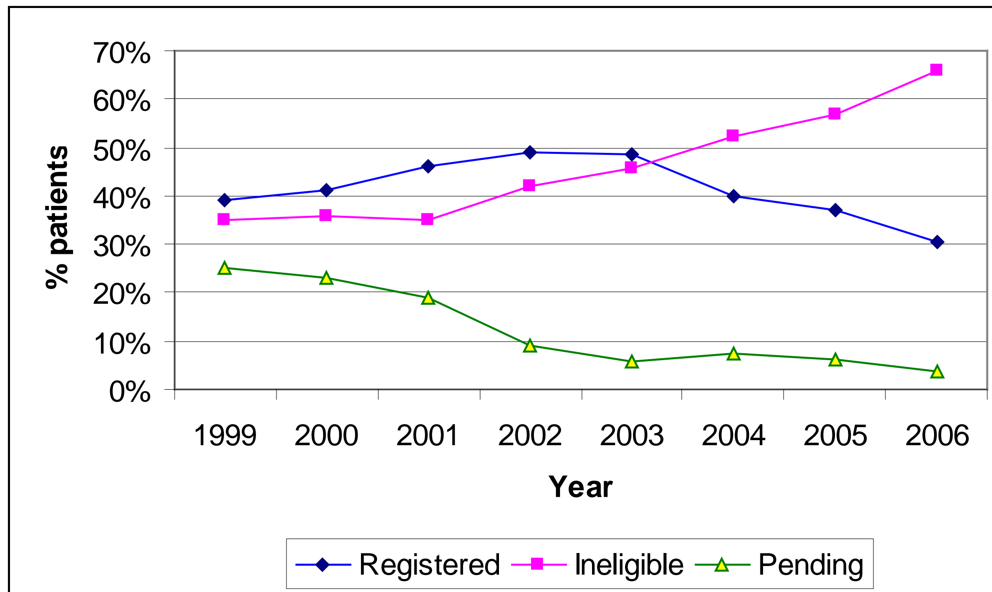
Table 23: Hepatitis Rates

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
HepB	9.8%	6.7%	6.9%	5.8%	5.7%	5.7%	7.5%	5.5%	5.2%	6.2%
HCV	9.80%	10.10%	9.40%	9.40%	9.70%	9.20%	11.5%	10.9%	9.8%	10.6%
HepB & HCV	1.40%	2%	1.90%	1.20%	1.10%	1.10%	1.7%	1.6%	1.7%	1.2%

TRANSPLANT WAITING LIST

Only 49 patients (30.4%) are on the waiting list. Only 6 have not been assessed. The number of ineligible patients grow as KDF takes in more patients with comorbidities since admission criteria was relaxed. Very few have not been assessed.

Figure 13: Proportion of patients on the Transplant Waiting List



8. CONCLUSION

The following year will see preparations for the third centre at Ghim Moh intensify.

KDF Haemodialysis Centres complement the peritoneal dialysis programme by offering interim haemodialysis when PD has not yet started or when the Tenckhoff catheter could not be used. Furthermore, interim haemodialysis at subsidized rates is also offered to those undergoing living related transplant workup.

We would like to thank all those who participated in the care of the patients,

DR CHOONG HUI LIN
MEDICAL DIRECTOR