

KIDNEY DIALYSIS FOUNDATION

MEDICAL ANNUAL REPORT HAEMODIALYSIS PROGRAMME 2012

Prepared by

Dr Choong Hui Lin
Medical Director

With input from:

Lay Kwee Chin
Senior Nurse Clinician, Patient Services

Theresa Soh
Clinical Coordinator, Patient Services

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY
2. INTRODUCTION
3. THE DIALYSIS CENTRES
 - Bishan
 - Kreta Ayer - San Wang Wu Ti
 - Ghim Moh
 - Peritoneal Dialysis Centre
- I. HAEMODIALYSIS PROGRAMME
4. STAFFING
5. EQUIPMENT
6. PATIENT CARE
7. PATIENT POPULATION
 - A. Intake and Exits
 - B. Demographic characteristics
 - C. Survival
 - D. Dialysis Parameters
 - E. Vascular Access
 - F. Dialysis Adequacy
 - G. Anemia
 - H. Nutrition
 - I. Renal Bone Disease
 - J. Diabetic
 - K. Hypertension
 - L. Hyperlipidemia
 - M. Infection - Hepatitis
 - N. Transplant Waiting List
8. CONCLUSION

1. EXECUTIVE SUMMARY

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

Two dialysis providers, Fresenius Medical Care and DaVita Renal, 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 2012, there were 65 new entrants.

Thirty-one (31) patients exited the programme (4 transplant, 13 deaths, 7 transfers to PD programme, 3 to non-PD programmes, 2 withdrew from dialysis, 2 terminated). In the prevalent population, average age was 57.7 ± 10.8 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 43.8%, diabetic nephropathy 28.4%. Overall first year survival of patients was 95.6% and five year survival 83.8%. 5 year survival in diabetics was similar in the first year (non-DM vs DM 96.4% vs 94%), 5 years 86.3% vs 77.8% and 10 years 72.9% vs 41.8%.

Almost all patients (99%) are using high flux dialysers. Average blood flow was 267 ± 31 ml/min. 86.0% of patients dialyse 4 hours or more. 76.6% of patients use a native arteriovenous fistula. Dialysis adequacy as measured by single pool KT/V is >1.2 in 97% of patients.

Mean hemoglobin was 11.1 ± 1.4 g/dl. About 87% of all patients are on EPO. About 15.4 % of patients are considered Fe deficient.

93.5% of patients have a S Albumin of <40 g/l. Hyperparathyroidism and hyper-phosphatemia remains a problem. Less patients are on intravenous Vitamin D.

Diabetes as a comorbidity was present in 33.3% of the population. 78% were on treatment for hypertension.

There was no significant changes in virology status. Hep B positivity was 4.5%, HCV 4.9%, HepB and HCV 1 %.

Less patients were registered on the National Transplant waiting list (14%), 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 28 patients was transferred to the KDF. Bishan Dialysis Centre commenced operation on November/December 1997 with 43 patients from the former Tan Tock Seng Dialysis Centre.

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 Nephrocare was awarded the tender as dialysis provider. Eight patients were transferred from Alexandra Hospital Centre when the centre started. 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.

When KDF first started operations in 1996, 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). Asia Renal Care was absorbed by Fresenius Medical Care on 1st July 2010. Thus all three centres came under one management. In 2011, the tender was opened with an option to quote for 5 years for Bishan Centre. It was awarded to DaVita Renal in June 2011. In 2012 the tender for Ghim Moh Centre was for 3 years. It was awarded to DaVita Renal in September 2012.

Renovations to SWWT Kreta Ayer Centre was carried out from June to September 2012. During this time, patients were temporarily decanted to Bishan and Ghim Moh centres.

Dialysis medical care is currently provided by a team of practicing nephrologists from SGH, NUH, TTSH, KTPH and the private sector.

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

This report covers medical data collated at the end of 2012.

3. THE DIALYSIS CENTRES

The location and prevalent number of patients as of 31 Dec 2012 are listed below:

	Centre	Location	Patient No
1	KDF-Bishan Centre	Block 197, Bishan Street 13 #01-575/583	106
2	San Wang Wu Ti – KDF Centre	Block 333, Kreta Ayer Road #03-33	70
3	KDF – Ghim Moh Centre	Blk 6 Ghim Moh Road #01-188	59
	TOTAL	Haemodialysis patients	235

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 started 135 evening shift in May 2012 inclusive of Public Holidays.

SWWT centre was closed from 11 June to 3 September 2012 for renovation and change of the reverse osmosis system. Patients were decanted to Ghim Moh and Bishan Centres. MOH re-audited the centre on 15 August 2012 and the centre was able to resume operation.

All haemodialysis centres operate 3 shifts a day.

Dialysis Station

	Centre	No. of Regular + Isolation Stations	Total
1	KDF-Bishan Centre	19 + 1 isolation	20
2	San Wang Wu Ti – KDF Centre	15 +1 isolation	16
3	KDF – Ghim Moh Centre	19 +1 isolation	20
	TOTAL		56

I. HAEMODIALYSIS PROGRAMME

Aside from the provision of long term hemodialysis, KDF also provides:

- A) an interim haemodialysis scheme started in May 2009 for patients temporarily requiring hemodialysis at a cheaper rate while awaiting permanent placement, CAPD temporarily on hemodialysis and bridging to transplantation.
- B) Subsidies for KDF patients turning high dependency and considered unsuitable for low dependency dialysis. This was started in Dec 2009 to enable the patients to continue dialysis in a private sector where physician care/advice could be rendered more quickly.

4 STAFFING

MEDICAL

The medical staff comprised 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 Stephen Chew
2. A/Prof Lina Choong
3. Dr Marjorie Foo
4. Dr Ho Chee Khun
5. Dr Titus Lau
6. Dr Grace Lee
7. Dr Pwee Hock Swee
8. Dr Tan Han Khim
9. Dr Tan Seng Hoe
10. Dr Yeoh Lee Ying
11. Dr Ng Tsun Gun
12. Dr Adrian Liew
13. Dr Jason Choo
14. Dr Roger Tan

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 Lay Kwee Chin, Senior Nurse Clinician, Ms Theresa Soh, Clinical Coordinator and Ms Sunitha Silvanathan, Clinical Nurse (joined in September 2012).

Routine audits are performed on the service 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)
- DaVita Renal at Bishan Centre (contract from June 2011 to May 2016)
- DaVita Renal at Ghim Moh Centre (contract from Sept 2012 to August 2015)

The Dialysis Provider is responsible for rostering of the nursing services. Staff numbers inclusive of the charge nurse as at 31 Dec 2012 is listed as follows:

Centre	Renal trained SN	SN	AN	DT	Total
Bishan	2	10	5	1	18
SWWT	2	7	4	0	13
Ghim Moh	2	10	1	0	13
Grand total					44

Training & Education

The Senior Nurse Clinician, Clinical Coordinator and Clinical Nurse, together with the Centre Charge Nurses are responsible for Training & Education for the service provider nursing staff. This is discussed in the Nursing report.

