

KIDNEY DIALYSIS FOUNDATION

ANNUAL REPORT

MEDICAL

2009

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1. EXECUTIVE SUMMARY

The Kidney Dialysis Foundation runs 3 dialysis centres at Bishan from 1997, Kreta Ayer Road – San Wang Wu Ti centre from Sep 2003 and Ghim Moh 2007.

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 2009, there were 18 new entrants.

Nineteen (19) patients exited the programme (4 transplants, 8 deaths, 2 transfers to PD programme, 5 to non-PD programmes). In the prevalent population, average age was 56.2 ± 10.3 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 46.2%, diabetic nephropathy 28.5%. Overall first year survival of patients was 95.7% and five year survival 84.4%. 5 year survival in diabetics was similar in the first year (non-DM vs DM 95.6% vs 95.9%), 5 years 86% vs 79.7% and 10 years 74.6% vs 53.2%.

Almost all patients (99%) are using high flux dialysers. Average blood flow was 270 ± 35 ml/min. 79.0% of patients dialyse 4 hours or more. 74.7% of patients use a native arteriovenous fistula. Dialysis adequacy as measured by single pool KT/V is >1.2 in 90% of patients.

Mean hemoglobin was 11.0 g/dl. About 84.9% of all patients are on EPO. About 9.9 % of patients are considered Fe deficient.

90.0% of patients have a S Albumin of <40 g/l. Hyperparathyroidism and hyperphosphatemia remains a problem. More patients are on intravenous Vitamin D.

Diabetes as a comorbidity was present in 34.9% of the population. 72.5% were on treatment for hypertension.

There was no significant changes in virology status. Hep B positivity was 6.5%, HCV 8.%, HepB and HCV 1 %.

Less patients were registered on the National Transplant waiting list (17.2%), 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 San Wang 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.

KDF's 4th dialysis centre started operations in Ghim Moh on 16 July 2007. The Peritoneal Dialysis Centre also shifted from Kreta Ayer to Ghim Moh.

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

Ms Theresa Soh (Coordinator Patient Services) together with Ms Lay Kwee Chin headed the paramedical team comprising Nursing, Patient Welfare and Dietetic Services.

This report covers medical data collated at the end of 2009.

3. THE DIALYSIS CENTRES

The location and prevalent number of patients as of 31 Dec 2009 are listed below:

	Centre	Location	Patient No
1	KDF-Bishan Centre	Block 197, Bishan Street 13 #01-575/583	85
2	San Wang Wu Ti – KDF Centre	Block 333, Kreta Ayer Road #03-33	67
3	KDF – Ghim Moh Centre	Blk 6 Ghim Moh Road #01-188	34
	TOTAL	Haemodialysis patients	186

The new Ghim Moh Centre started operations from 16 July 2007 with a total no of 14 patients. Ten (10) patients were transferred from SWWT centre and 3 from Bishan centre and 1 new patient from Alexandra Hospital. The centre operates 2 shifts inclusive of Public Holidays as the patient number was low.

The other haemodialysis centres operate 3 shifts a day.

Dialysis Station

	Centre	No. of Regular and Isolation Station	Total
1	KDF-Bishan Centre	19 + 1	20
2	San Wang Wu Ti – KDF Centre	15 + 1	16
3	KDF – Ghim Moh Centre	14+ 1	15
	TOTAL		51

I. 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 (until Jul 09)
2. Dr Stephen Chew
3. A/Prof Lina Choong
4. Dr Marjorie Foo
5. Dr Ho Chee Khun
6. Dr Terence Kee (until Jul 09)
7. Dr Titus Lau
8. Dr Grace Lee
9. Dr Pwee Hock Swee
10. Dr Tan Han Khim
11. Dr Tan Seng Hoe
12. Dr Yeoh Lee Ying
13. Dr Ng Tsun Gun
14. Dr Adrian Liew (joined Jan 09)
15. Dr Yang Wen Shin (joined Jul 09)
16. Dr Jason Choo (joined Jul 09)

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

Ghim Moh Centre:

1. Mobile doctor – 24hrs hotline: 62500625
2. Dr Lim Chin Wei – Family Clinic

NURSING

The overall standard of nursing is overseen by Ms Theresa Soh as Patient Services Coordinator and Ms Lay Kwee Chin (Senior Executive Patient Services,) Ms Tay See Inn joined the team in December 2009 as Nurse Clinician.

Routine audits are performed on the provider to maintain standards. The Dialysis Providers are:

- Fresenius Medicare at San Wang Wu Ti (Kreta Ayer) Centre (contract is renewed in Sep 2008, to end in Aug 2013)
- Asia Renalcare Pte Ltd at Bishan Centre (contract renewed in 2006, to end in Feb 2011) and Ghim Moh Centre (contract to end in May 2012)

The Dialysis Provider is responsible for rostering of the nursing services. Staff numbers as at 31 Dec 2009 is listed as follows:

Centre	Renal trained	SN	AN	DT	Total
Bishan	1	8	4	3	16
SWWT	2	6	5	1	14
Ghim Moh	1	6	1	1	9
Grand total					39

Training & Education

The Patient Services Coordinator and Senior Executive together with the Nursing Officers is responsible for Training & Education for the Nursing staff. This is discussed in the Nursing report.

5 EQUIPMENT

DIALYSIS MACHINES

There are in total 54 dialysis machines.

These were located as follows:

	Baxter 1550	Baxter Tina	Fresenius 4008S	Gambro AK96
Bishan	0	0	5	16
Kreta Ayer	0	0	17	0
Ghim Moh	0	0	16	0

WATER TREATMENT SYSTEMS

The water treatment system in Bishan Centre is serviced by Waterman Pte Ltd, SWWT Centre by Memiontec Pte Ltd while that in Ghim Moh Centre is by Transmedic Pte Ltd. The water treatment system in Bishan Centre was replaced by Gambro WRO

All 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.

For Ghim Moh and SWWT centres the system undergoes auto-washing and flushing before going onto standby mode at the end of each dialysis day whereas for Bishan centre the RO system will perform daily intergrated heat disinfection at the end of the day.

Daily monitoring of RO system pressure parameters and performing the chloramine check at the beginning of the day before priming. Chemical disinfection is done 6 monthly by the vendors for Ghim Moh and SWWT centres and the nurses in Bishan centre will perform the membrane disinfection 2 monthly.

The chemical disinfectant used for RO disinfection as follows:

Bishan centre – Dialox

SWWT centre – Hydrogen Peroxide 13%

Ghim Moh centre – Hydrogen Peroxide 22% and Peroxyacetic Acid 4.5%

Residual checks are conducted after disinfection to ensure that the system is clear of chemical before patient use. RO water and dialysate cultures for LAL and total microbial count samples are done 2 monthly, meet AAMI standards.

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 8 Renatron machines in the three centres (three each in Bishan and Kreta Ayer, two in Ghim Moh) linked to the Renalog Reprocessing Management (RM).

The Renalog RM dialyzer reprocessing management software is a Windows-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.

Renalin 100 Cold Sterilant (containing Hydrogen Peroxide 20%) was classified as an explosive precursor since 1 Dec 07. In order to comply with the requirements of the Arms and Explosives Act, each of the centres has applied for a licence from the Singapore Police Force (SPF) for storage of the Renalin. The licence was due to expire in March 2010.

Appropriate measures were taken to ensure that the service provider comply with the requirements. SPF conducts surprise checks.

6 PATIENT CARE

Ms Theresa Soh (Coordinator of Patient Services) together with Ms Lay Kwee Chin (Senior Executive, Patient Services) headed the paramedical team.

DIETETICS

Dietetic counseling was provided for under the contract with the dialysis providers. Patients are seen at least once in 3 months at the centre. The dieticians assigned were Mr Nelson Chin by Asia Renalcare and Ms Liow Min Choo by Fresenius Medical Care.

PATIENT WELFARE

Ms Wong Mei Toon, Welfare Officer resigned in March 09 and was replaced by Ms Rena Lee.

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

Seven (7) patients received civil service benefits.

Sixty (60) patients (32.3%) received Medifund subsidies from the restructured hospitals.

In addition to routine dialysis, KDF provides interim haemodialysis for CAPD and bridging to transplantation. Portable funding for KDF patients turning high dependency was started for a former PD patient. Another scheme providing interim dialysis for needy patients waiting for other programs is to be started in 2009.

DIALYSIS REVIEWS

Apart from the rounds which are carried out on a monthly basis by the doctors, Patient Services Coordinator or designee and Staff Nurse in charge of the patient will review problem cases with the Medical Director.

7 THE PATIENT POPULATION

As at 31 December 2009, we had 186 patients dialysing in 3 centres – 85 patients at Bishan Centre (BS), 67 at Kreta Ayer (SWWT) and 34 patients at Ghim Moh centre.

A. INTAKE AND EXITS

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

Table 1 – Patient Stock & Flow

ENTRY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New Cases	27	16	10	5	18	5	10	13	18	26
New Cases (interim)					1	6	3	3	3	7
Transfers in from SDDU	0	0	0	0	0	0	0	0	0	0
Re-enter KDF	2	1	0	3	0	0	0	1	1	0
Total Entries	29	17	10	8	19	11	13	17	22	33
EXIT										
Transfer Out to non-KDF Programs	3	5	2	2	2	3	0	1	0	5
Transfer Out to KDF PD						5	3	2	2	1
Transplant	7	2	2	2	4	6	10	6	4*	4*
Withdraw from Dialysis/Default	0	1	1	0	0	1	0	2	0	1
Deaths	9	4	5	4	6	5	11	2	9	8
Total Exits	19	11	10	8	12	20	24	13	15	19
Total No of Pt	169	174	174	174	181	172	161	165	172	186

* Cadaveric

Table 2 – Source of Referral

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
SDDU	0	0	0	0	0	0	0	0	0	0
SGH	25	15	6	5	19	8	10	14	18	16
NUH	4	2	3	3	0	0	2	1	2	11
TTSH						2	1	1	1	1
AH								1	0	4
Private	0	0	1	0	0	1	0	0	1	1
Total Entries	29	17	10	8	19	11	13	17	22	33

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

Thirty-three (33) patients were admitted to the programme in 2009: 7 for interim hemodialysis of which one was awaiting catheter re-insertion for peritoneal dialysis and one waiting to start PD program. The rest initiated dialysis only recently.

B. 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

Etiology	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
Chronic glomerulonephritis	1	9.1	4	30.8	4	23.5	4	18.2	6	18.1
Diabetic nephropathy	6	54.5	6	46.2	9	52.9	13	59.1	20	60.6
Lupus nephritis	1	9.1	0	0	0	0	1	4.5	1	3.1
Obstructive uropathy	0	0	0	0	0	0	0	0	0	0
PCKD	1	9.1	0	0	0	0	1	4.5	1	3.1
TB kidney	0	0	0	0	0	0	0	0	0	0
Hypertension			2	15.4	1	5.9	1	4.5	0	0
Others	2	18.2	1	7.7	3	17.6	0	0	0	0
Unknown Etiology	0	0	0	0	0	0	2	9.1	5	15.1
Total	11	100.0	13	100	17	100	22	100	33	100

As in last year, the majority of new cases were patients with diabetes mellitus (60.6%).

Table 4 – Etiology of Renal Failure in Prevalent Patients

Etiology	2005		2006		2007		2008		2009	
	n	%	n	%	N	%	n	%	n	%
Chr glomerulonephritis	100	58.4	96	59.6	93	56.4	90	52.3	86	46.2
Diabetic nephropathy	29	16.8	28	17.4	33	20.0	40	23.3	53	28.5
Lupus nephritis	10	5.8	9	5.6	8	4.8	9	5.2	10	5.4
Obstructive uropathy	1	0.6	0	0.0	0	0	0	0	0	0
PCKD	4	2.3	2	1.2	2	1.2	2	1.2	3	1.6
TB kidney	2	1.2	1	0.6	1	0.6	1	0.6	1	0.5
HT					3	1.3	4	2.3	4	2.2
VUR	3	1.7	2	1.2	2	1.2	2	1.2	2	1.1
Others	2	1.2	9	5.6	9	5.5	8	4.6	9	4.8
Unknown Etiology	21	12.1	14	8.7	14	8.5	16	9.3	18	9.7
Total	172	100	161	100	165	100	172	100	186	100

Majority of patients (46.2%) have chronic glomerulonephritis as the primary etiology of renal failure. Patients with diabetic nephropathy have increased to 28.5%.

Gender

Table 5 – Gender of New Patients

Gender	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
Males	6	54.5	4	30.8	11	64.7	14	63.6	16	48.5
Females	5	45.4	9	69.2	6	35.3	8	36.4	17	51.5
Total	11	100.0	13	100.0	17	100.0	22	100.0	33	100

Table 6 – Gender of Prevalent Patients

Gender	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
Males	83	48.0	72	44.7	79	47.9	82	47.7	87	46.8
Females	90	52.0	89	55.3	86	52.1	90	52.3	99	53.2
Total	173	100	161	100	165	100	172	100	186	100

At the end of 2009, the ratio of male to female patients was 87:99.

Ethnic Distribution

Table 7 – Ethnic Distribution of New Patients

Race	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
Chinese	10	90.9	10	76.9	13	76.5	16	72.7	18	54.6
Malay	1	9.1	1	7.7	4	23.5	5	22.7	11	33.3
Indian	0	0	2	15.4	0	0	1	4.5	4	12.1
Others	0	0	0	0	0	0	0	0	0	0
Total	11	100.0	13	100	17	100	22	100	33	100

Table 8 – Ethnic Distribution of Prevalent Patients

Race	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
Chinese	133	77.5	126	78.30	126	76.4	138	77.3	138	74.2
Malay	28	16.2	23	14.3	27	16.4	36	17.4	36	19.4
Indian	11	6.4	12	7.4	12	7.3	12	5.2	12	6.4
Others	0	0	0	0	0	0	0	0	0	0
Total	172	100.0	161	100	165	100	172	100	186	100

The ethnic distribution of our prevalent patients was 74.2% Chinese, 19.4% Malays and 6.4% Indians.

Age

The mean age at entry in 2009 was 56.6 ± 12.5 years (median, 55.9). Nine (9) patients were above the age of 65 years

Table 9: Average age of entry into the Programme

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mean Age (years)	42.1	43.1	43.4	41.5	46.6	52.7	62.6	56.6	58.8	56.6
SD	11	10.6	12.1	7.3	8.8	15.1	11.8	12.9	12.4	12.5
Min								26.9	33	26
Max								73.0	78	76

Table 10: Average age of Prevalent patients on the Programme

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mean Age (years)	47.2	46.7	47.3	48.1	48.7	50.1	52.3	53.8	55.5	56.2
SD	9.5	9.3	9.4	9.3	9.3	9.3	10.0	9.9	9.7	10.3

Age of the prevalent dialysis population at the end of 2009 was 56.2 ± 10.3 years (median 56.5). 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 Incident patients

Year	2006		2007		2008		2009	
	n	%	n	%	n	%	n	%
Diabetic	6	46.2	11	64.7	10	45.5	22	71
IHD n other cardiac disease	3	23.1	2	11.8	5	22.7	15	48.4
CVA	0	0	0	0	4	18	7	22.6
PVD	0	0	1	5.9	1	4.5	5	16.1

Table 12: Common Comorbidities in Prevalent patients

Year	2004		2005		2006		2007		2008		2009	
	n	%	N	%	n	%	n	%	n	%	n	%
Diabetics		17.6	31	17.9	36	21.8	44	26.7	45	26.2	65	34.9
IHD n other cardiac			18	10.4	33	20.0	42	25.5	37	25.1	59	31.7
CVA					7	4.2	7	4.2	9	5.2	15	8.1
PVD					5	3.0	5	5	6	3.5	7	3.8

The proportion of diabetics in the prevalent dialysis population has increased to 34.9% compared with the previous year's 26.2%.

The proportion of patients with cardiac problems has also been increasing, now 31.7%.

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

HOSPITALIZATIONS

Table 13: Hospitalized Patients

	2009	
	No	%
No of Patients admitted	130	63.4%
- Non diabetic	79	59.4%
- Diabetic	51	70.8%
		Per Pt Yr
Episodes	272	1.50
- Non diabetic	107	0.87
- Diabetic	165	2.84
		Per Pt Yr
Days	2207	13.9
- Non diabetic	1059	10.9
- Diabetic	1148	20.4

The admission rate was 1.5 episodes per patient year or 13.9 days per dialysis year. Access problems accounted for 28.1% of admission days

Hospitalizations during the period 1 January 2009 to 31 December 2009 were analyzed and expressed as days hospitalized per patient year of dialysis programme. There were 272 hospitalization episodes in 130 patients. Thus, 63.4% of the patients were ever admitted that year.

Access problems accounted for lesser admission days (28.1%) compared with the previous year.

Table 14: Hospitalization Days

Hospitalization	2007	2008	2009
Days per pt year	10.2	9.75	13.9
• % due to access*	35.4	24.0	28.1
• % due to infection +	10.7	4.9	15.9
Episodes per pt year	1.5	1.3	1.5

* including infections of the access

+ excluding access related infections

Table 15: Admission Rates for Diabetics

RATES/YR	2007	<i>Per yr</i>	2008	<i>Per yr</i>	2009	<i>Per yr</i>
Admission episodes	234	1.5	248	1.3	272	1.5
• diabetic	93	2.7	111	2.1	165	2.84
• non-diabetic	141	1.1	137	1.0	107	0.87
Admission days	1628	10.2	1833	9.75	2207	13.9
• diabetic	909	25.9	870	16.7	1148	20.5
• non-diabetic	719	5.7	963	7.1	1059	10.9

Admission episodes and hospitalization days in both diabetics and non-diabetics were higher in 2009.