5 EQUIPMENT

DIALYSIS MACHINES

There are in total 59 dialysis machines. During the year 17 new Gambro AK96 dialysis machine were purchased

These were located as follows:

	Fresenius 4008S	Gambro AK96
Bishan	0	21
Kreta Ayer	0	17
Ghim Moh	21	0

WATER TREATMENT SYSTEMS

When Bishan centre was set up in 1997, Waterman Pte Ltd was contracted to provide the water treatment system. The water treatment system in Bishan Centre was replaced by Gambro WRO system in October 2009. For SWWT centre in 2002, a local company, Memiontec Pte Ltd, was awarded the tender for the RO water treatment system. This was replaced with a Gambro CWP113 system in August 2012.

The water treatment system in Ghim Moh Centre is from Minntech installed by Transmedic Pte Ltd.

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.

The systems at Ghim Moh and SWWT centres undergo auto-washing and flushing before going onto standby mode at the end of each dialysis day whereas in Bishan centre the RO system will perform daily integrated heat disinfection at the end of each day.

Daily monitoring of RO system pressure parameters and chloramine checks are carried out at the beginning of the day before priming and mid shift. Chemical disinfection is done 6 monthly by the vendors for Ghim Moh centre. In Bishan and SWWT centres membrane disinfection is performed every 2 months by the nurses.

The chemical disinfectant used for RO disinfection as follows:

Bishan and SWWT centres – Dialox

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 performed 2 monthly meeting 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 is renewed every 2 years.

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

6 PATIENT CARE

Ms Lay Kwee Chin (Senior Nurse Clinician) Ms Theresa Soh (Clinical Coordinator) and Ms Sunitha (Clinical Nurse) together oversee 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 Ms Lim Chi Lee by DaVita and Ms Liow Min Choo by Fresenius Medical Care.

PATIENT WELFARE

Ms Sandy Lim, Welfare Officer in charge of SWWT and PD patients, while Ms Rena Lee is in charge of Bishan and Ghim Moh patients.

Consistent with its mission, KDF patients are heavily subsidised. In 2012, KDF noted that 105 patients (44.7%) received Medifund subsidies from the restructured hospitals compared with 40.3% the previous year.

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

Five (5) patients received civil service benefits.

DIALYSIS REVIEWS

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

REPORTING OF INCIDENTS AND ADVERSE OUTCOMES

As mandated by MOH mortality statistics were provided to MOH on prescribed on their format since December 2011.

A process of incident reporting of adverse events is in place. Immediate action if required will be carried out by Dialysis Provider and reported to KDF Administration within 24 hours.

7 THE PATIENT POPULATION

As at 31 December 2012, we had 235 patients dialysing in 3 centres – 106 patients at Bishan Centre (BS), 70 at Kreta Ayer (SWWT) and 59 patients at Ghim Moh centre.

A. INTAKE AND EXITS

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

Table 7A-1 – Patient Stock & Flow

ENTRY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
New Cases	5	18	5	10	13	18	26	28	12	32
New Cases (interim)		1	6	3	3	3	7	7	15	31
Transfers in from SDDU	0	0	0	0	0	0	0	0	0	0
Re-enter KDF	3	0	0	0	1	1	0	3	2	2
Total Entries	8	19	11	13	17	22	33	38	29	65
EXIT										
Transfer Out to non-KDF Programs	2	2	3	0	1	0	5	1	7	5
Transfer Out to KDF PD			5	3	2	2	1	2	3	7
Transplant	2	4	6	10	6	4*	4*	2*	1*	4**
Withdraw from Dialysis/Default	0	0	1	0	2	0	1	4	4	2
Deaths	4	6	5	11	2	9	8	8	20	13
Total Exits	8	12	20	24	13	15	19	17	35	31
Total No of Pt	174	181	172	161	165	172	186	207	201	235

* Cadaveric/Deceased Donor

** 3 Cadaveric/Deceased Donor and 1 living related donor

Table 7A-2 –Mode of Dialysis

Interim HD		32
- Newly initiated subsequently permanent HD	26	
- Newly initiated awaiting PD	5	
- Newly initiated Bridge to Transplant	0	
- PD complications for temp HD	1	
- PD complications subs permanent HD	0	
Permanent HD [not via interim route]		33
- newly initiated	31	
- failed PD program, re-enter program	2	
TOTAL		65

Table 7A-3 – Source of Referral

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SGH	5	19	8	10	14	18	16	25	22	52
NUH	3	0	0	2	1	2	11	8	3	6
TTSH			2	1	1	1	1	2	1	3
AH / KPTH					1	0	4	3	3	4
Private	0	0	1	0	0	1	1	0	0	0
Total Entries	8	19	11	13	17	22	33	38	29	65

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

B. DEMOGRAPHIC & PATIENT CHARACTERISTICS

Etiology of Renal Failure

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

Table 7B-1 – Etiology of Renal Failure in New Patients

Etiology	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Chronic glomerulonephritis	4	23.5	4	18.2	6	18.1	14	36.8	6	20.7	18	27.7
Diabetic nephropathy	9	52.9	13	59.1	20	60.6	14	36.8	14	48.3	27	41.5
Lupus nephritis	0	0	1	4.5	1	3.1	0	0	0	0	1	1.5
Obstructive uropathy	0	0	0	0	0	0	1	2.6	2	6.9	1	1.5
PCKD	0	0	1	4.5	1	3.1	2	5.3	1	3.4	2	3.1
TB kidney	0	0	0	0	0	0	0	0	0	0	1	1.5
Hypertension	1	5.9	1	4.5	0	0	1	2.6	1	3.4	2	3.1
Others	3	17.6	0	0	0	0	4	10.6	4	13.8	6	9.2
Unknown Etiology	0	0	2	9.1	5	15.1	2	5.3	1	3.4	6	9.2
Total	17	100	22	100	33	100	38	100	29	100	65	100

The majority of new cases were patients with diabetes mellitus (41.5%) and chronic GN (27.7%).

Table 7B-2 – Etiology of Renal Failure in Prevalent Patients

Etiology	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Chr glomerulonephritis	93	56.4	90	52.3	86	46.2	93	44.9	88	43.8	96	41.4
Diabetic nephropathy	33	20.0	40	23.3	53	28.5	62	30.0	57	28.4	69	29.7
Lupus nephritis	8	4.8	9	5.2	10	5.4	10	4.8	10	5.0	9	3.9
Obstructive uropathy	0	0	0	0	0	0	2	1.0	2	1.0	2	0.9
PCKD	2	1.2	2	1.2	3	1.6	5	2.4	6	3.0	8	3.4
TB kidney	1	0.6	1	0.6	1	0.5	0	0	1	0.5	2	0.9
HT	3	1.3	4	2.3	4	2.2	4	1.9	5	2.5	7	3.0
VUR	2	1.2	2	1.2	2	1.1	2	1.0	2	1.0	3	1.3
Others	9	5.5	8	4.6	9	4.8	10	4.8	13	6.5	17	7.3
Unknown Etiology	14	8.5	16	9.3	18	9.7	19	9.2	17	8.5	22	9.4
Total	165	100	172	100	186	100	207	100	201	100	232	100

Majority of patients (41.4%) have chronic glomerulonephritis as the primary etiology of renal failure and 29.7% of the patients with diabetic nephropathy.

Gender

Table 7B-3 – Gender of New Patients

Gender	2006		2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Males	4	30.8	11	64.7	14	63.6	16	48.5	21	55.3	18	62.1	28	43
Females	9	69.2	6	35.3	8	36.4	17	51.5	17	44.7	11	37.9	37	57
Total	13	100.0	17	100.0	22	100.0	33	100	38	100	29	100	65	100

Table 7B-4 – Gender of Prevalent Patients

Gender	2006		2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Males	72	44.7	79	47.9	82	47.7	87	46.8	96	46.4	96	47.5	112	47.7
Females	89	55.3	86	52.1	90	52.3	99	53.2	111	53.6	105	52.4	123	52.3
Total	161	100	165	100	172	100	186	100	207	100	201	100	235	100

At the end of 2012, the ratio of male to female patients was 112:123.

Ethnic Distribution

Table 7B-5 – Ethnic Distribution of New Patients

Race	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Chinese	13	76.5	16	72.7	18	54.6	27	71.0	20	67.0	37	56.9
Malay	4	23.5	5	22.7	11	33.3	6	15.8	8	27.6	18	27.7
Indian	0	0	1	4.5	4	12.1	5	13.2	1	3.4	9	13.8
Others	0	0	0	0	0	0	0	0	0	0	1	1.5
Total	17	100	22	100	33	100	38	100	29	100	65	100

Table 7B-6 – Ethnic Distribution of Prevalent Patients

Race	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Chinese	126	76.4	138	77.3	138	74.2	153	73.9	145	72.1	163	69.4
Malay	27	16.4	36	17.4	36	19.4	38	18.4	42	20.9	54	23
Indian	12	7.3	12	5.2	12	6.4	16	7.7	14	7.0	17	7.2
Others	0	0	0	0	0	0	0	0	0	0	1	0.4
Total	165	100	172	100	186	100	207	100	201	100	235	100

The ethnic distribution of our prevalent patients was 69.4% Chinese, 23% Malays, 7.2% Indians and 0.4% Others.

Age

The mean age at entry in 2012 was 56.5 ± 12.5 years (median, 52.2). Twenty-one (21) patients were above the age of 65 years

Table 7B-7 – Average age of entry into the Programme

Year	2007	2008	2009	2010	2011	2012
Mean Age (years)	56.6	58.8	56.6	56.7	56.9	56.5
SD	12.9	12.4	12.5	10.4	12.5	12.5
Min	26.9	33	26	34.5	32.7	23.5
Max	73.0	78	76	81.9	78.9	80.2

Average age of new patients with diabetic nephropathy was 60.6 years compared with 51.6 years in non-diabetics.

Table 7B-8 – Average age of Prevalent patients on the Programme

Year	2007	2008	2009	2010	2011	2012
Mean Age (years)	53.8	55.5	56.2	57.4	57.7	58.7
SD	9.9	9.7	10.3	10.3	10.8	10.8
Min					28.0	29.0
Max					86.0	87.0

Age of the prevalent dialysis population at the end of 2012 was 58.7 ± 10.8 years (median 58.8). The mean prevalent age continues to rise as the existing population ages with a low turnover with influx of elderly new patients.

COMORBIDITY

Table 7B-9 – Common Comorbidities in Incident patients

Year	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Diabetic	11	64.7	10	45.5	22	71	20	52.6	19	65.5	31	47.7
IHD n oth cardiac dis	2	11.8	5	22.7	15	48.4	22	57.9	6	20.7	21	32.3
CVA	0	0	4	18	7	22.6	4	10.5	1	3.4	1	1.5
PVD	1	5.9	1	4.5	5	16.1	4	10.5	1	3.4	6	9.2

Table 7B-10 – Common Comorbidities in Prevalent patients

Year	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
Diabetics	44	26.7	45	26.2	65	34.9	69	33.3	67	33.3	81	34.5
IHD n other cardiac dis	42	25.5	37	25.1	59	31.7	57	27.5	45	23.4	15	6.4
CVA	7	4.2	9	5.2	15	8.1	14	6.8	11	5.5	11	4.7
PVD	5	5	6	3.5	7	3.8	11	5.3	7	3.5	11	4.7

The proportion of diabetics in the prevalent dialysis population has increased 34.5%

The proportion of patients with cardiac problems has decreased 6.4%.

HOSPITALIZATIONS

Hospitalizations during the period 1 January 2012 to 31 December 2012 were analyzed and expressed as episodes and days hospitalized per patient year of dialysis programme. There were 521 hospitalization episodes in 180 patients. Thus, 67.2% of the patients were ever admitted that year.

Table 7B-11 – Admission Rates

	2009		2010		2011		2012	
	No	%	No	%	No	%	No	%
No of Patients admitted in ref year	134	63.4%	141/224	62.9%	160/235	69.9%	180/266	67.7
- Diab pt adm / all diab	51	70.8%	69/85	81.2%	75/97	77.3%	80/99	80.8
- Non-diab pt adm / all	83	59.4%	72/139	51.8%	89/138	64.5%	100/154	64.9

RATES/YR	2009	<i>Per yr</i>	2010	<i>Per yr</i>	2011	<i>Per yr</i>	2012	<i>Per yr</i>
Admission episodes	272	1.5	466	2.4	499	2.5	521	2.4
• diabetic	165	2.84	266	3.6	233	3.1	239	2.9
• non-diabetic	107	0.87	200	1.6	266	2.1	282	2.1
Admission days	2207	13.9	2581	13.4	3574	17.6	3928	17.8
• diabetic	1148	20.5	1394	18.8	1897	25.5	2084	25.1
• non-diabetic	1059	10.9	1187	9.6	1677	13.0	1844	13.4

The admission rate was 2.4 episodes per patient year. Days admitted per dialysis year increased to 17.8. Not unexpectedly, diabetics had about double the number of days (25.1) admitted compared with non-diabetics (13.4).

Access problems accounted for 15% of admission days (10.6% in diabetics, 19.9% in non-diabetics).

Table 7B-12 – Hospitalization Days

Hospitalization	2007	2008	2009	2010	2011	2012
Days per pt year	10.2	9.75	13.9	13.4	17.6	17.8
• % due to access*	35.4	24.0	28.1	33.8	27.8	15.0
• % due to infection +	10.7	4.9	15.9	20.0	6.2	6.1

* including infections of the access

+ excluding access related infections

DEATHS AND WITHDRAWALS

A total of 31 patients left the programme. Reasons were as follows:

5 patients was on interim haemodialysis and transferred to PD programme

2 patients unable to continue HD and transferred to PD programme

3 patients received a deceased donor transplant and

1 patient received a living related transplant

2 patients withdrew from dialysis treatment.

5 patients transferred to other centres where

- two was terminated due to behaviour

- 3 to high dependency dialysis

There were 13 deaths – 5 from cardiac causes, 2 from ESRD, 2 from unknown, 1 from septicaemia/ infection, 1 from pneumonia, 1 from haemorrhage, and 1 died at home.

Table 7B-13 – Deaths and Withdrawals

	2008	2009	2010	2011	2012
Transfers					
- PD	2	2	3	3	7
- Other	-	4 (high dep)	1	7	5 (high dep)
Transplants	4	4	2	1	4*
Withdrawals	-	1	1	4	2
Deaths	9	8	8	20	13
Total	15	19	17	35	31

* 3 cadaveric donors and 1 living related donor

C. SURVIVAL

Patient survival was analysed by the Kaplan Meier method. There were a total of 418 entries (including re-entries) into the programme.

Overall first year survival was 95.6% and 5 year survival 83.8%.