DEATHS AND WITHDRAWALS

19 patients left the programme.

One patient was on interim haemodialysis and transferred to PD programme while the other patient failed HD and changed to PD programme.

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

4 patients were transferred to high dependency dialysis. 1 patient withdrew dialysis treatment.

There were 8 deaths - 2 from IHD, 2 from cardiac causes, 1 from septicaemia, 1 – hepatic encephalopathy, 1 – ESRD and 1 – right foot gangrene

C. SURVIVAL

Patient survival was analysed by the Kaplan Meier method. There were a total of 380 entries (including re-entries) into the programme.

Overall first year survival was 95.7% and 5 year survival 84.4%.

Table 16 – Survival of entire program as analysed in years 1996 - 2009

Yr of analysis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1 yr	94.4%	94.9%	94.8%	94.9%	95.2%	95.4%	95.5%	96.0%	95.6%	95.7%
2 yr	90.6%	91.5%	91.6%	91.9%	92.3%	93.0%	92.9%	93.1%	92.4%	92.8%
3 yr	88.6%	89.7%	90.0%	89.8%	90.4%	91.3%	91.2%	91.5%	90.5%	90.9%
4 yr	88.6%	88.9%	87.2%	87.9%	87.6%	88.3%	87.8%	88.2%	87.4%	87.9%
5 yr	NA	83.4%	82.5%	83.0%	83.3%	84.5%	84.3%	84.7%	84.2%	84.4%
10 yr	NA	NA	NA	NA	NA	NA	63.8%	68.5%	68.7%	70.1%

Fig 1: Overall Patient Survival

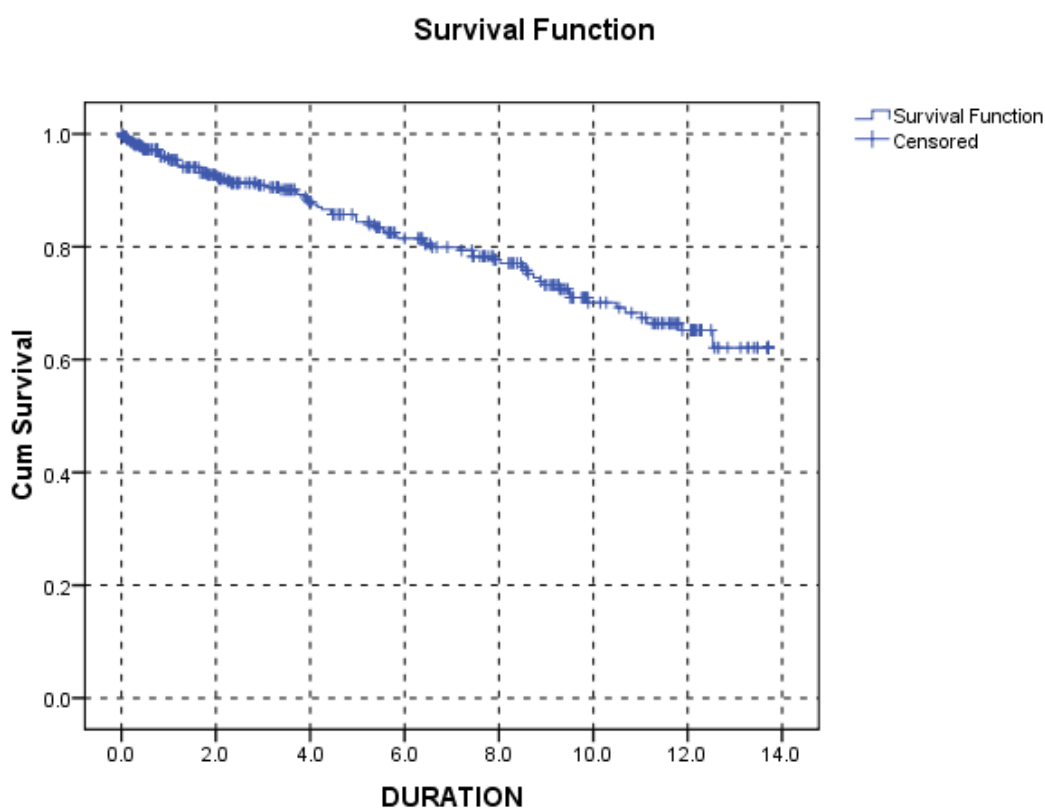
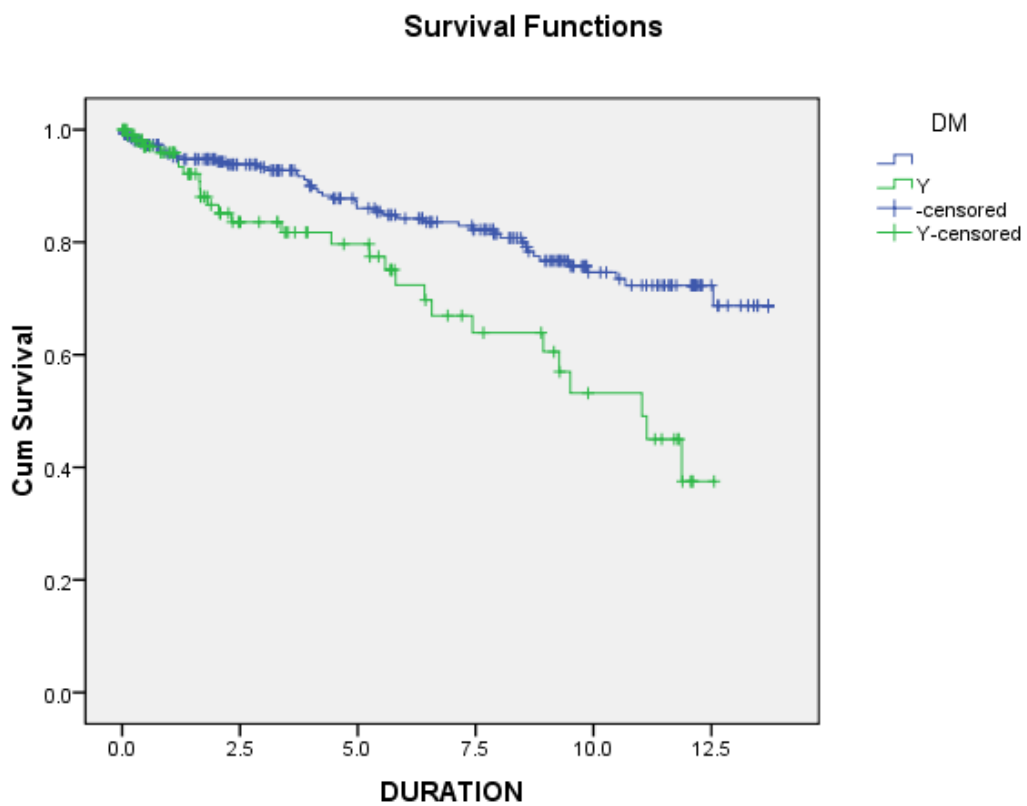


Table 17 - Survival Difference between Diabetics and Non diabetics 1996- 2009

	2007	2008	2009
Non-DM			
1 yr	96.2%	95.4%	95.6%
5 yr	86.8%	86.2%	86.0%
10 yr	74.4%	73.8%	74.6%
DM			
1 yr	95.4%	96.1%	95.9%
5 yr	76.2%	84.9%	79.7%
10 yr	41.2%	49.3%	53.2%

As expected, diabetics have worse survival than non diabetics.

Fig 2: Patient Survival – Diabetic vs Non Diabetic



D. 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 and Ghim Moh, dialyzers used by HepB positive patients are not reused.