Table 7C-1 – Survival of entire program as analysed in years 1996 - 2011

Yr of analysis	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1 yr	94.4%	94.9%	94.8%	94.9%	95.2%	95.4%	95.5%	96.0%	95.6%	95.7%	96.1%	95.6%
2 yr	90.6%	91.5%	91.6%	91.9%	92.3%	93.0%	92.9%	93.1%	92.4%	92.8%	93.1%	92.6%
3 yr	88.6%	89.7%	90.0%	89.8%	90.4%	91.3%	91.2%	91.5%	90.5%	90.9%	91.0%	89.4%
4 yr	88.6%	88.9%	87.2%	87.9%	87.6%	88.3%	87.8%	88.2%	87.4%	87.9%	88.1%	86.7%
5 yr	NA	83.4%	82.5%	83.0%	83.3%	84.5%	84.3%	84.7%	84.2%	84.4%	85.1%	83.8%
10 yr	NA	NA	NA	NA	NA	NA	63.8%	68.5%	68.7%	70.1%	67.5%	65.2%

Fig 7C-1: Overall Patient Survival

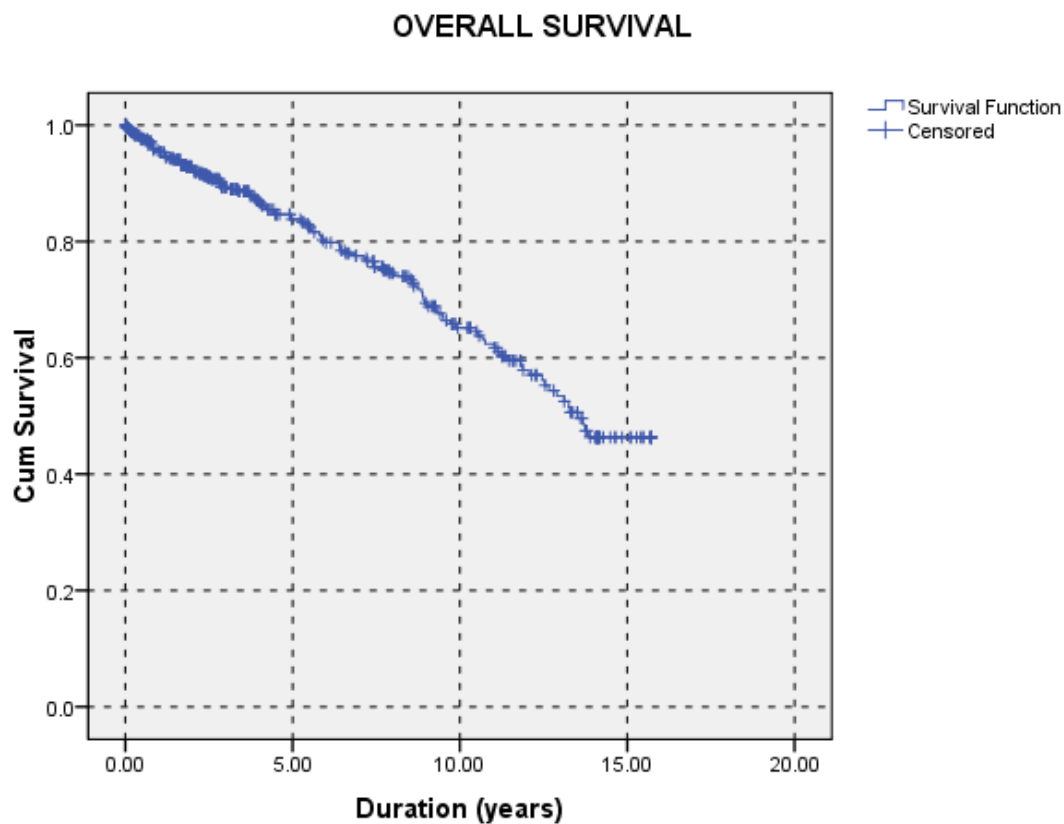


Table 7C-2 - Survival Difference between Diabetics and Non diabetics 1996- 2011

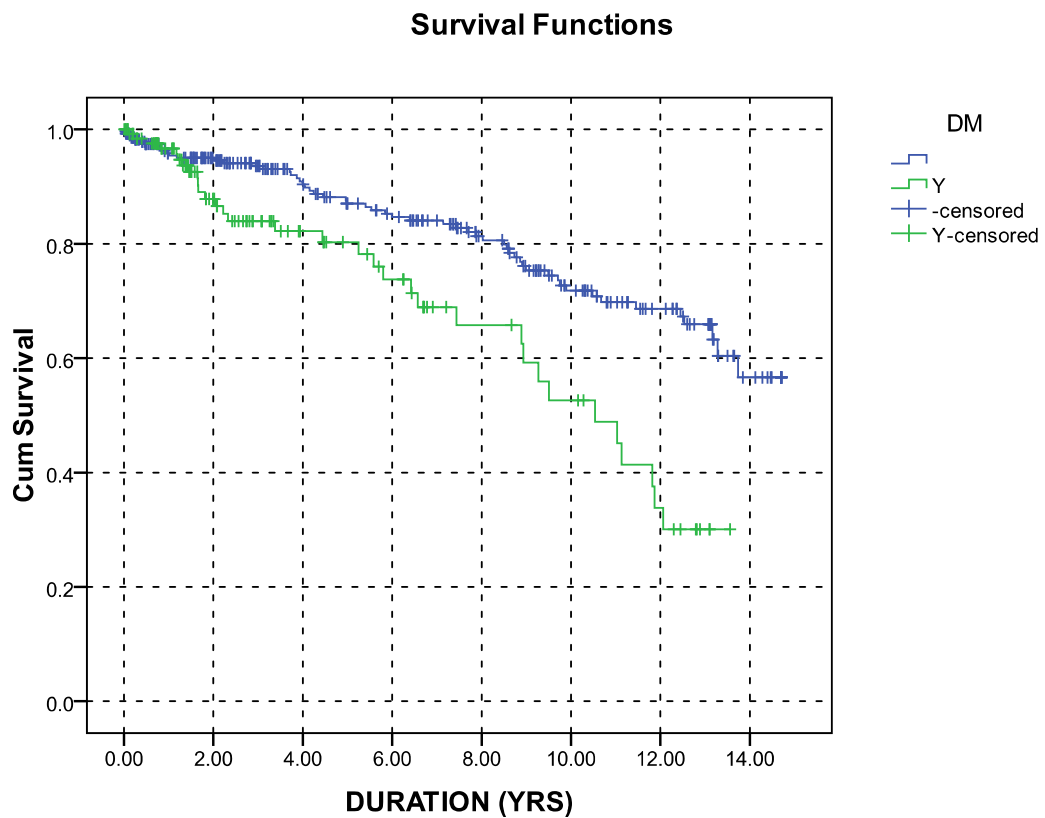
	2007	2008	2009	2010	2011
Non-DM					
1 yr	96.2%	95.4%	95.6%	96.8%	96.4%
5 yr	86.8%	86.2%	86.0%	87.0%	86.3%
10 yr	74.4%	73.8%	74.6%	71.8%	72.9%
DM					
1 yr	95.4%	96.1%	95.9%	96.6%	94%
5 yr	76.2%	84.9%	79.7%	80.3%	77.8%
10 yr	41.2%	49.3%	53.2%	52.6%	41.8%

As expected, diabetics have worse survival than non diabetics.