Table 18 : Types of Dialyzers used

	2005		2006		2007		2008		2009	
	n	%	n	%	n	%	n	%	n	%
F6	2	1.20	1	0.6	1	0.6	3	1.7	2	1
F7	0		0	0	0	0	0	0	0	0
HF50	10	5.8	13	7.9	13	7.9	13	7.6	17	9
HF60	44	25.4	42	25.5	38	23.0	41	23.8	40	22
HF80	18	10.4	14	8.5	10	6.1	10	5.8	9	5
HF100	7	4.0	7	4.2	8	4.8	8	4.7	9	5
PolyFlux6L					1	0.6	1	0.6	0	0
PolyFlux11			1	0.6			0	0	0	0
PolyFlux14	48	27.7	47	28.5	54	32.7	55	32	65	35
PolyFlux17	26	15.0	24	14.5	25	15.2	25	14.5	30	16
PolyFlux21	17	9.8	15	9.1	14	8.5	15	8.7	14	8
FB210U	1	0.6	1	0.6	1	0.6	1	0.6	0	0
TOTAL	173	100	165	100	165	100	172	100	186	100

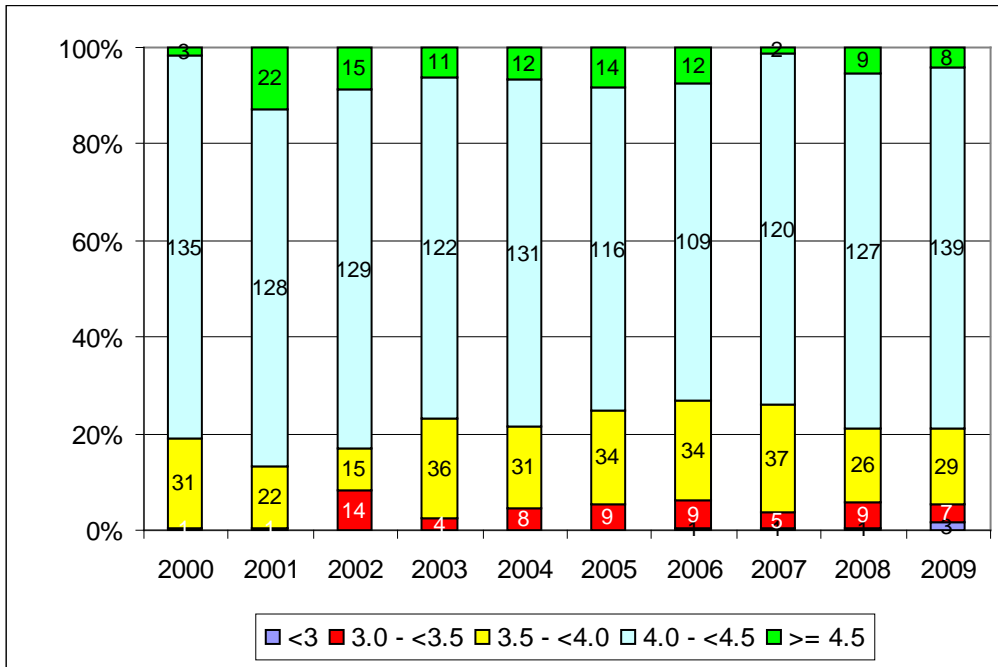
Only 1 % (2 patients) were on low flux dialyzers.

Table 19 : Average Blood flow Used (ml/min)

ml/min	2005	2006	2007	2008	2009
Mean	276	274	272	273	270
Std Dev	36	34	36	34	35
Min	180	180	180	150	150
Max	400	400	360	360	360

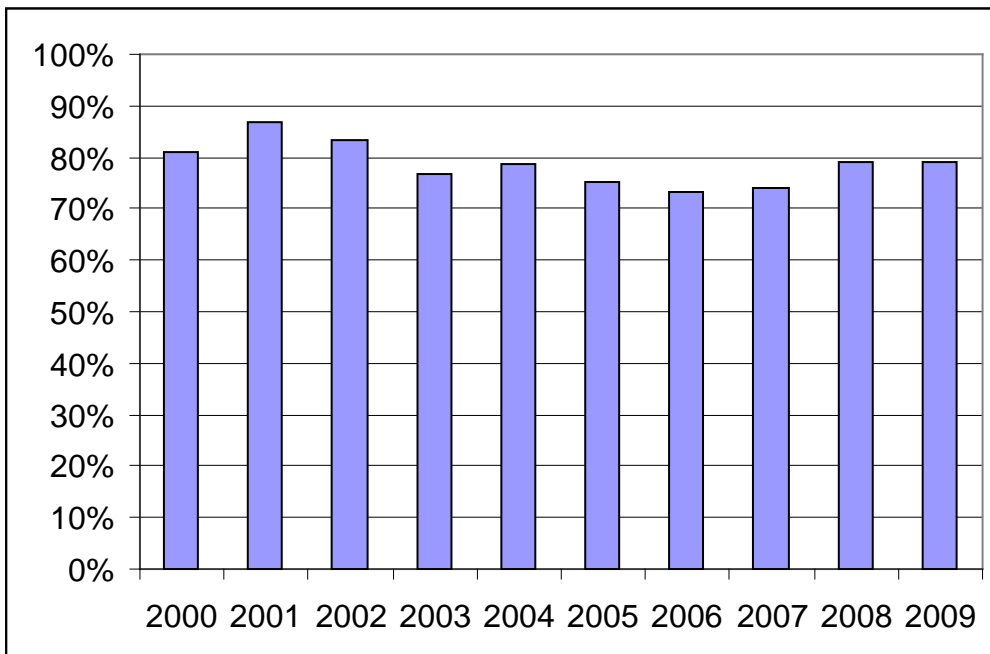
Blood flow is set at a minimum of 200 ml/min averaging 270 ± 35 ml/min range (150 - 360).

Fig 3: Dialysis Time Per Session



Most patients (79.0%) dialyze for 4 hours or more, similar to the previous year

Fig 4: Percentage of patients Dialyzing 4 hours or more per session



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 but without reuse of dialyzers for Hepatitis B positive patients. Ghim Moh centre started accepting Hepatitis B positive but without reuse of dialyzers.

DIALYSATE

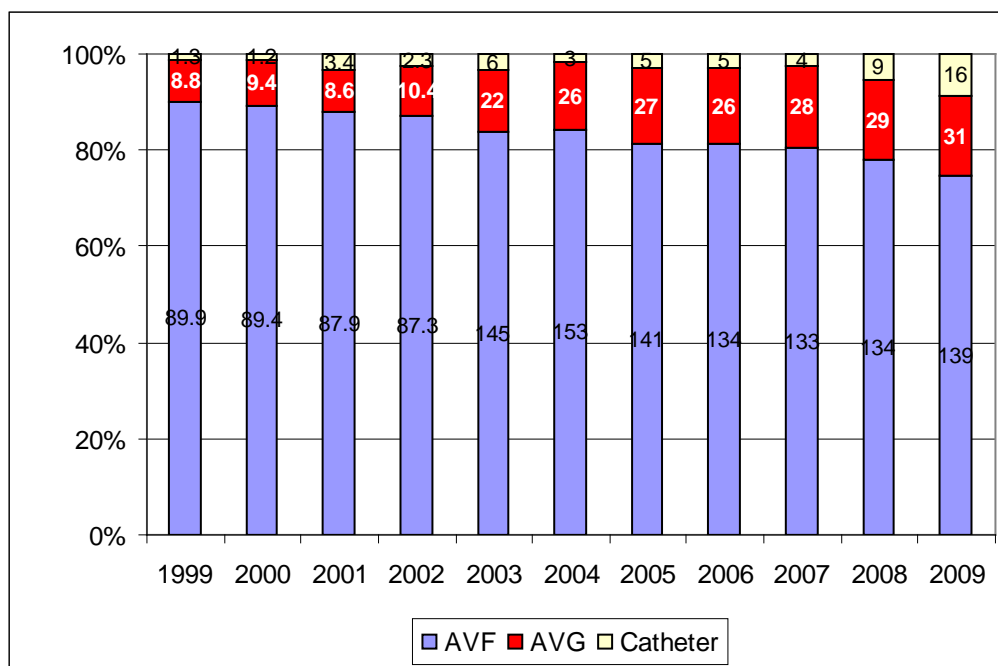
Dialysate available contains

- potassium value of 2.0 mmol/L
- calcium of 1.5 mmol/L and 1.2 mmol/L
- glucose of 10 mmol/L in SWWT centre for diabetic and elderly patients

Dialysate containing 1.5 mmol/L calcium and 10 mmol/L glucose was introduced in SWWT centre on 2nd December 2008 for diabetic and elderly patients.

E. VASCULAR ACCESS

Fig 5: Vascular Access



Thirty one patients or 1.7% (31/186) were using grafts for vascular access, approximately the same proportion as last year. This is compared to 8.8% in 1999. Sixteen patients were on temporary catheters (8.6%). The rest were using AV fistulae (74.7%).

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 for AVF's was 1183 ± 698 ml/min (median

1020 ml/min). The average flow for AVG's was 957 ± 444 ml/min (median 850 ml/min). There is zero recirculation.

Any recirculation above 5% or persistently low access flow with reduction of 25% over the past 3 months was referred back to the surgeon.

F. 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:

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

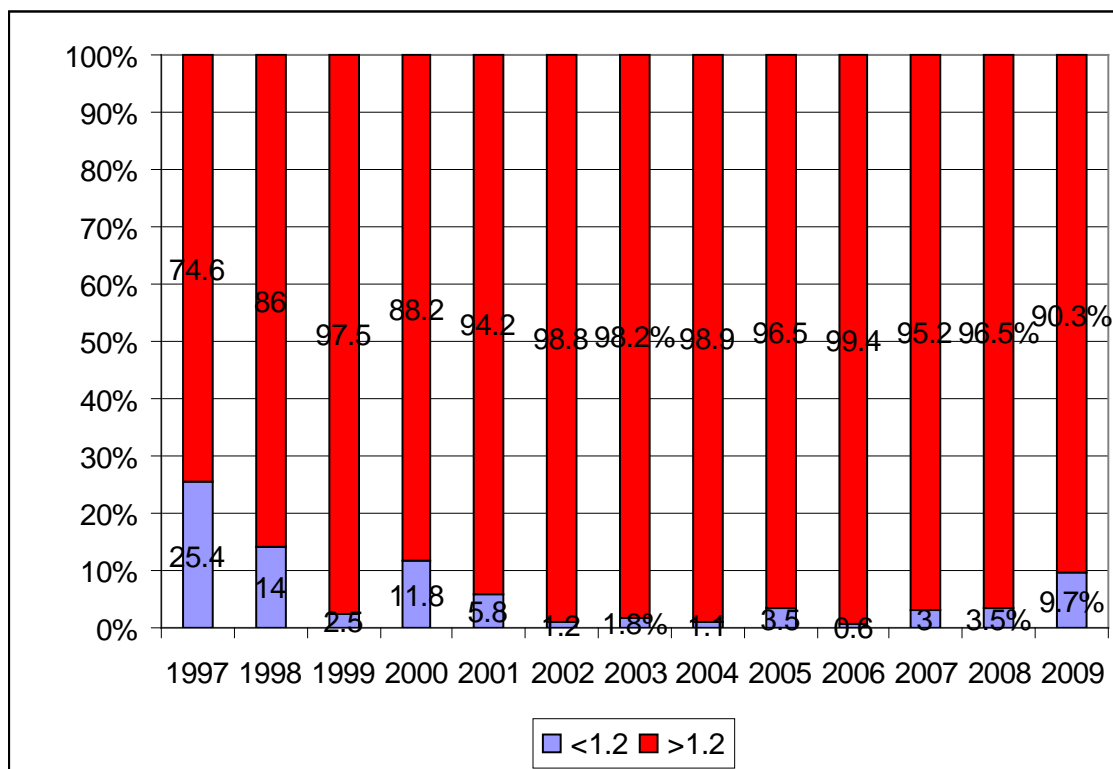
where R = post/pre urea
 UF = ultrafiltration in litres
 W = post dialysis weight

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

Our patients weighed $58. \pm 13.9$ kg (range 32.6 – 100.5 kg). Median 56.5

The proportion of patients with KT/V of 1.2 or greater in November / December 2009 was 90%.

Fig 6: Percentage with KT/V index > 1.2



G. ANAEMIA

The mean Hb was calculated to be 11.0 ± 1.5 g/dl (range 7.5 – 15.9). This has been stable over the past few years. The percentage of patients with a haemoglobin count of less than 10 g/dl was 24% same as last year.

Fig 7: Average Hemoglobin

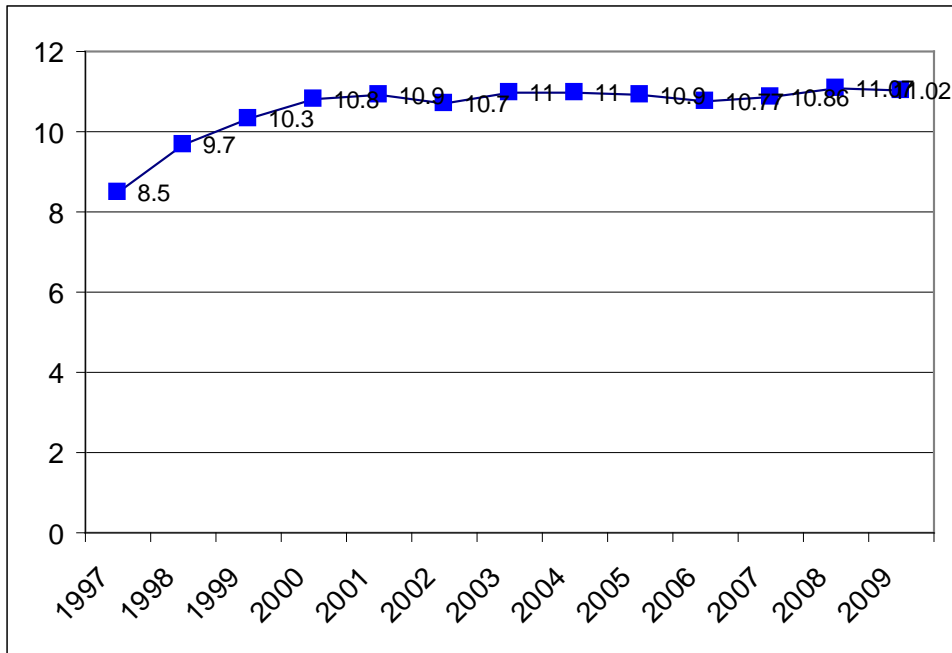


Fig 8: Hb Frequency

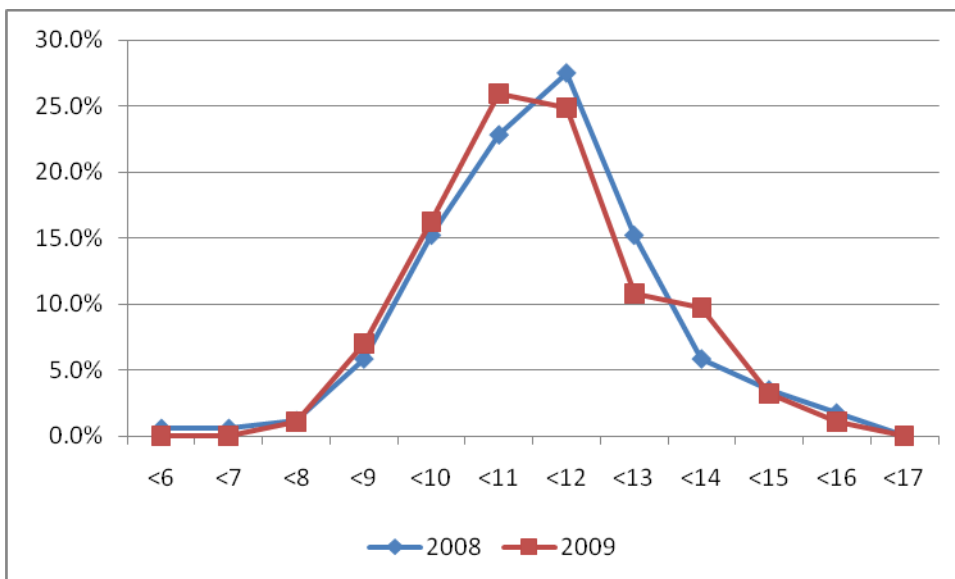
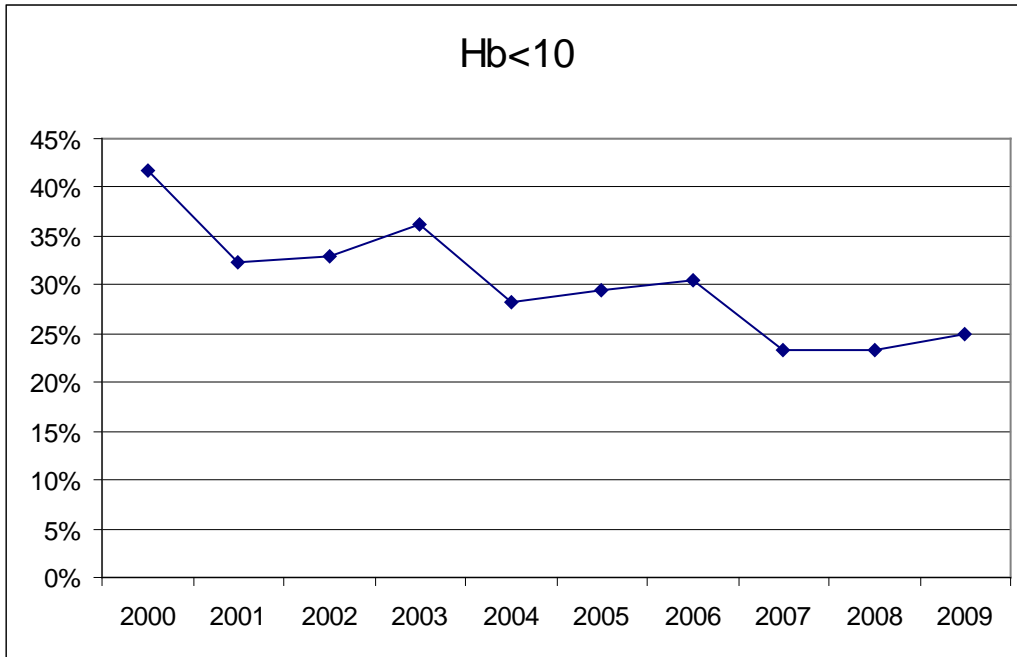