Table 7C-3 – Survival comparison with SRR stats (2008)

	Overall		non-DM		DM	
	KDF	Nat	KDF	Nat	KDF	Nat
1 yr	95.6	89.2	96.4	92.0	94.0	86.7
5 yr	83.8	58.9	86.3	71.0	77.8	47.7
10 yr	65.2		72.9		41.8	
Estimated mean (yrs)	11.4		12.4		8.7	

Fig 7C-4: Patient Survival – Diabetic vs Non Diabetic



D. DIALYSIS PARAMETERS

All patients are on high flux dialyzers, majority using 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 for HepB positive patients are not reused.

Table 7D-1: Types of Dialyzers used

	2007		2008		2009		2010		2011		2012	
	n	%	n	%	n	%	n	%	n	%	n	%
F6	1	0.6	3	1.7	2	1	1	0.5	2	1	0	0
F7	0	0	0	0	0	0	0	0	0	0	0	0
HF50	13	7.9	13	7.6	17	9	19	9.2	21	10	22	9.4
HF60	38	23.0	41	23.8	40	22	37	17.9	49	24	60	25.5
HF80	10	6.1	10	5.8	9	5	15	7.2	32	16	36	15.3
HF100	8	4.8	8	4.7	9	5	8	3.9	12	6	14	6
PolyFlux6L	1	0.6	1	0.6	0	0	0	0	0	0	3	1.3
PolyFlux11			0	0	0	0	0	0	0	0	0	0
PolyFlux14	54	32.7	55	32	65	35	77	37.2	45	22	56	23.8
PolyFlux17	25	15.2	25	14.5	30	16	34	16.4	30	15	33	14
PolyFlux21	14	8.5	15	8.7	14	8	16	7.7	10	5	11	4.7
FB210U	1	0.6	1	0.6	0	0	0	0	0	0	0	0
TOTAL	165	100	172	100	186	100	207	100	201	100	235	100

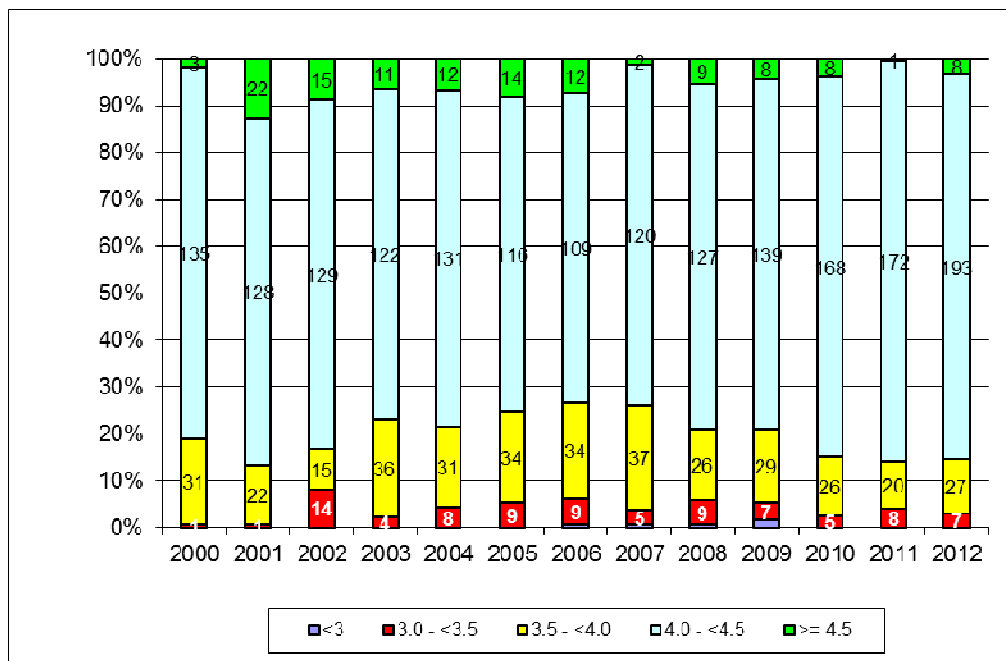
Only 3 patients (1.3 %) were using low flux dialyzers.

Table 7D-2: Average Blood flow Used (ml/min)

ml/min	2007	2008	2009	2010	2011	2012
Mean	272	273	270	267	267	267
Std Dev	36	34	35	31	34	33.4
Min	180	150	150	150	180	200
Max	360	360	360	360	360	360

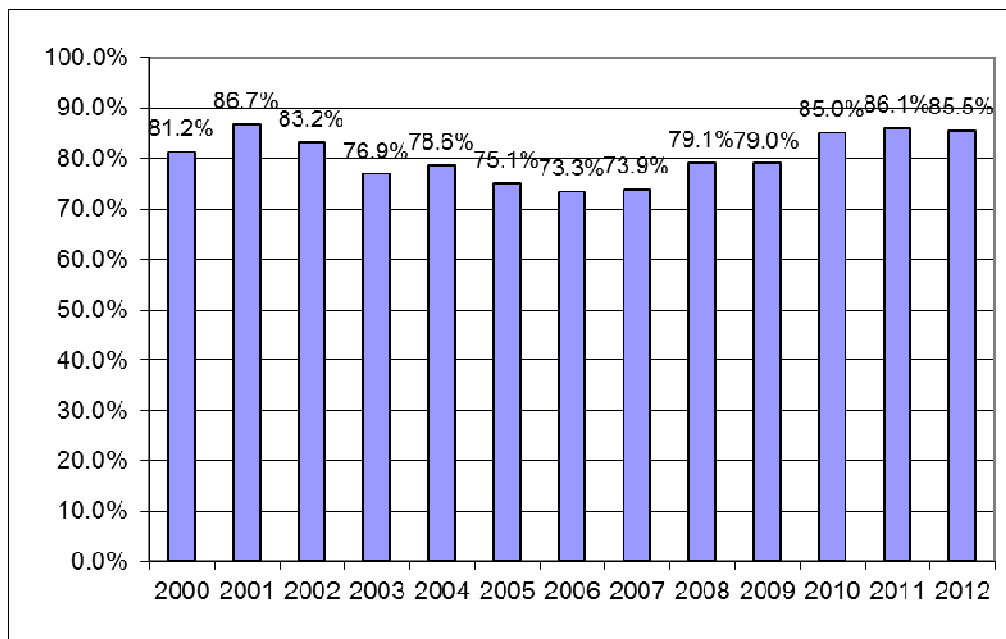
Blood flow is set at a minimum of 200 ml/min and averaged 267 ± 33.4 ml/min (range 200 - 360).

Fig 7D-1: Dialysis Time Per Session



Most patients (85.5%) dialyze for 4 hours or more as compared to the previous year (86.1%).

Fig 7D-2: 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 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 also started accepting Hepatitis B positive with single use of dialyzers.

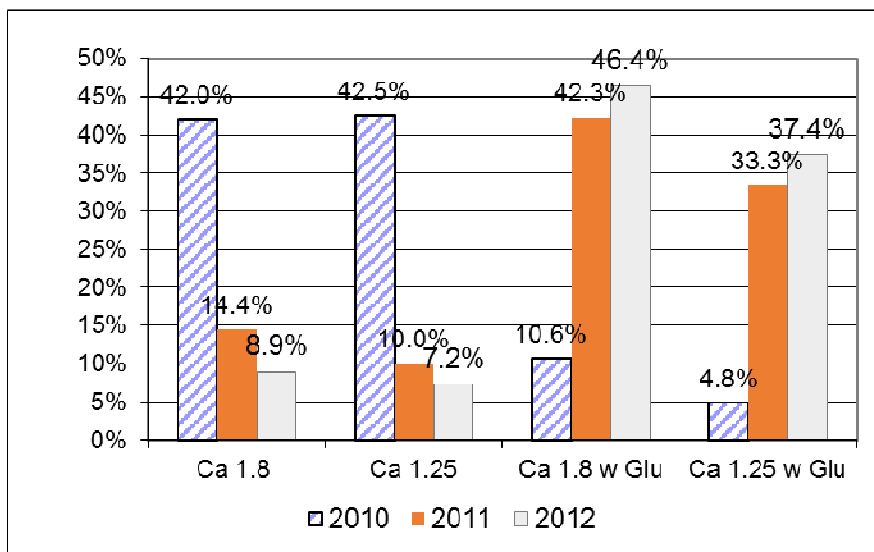
DIALYSATE

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

Dialysate containing 1.5 mmol/L calcium and 10 mmol/L glucose was first introduced in SWWT centre on 2nd December 2008 for diabetic and elderly patients. All patients in Bishan centre were provided with dialysate with glucose 10mmol/L with either calcium 1.5 or 1.2 mmol/L from July 2011.

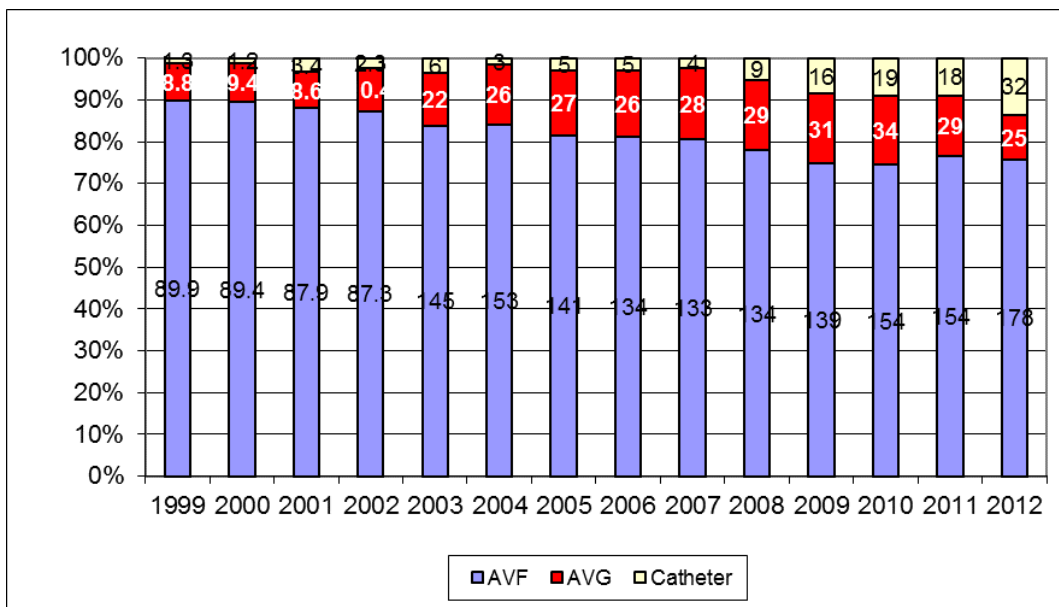
Fig 7D-3: Dialysate Calcium and Glucose



As there are a large proportion of diabetics and elderly patients, more than 80% are using glucose in the dialysate.

E. VASCULAR ACCESS

Fig 7E-1: Vascular Access



Twenty five patients or 10.6% (25/235) were using grafts for vascular access, approximately the same proportion as last year. This is compared to 8.8% in 1999. Thirty-two (32) patients were on temporary catheters (13.6%). This high proportion is due to the large number of new patients who did not yet have a permanent vascular access. The rest were using AV fistulae (75.7%), slightly lower than last year (76.6%).

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 1134 ± 740 ml/min (median 970 ml/min). The average flow for AVG's was 916 ± 554 ml/min (median 750 ml/min). There were no patients with recirculation.

Any patient who had recirculation above 5% or persistently low access flow with reduction of 25% over the past 3 months was referred back to their respective hospitals for assessment.

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:

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

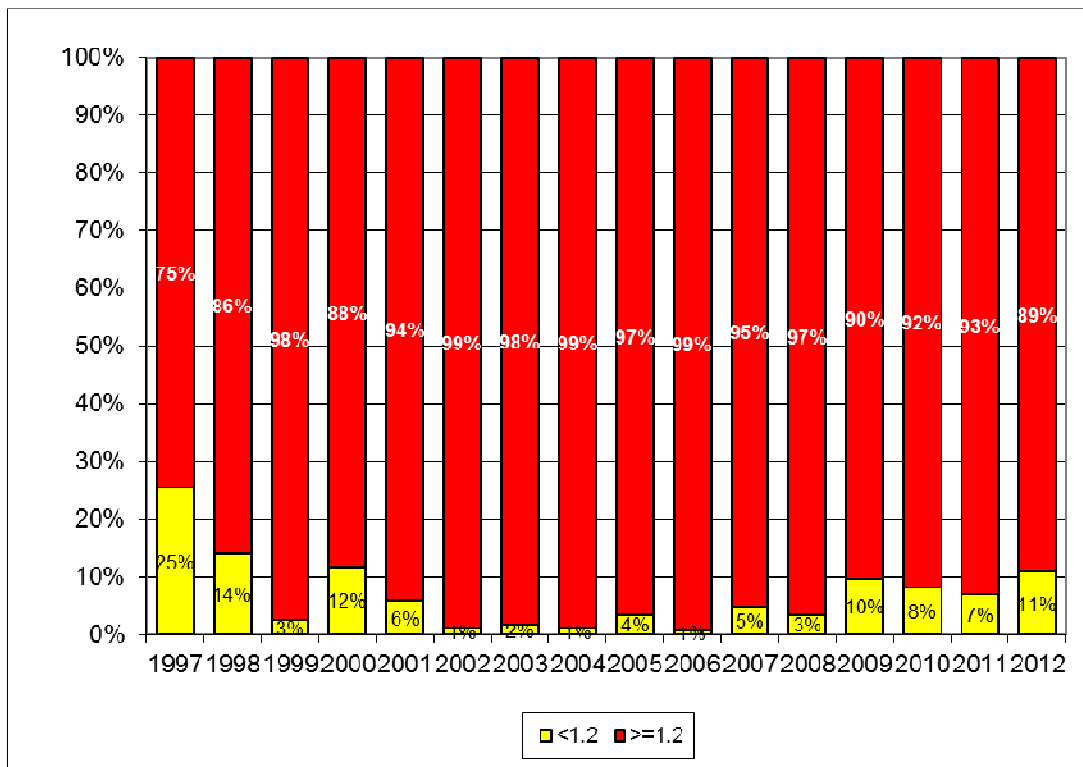
where R = post/pre urea
 UF = ultrafiltration in litres
 W = post dialysis weight

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

Our patients weighed 59.7 ± 14.7 kg (median 58.1 kg, range 35.4 – 131.1 kg).