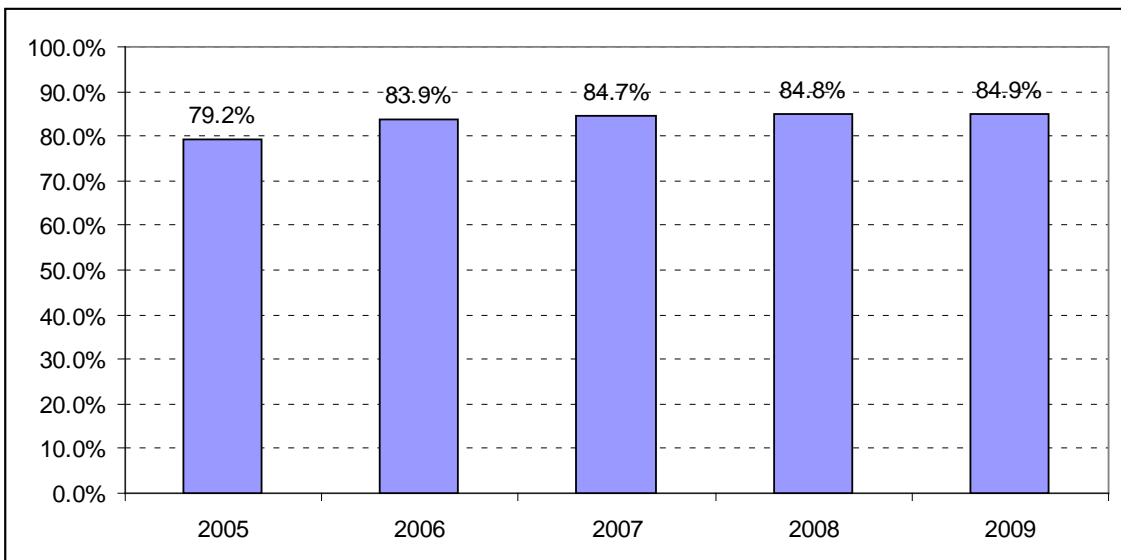
Fig 9: Hb <10



ERYTHROPOIESIS STIMULATING AGENTS

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 (156, 84.4%) were on erythropoietin as compared to last year 146 patients, although the percentage is about the same (84.9%).

Fig 10: Proportion of Patients on ESA



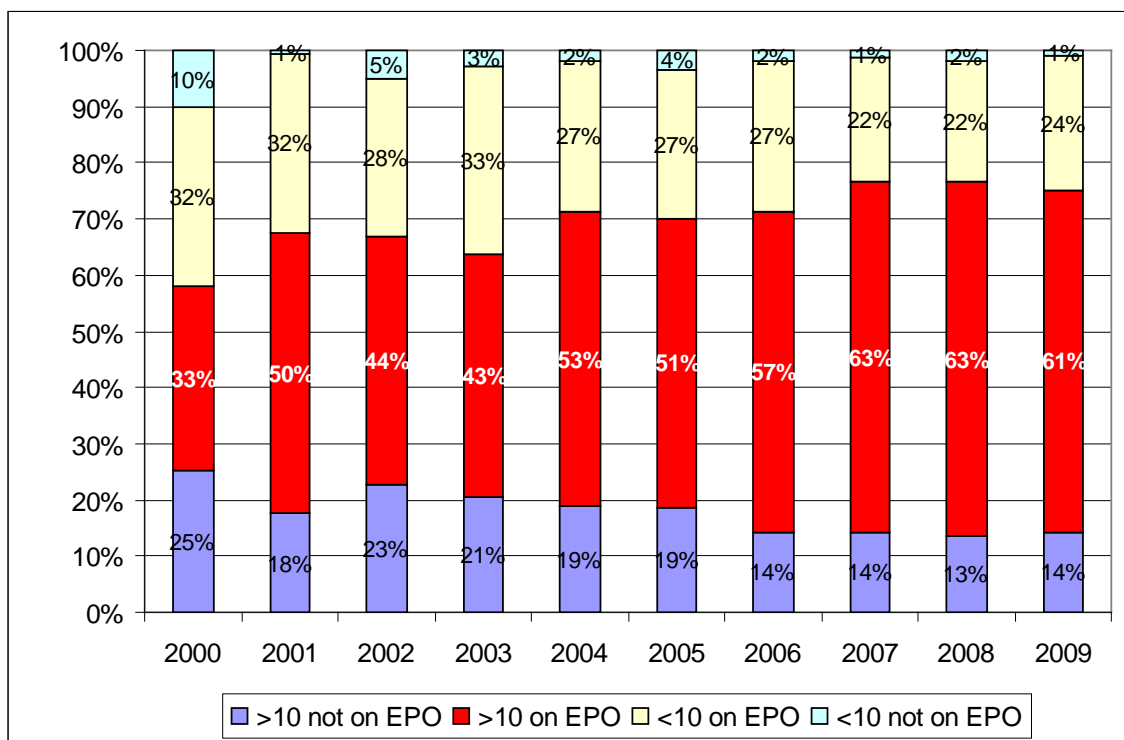
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy

Patients who were on EPO used on the average 113.4 ± 68.7 units/kg/wk (median 102 units/kg/wk) higher than last year's figure of 97.2 units/kg/wk.

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

28 patients (15.1%) were not on EPO. They had a mean Hb of 12.5 g/dl (range 9.5 – 15.9). Only 2 patients (1.1%) with Hb below 10 g/dl were not on EPO.

Fig 11: Use of Erythropoietin



IRON STATUS

Table 20 : Transferrin Saturation

	2005	2006	2007	2008	2009
Mean (%)	36.2	39.2	33.5	37.9	36.7
SD	16	16.9	16.3	18.2	17
% pats w TFSat <20%	9.2	6.7	19.6%	9.9%	10.8%
Average HB when TFSat<20% (g/dl)	10.6	10.5	10.7	11.4	10.9
% pats w TFSat >20%	90.8	93.3	80.4	90.1	88.7
Average HB when TFSat>20% (g/dl)	10.9	10.8	10.9	11	11

As at the end of 2009, mean transferrin saturation was $36.7 \pm 17\%$ (range 10.9 – 102.4). The proportion of patients with transferrin saturation of less than 20% was 10.8%, higher than the previous year. 30% (6/20) in this iron deficient group had a Hb of less than 10 g/dl. The average Hb of patients with transferrin saturation greater or equal to 20% was 11 g/dl compared with 10.9 g/dl for those whose TF Sat was <20%

More patients (65) used intravenous iron (Venofer) in 2009. Forty four (44) used Venofer to replenish iron stores (as compared to 30 in 2008) while 40 patients used it for maintenance. A subsidy scheme for Venofer was available since April 2005.

Table 21 : Ferritin

	2008	2009
Mean	580	547
SD	573	333
% pats w Ferritin < 200	17.5%	10.3%

Using S Ferritin, 10.3% are iron deficient

BLOOD TRANSFUSION

A total of 17 patients received 57 units of blood during admissions to hospital.

H. NUTRITION

Mean S Albumin was 33.9 ± 3.42 g/l. The number of patients with Serum albumin less than 40 g/dl was 90.3%.

Table 22 : Normalised Protein Catabolic Rate and S Albumin

	2003	2004	2005	2006	2007	2008	2009
NPCR (g/kgBW)							
• Mean \pm SD	1.14 \pm 0.23	1.13 \pm 0.23	1.12 \pm 0.21	1.13 \pm 0.22	1.14 \pm 0.24	1.07 \pm 0.23	1.09 \pm 0.26
• % < 1.2	62.6	63.5	68.2	63.6	63.6	75	71
S Albumin (g/l)							
• Mean \pm SD	36.9 \pm 3.1	36.9 \pm 3.5	37.5 \pm 3.4	36.8 \pm 3.1	34.3 \pm 3.4	33.9 \pm 3.8	33.9 \pm 3.42
• % <40	80.6	81.8	72.3	77.6	95.7	90.0	90.3
• % <35	22.9	21.0	16.8	24.2	59.1	50.0	51.1

I. MINERAL METAB

Table 23 : Serum Calcium levels

	2005	2006	2007*	2008	2009
Mean S Calcium (mmol/L)	2.44	2.38	2.44	2.46	2.46
SD	0.25	0.22	0.21	0.20	0.21
Min		1.26	1.79	2.01	1.73
Max		2.88	3.04	3.06	3.2

* S Calcium corrected for S Albumin reported from this year

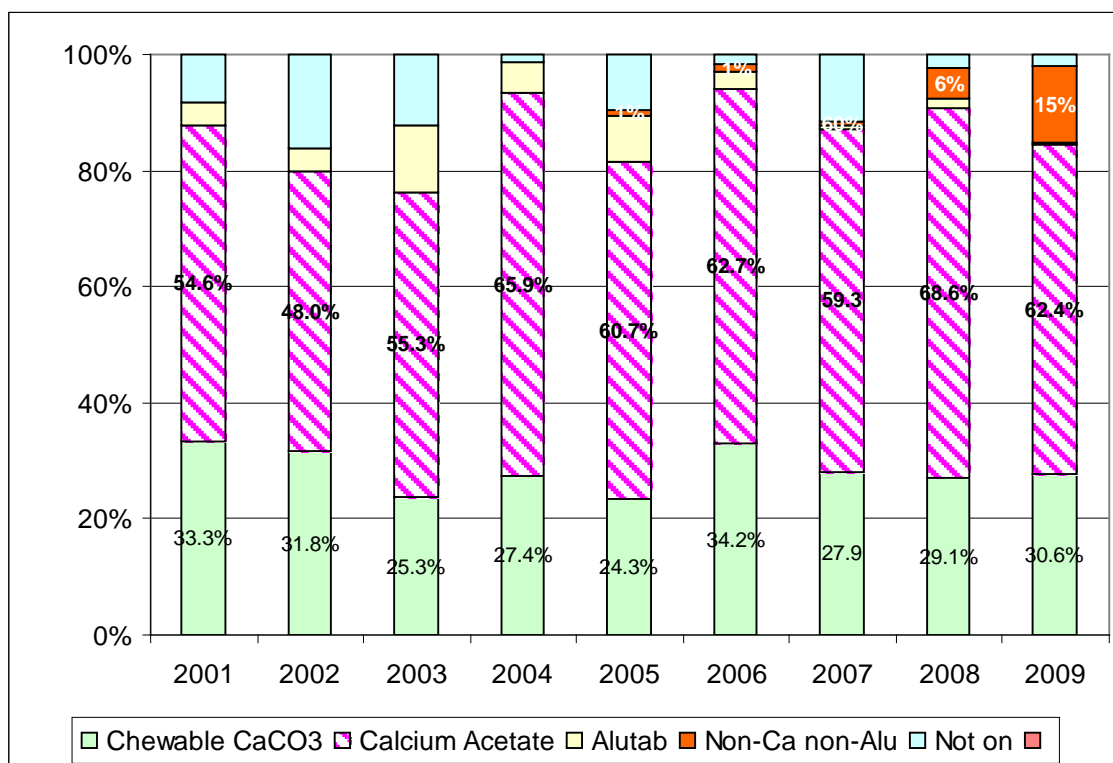
The mean corrected serum calcium value was 2.46 ± 0.21 mmol/l. Low calcium dialysate is currently in use for more than half of the patients (115/186, 61.8%).

Table 24 : Serum Phosphate levels

	2005	2006	2007	2008	2009
Mean S PO4 (mmol/L)	1.88	1.75	1.79	1.55	1.65
SD	0.51	0.44	0.52	0.38	0.47
% with S PO4>2.0 mmol/l	41.6	29.1	31.7	11	11.8
Min	0.38	0.49	0.66	0.62	0.7
Max	3.63	3.37	3.65	2.55	3.25

Mean S Phosphate was 1.65 ± 0.47 mmol/l. The patients having values above 2.0 mmol/l (11.8%) about the same as compared to last year.

Fig 12: Phosphate binders in use



Majority of patients are on calcium-based phosphate binders of which 62.4% are on calcium acetate.

Non calcium non-aluminum binders (Lanthanum and Renagel) are now available to selected patients. They are costly and probably out of reach of most patients. More patients are on Lanthanum with the availability of subsidy for phosphate binders.

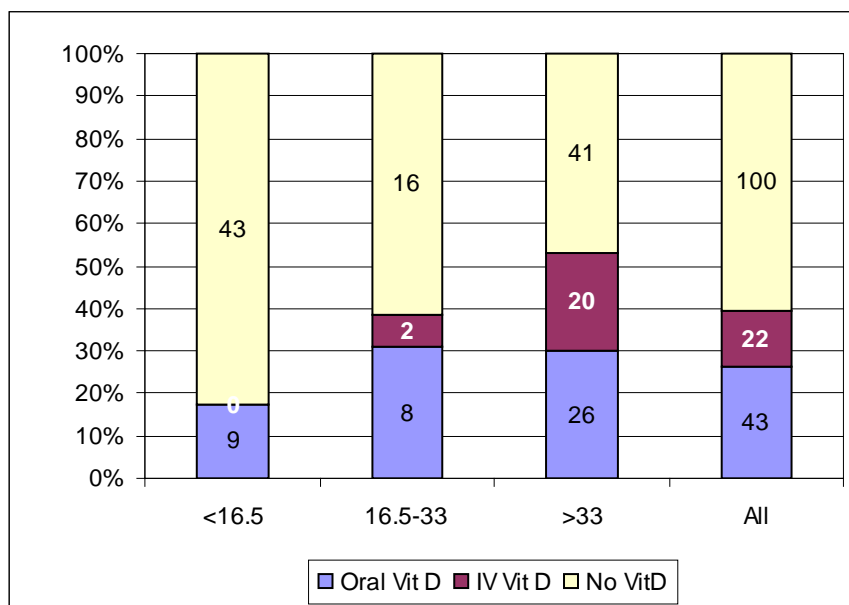
The KDOQI guidelines of 2003 (AJKD Vol 42 October 2003 Suppl 3) recommends treatment for patients on dialysis (CKD Stage 5) when iPTH exceed 33 pmol/l should be treated with Vit D analogs to main the PTH at 16.5-33 pmol/l.

Table 25 : PTH levels

	2005	%	2006	%	2007	%	2008	%	2009	%
<16.5	46	26.7	52	32.3	54	32.9	52	31.3	71	38
16.5-33	37	21.5	31	19.3	24	14.6	27	16.3	31	17
>33.0	89	51.7	78	48.4	86	52.4	87	52.4	83	45
Total	172	100	161	100	164	100	166	100	185	100

Majority (45%) of the patients have intact parathyroid hormone levels elevated beyond 33 pmol/l. Hyperparathyroid bone disease is still a significant problem in the dialysis population.

Fig 13: Parathyroid Hormone levels and Vit D Treatment



In the group with low PTH (<16.5 pmol/l) which constitutes 38% (71 patients) of all cases, only 4.3% (8) were on oral Vit D and none on iv Vit D.

K/DOQI now aims for a PTH level of 16.5 – 33 pmol/l. Only 17% of all patients had PTH values in this range. 53% (44/83) of patients with PTH>33 pmol/l being treated with Vit D. A subsidy scheme for Calcijex was started in April 2005. Hyperphosphatemia and hypercalcemia often preclude them from treatment. Paricalcitol may be useful in these cases.

A total of 38 patients had parathyroidectomy bringing the prevalent rate to 20.4% (38/186).

J. DIABETICS

The prevalent number of diabetic patients was 65 (34.9%). This is not surprising as diabetic nephropathy is the etiology of ESRD in more than half of all new cases.

K. HYPERTENSION

72.5% (135/186) have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

Table 26 : Use of Antihypertensive Agents by number of Drugs

	2005	2006	2007	2008	2009
None	38.7%	31.7%	37.0%	29.7%	27.4%
1 Drug	28.3%	31.9%	31.5%	28.5%	28.5%
2 Drugs	22.0%	20.7%	23.0%	27.3%	26.3%
3 Drugs	8.7%	13.4%	6.1%	9.9%	14%
4 drugs	2.3%	1.2%	2.4%	4.7%	3.8%
	100.0%	100%	100%	100%	100%

About 30% of the patients were not on antihypertensives and another 29% on one drug only.

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

Table 27 : Use of Antihypertensive Agents by Drug Type

	2005	2006	2007	2008	2009
None	38.7%	31.7%	37.0%	29.7%	27.4%
Beta blockers	43.9%	44.7%	38.8%	43.6%	47.3%
Calcium channel Blockers	31.2%	36.4%	33.3%	43.6%	43%
ACEI / ARB	26.0%	30.8%	26.7%	33.7%	37.6%
Others	5.8%	3.6%	4.8%	4.7%	13.4%

These are not mutually exclusive.

L. HYPERLIPIDEMIA

Mean total cholesterol and LDL-Cholesterol was lower than last year while total cholesterol/HDL-cholesterol ratio and triglyceride levels increased.