The proportion of patients with KT/V of 1.2 or greater in November / December 2012 was 89%.

Fig 7F-1: Percentage with KT/V index > 1.2



The high number of new intakes has caused an increase in proportion of patients with low KT/V.

G. ANAEMIA

The mean Hb was calculated to be 11.0 ± 1.53 g/dl (range 6.6 – 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 25% higher than last year (23%).

Fig 7G-1: Average Hemoglobin

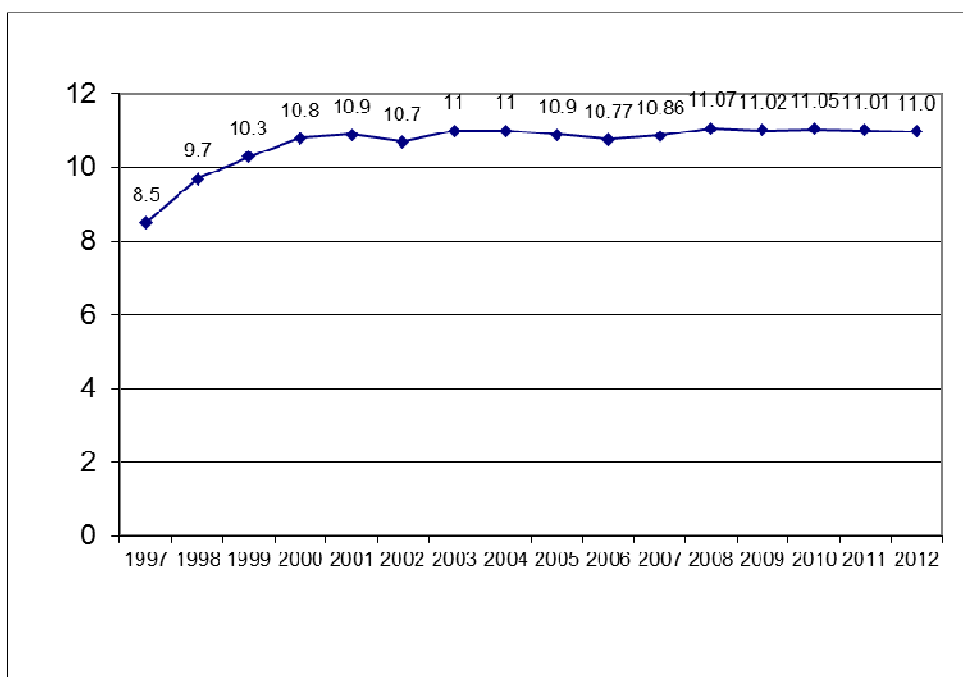


Fig 7G-2: Hb Frequency

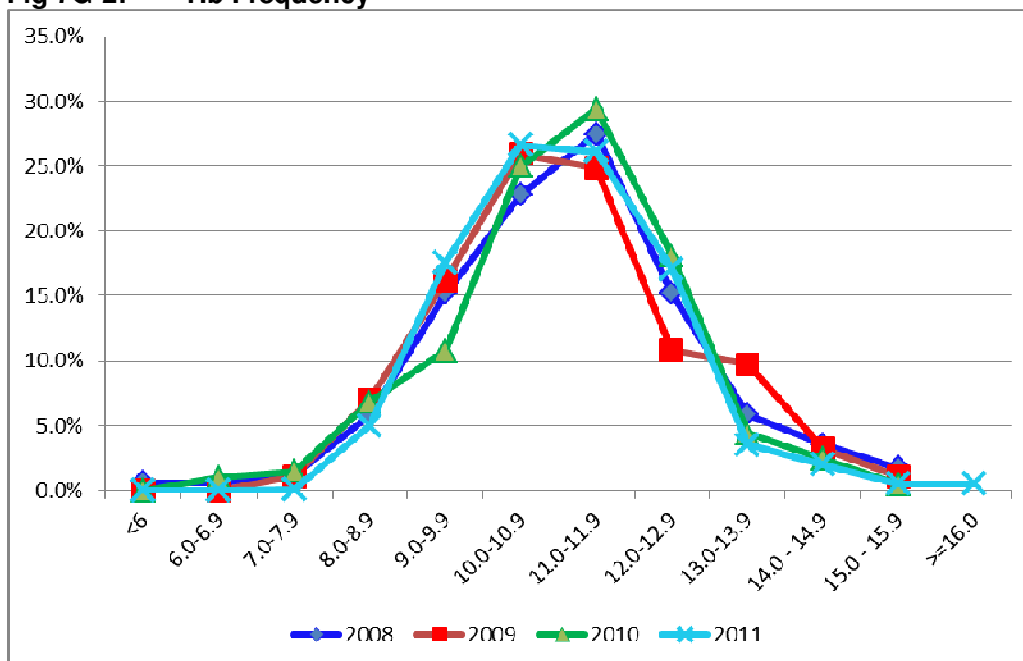
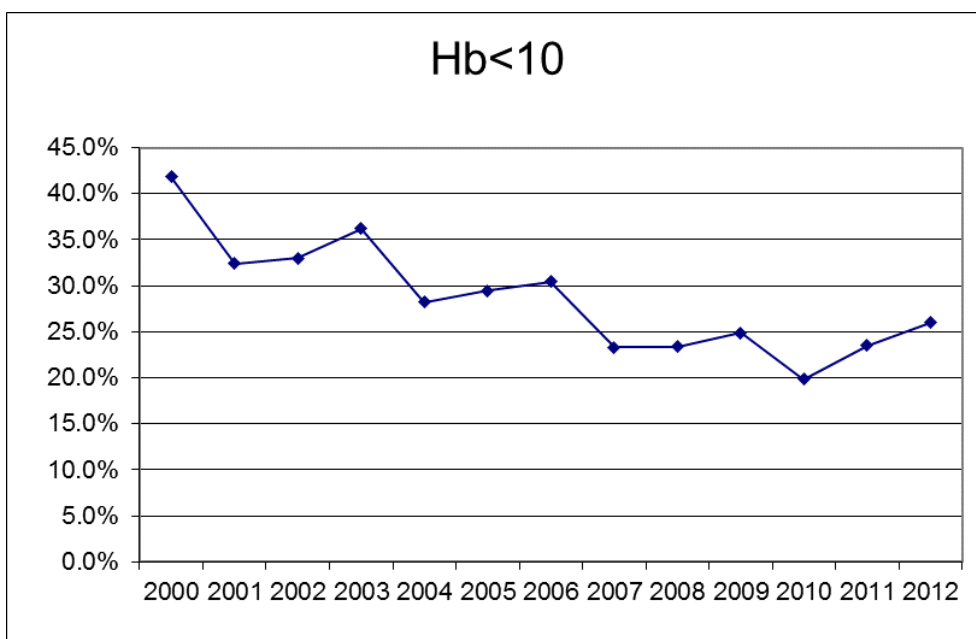