Fig 14: Lipids

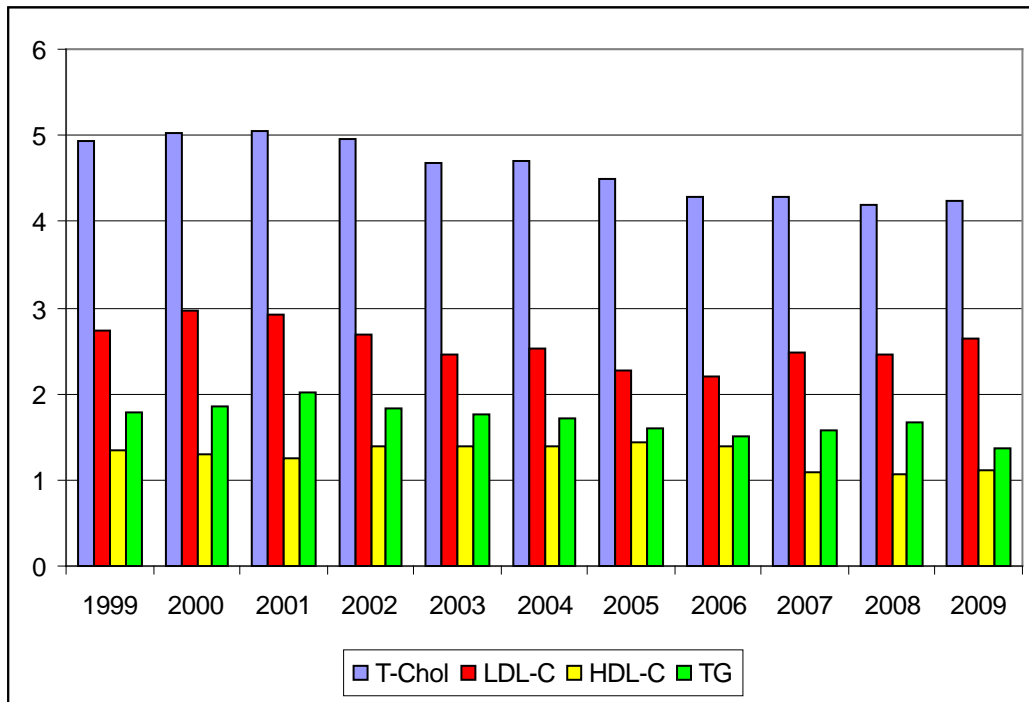
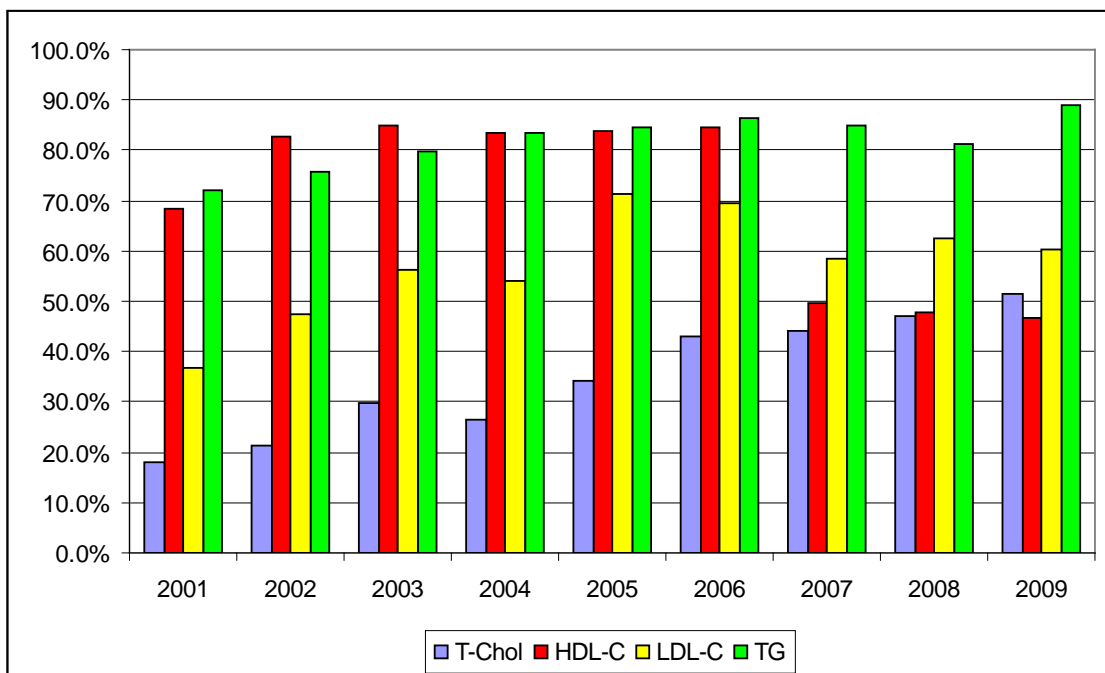


Fig 15: Percentage of patients achieving target levels as recommended by MOH guidelines 2002



The percentage of patients achieving MOH targets for TG (<2.3 mmol/l) remains quite high 88.2%. However, those for the rest are only around 50% - cholesterol (<4.1 mmol/l) 51%, HDL-cholesterol (>=1.0 mmol/l) 46.2%, LDL cholesterol (<2.6 mmol/l) 59.6% though the target for total cholesterol seems to be rising.

The proportion of patients drug therapy has increased to 68.3% (127/186). Majority was on one drug only 59.7%. HMG-CoA reductase inhibitors were the most commonly used drug (67.7%),

M. HEPATITIS SEROPOSITIVITY

6.5% are hepatitis B carriers, 8% are anti-HCV positive for Hepatitis C antibody. Four patients had received interferon treatment and both patients' HCV PCR was negative. Two patients (1.2%) are both anti-HCV and HepBsAg positive.

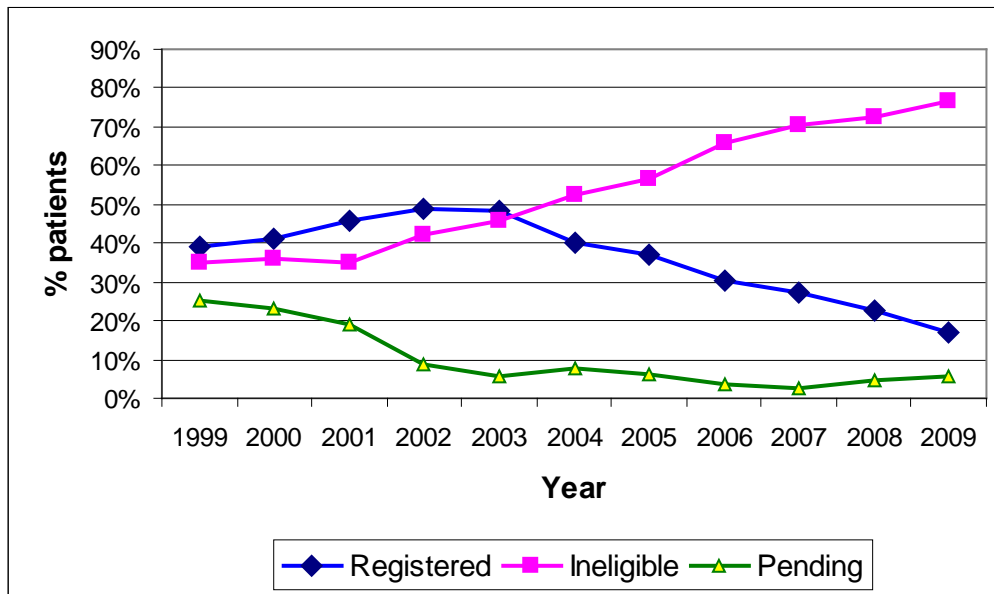
Table 28 : Hepatitis Rates

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
HepB	5.8%	5.7%	5.7%	7.5%	5.5%	5.2%	6.2%	6.7%	6.4%	6.5%
HCV	9.4%	9.7%	9.2%	11.5%	10.9%	9.8%	10.6%	9.1%	8.7%	8%
HepB & HCV	1.20%	1.1%	1.1%	1.7%	1.6%	1.7%	1.2%	1.2%	1.2%	1%

N. TRANSPLANT WAITING LIST

Only 32 patients (17.2%) are on the waiting list. Only 11 patients have not been assessed. The number of ineligible patients grow as KDF takes in more patients with comorbidities since admission criteria was relaxed.

Fig 16: Proportion of patients on the Transplant Waiting List



8. CONCLUSION

In recent years, the typical new dialysis patient has more comorbidities. Prevalent patients are growing older and manifesting increasing complications of the ESRD state.

Challenges for the future continues to increase as we aim to maintain the same life expectancy and quality of life.

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

A/PROF CHOONG HUI LIN
MEDICAL DIRECTOR