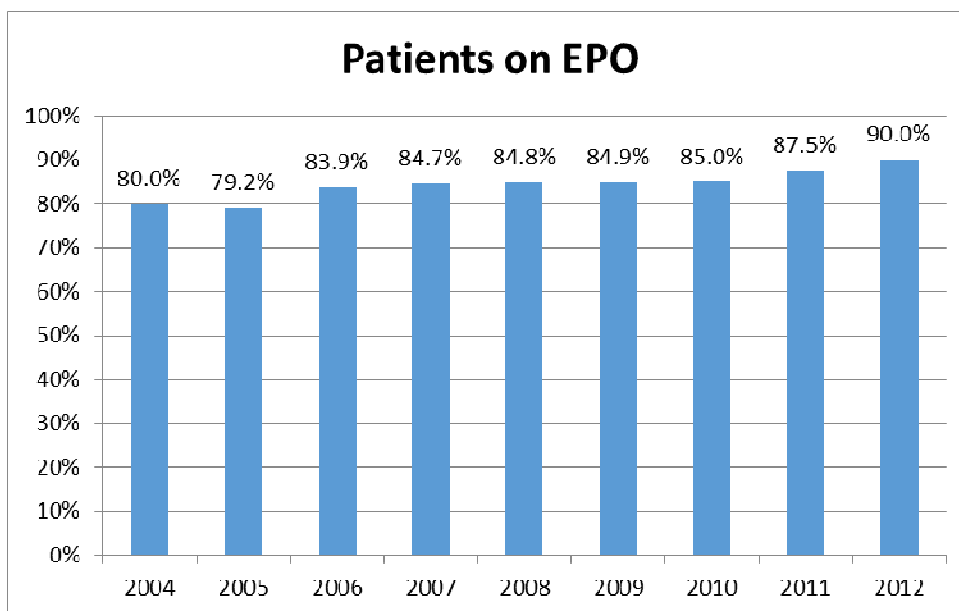
Fig 7G-3: Hb <10



ERYTHROPOIESIS STIMULATING AGENTS

Patients are advised to start erythropoietin when their Hb falls below 10 g/dl. Target Hb while on erythropoietin is 11-12 g/dl. The proportion of patients with Hb < 10 g/dl slightly increased 25.5%. The proportion of patients on ESA is still rising

Fig 7G-4: Proportion of Patients on ESA



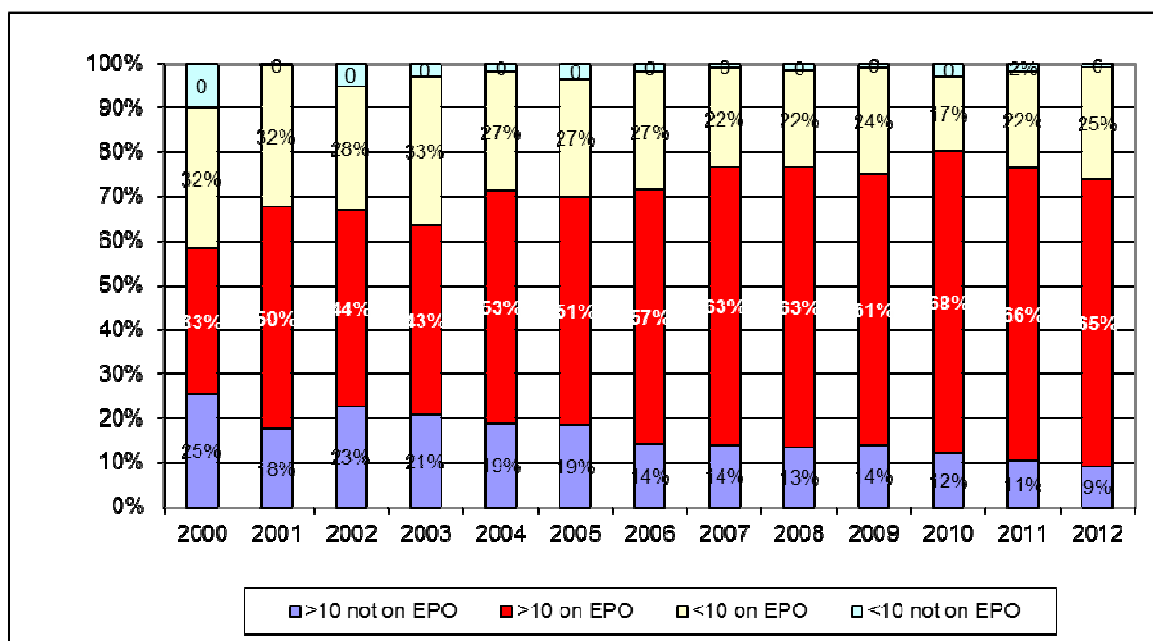
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy

Patients who were on EPO used on the average 112 ± 70 units/kg/wk (median 92.6) less than last year's figure of 123 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.

Twenty-one (21) patients (8.9%) were not on EPO. They had a mean Hb of 12.5 g/dl (range 10.4 – 15.9). Only 2 patients (0.9%) with Hb below 10 g/dl were not on EPO.

Fig 7G-5: Use of Erythropoietin



Of note is the reduced proportion of patients with Hb<10g/dl not using EPO compared with 10 years ago. There is also a smaller proportion of patients with Hb>10 g/dl not requiring EPO.

IRON STATUS

Table 7G-1 : Transferrin Saturation

	2005	2006	2007	2008	2009	2010	2011	2012
Mean (%)	36.2	39.2	33.5	37.9	36.7	34.2	34.6	32.8
SD	16	16.9	16.3	18.2	17	15	15	15
% pats w TFSat <20%	9.2	6.7	19.6%	9.9%	10.8%	11.1%	10.4%	13.6%
Average HB when TFSat<20% (g/dl)	10.6	10.5	10.7	11.4	10.9	10.4	10.8	14.4
% pats w TFSat >20%	90.8	93.3	80.4	90.1	88.7	87.9	88.6	83.8
Average HB when TFSat>20% (g/dl)	10.9	10.8	10.9	11	11	11	11	11

As at the end of 2012, mean transferrin saturation was $32.8 \pm 15\%$ (range 7.4 – 92.9). The proportion of patients with transferrin saturation of less than 20% was 13.6%, higher than the previous year. 31.3% (10/32) 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 14.4 g/dl for those whose TF Sat was <20%

101 patients used intravenous iron (Venofer) in 2012. Forty-nine (49) used Venofer to replenish iron stores (as compared to 48 in 2011) while 72 patients used it for maintenance. A subsidy scheme for Venofer has been available since April 2005.

Table 7G-2: Ferritin

	2008	2009	2010	2011	2012
Mean	580	547	525	543	597
SD	573	333	392	356	454
% pats w Ferritin < 200	17.5%	10.3%	14.5%	15.4%	16.4%

Using S Ferritin, 16.4% are iron deficient

BLOOD TRANSFUSION

A total of 17 patients received 37 units of blood during admissions to hospital.

H. NUTRITION

Mean S Albumin was 34.1 ± 3.5 g/l. The number of patients with Serum albumin less than 40 g/dl was 95.7%.

Table 7H-1 : Normalised Protein Catabolic Rate and S Albumin

	2007	2008	2009	2010	2011	2012
NPCR (g/kgBW)						
• Mean \pm SD	1.14 \pm 0.24	1.07 \pm 0.23	1.09 \pm 0.26	1.06 \pm 0.26	1.05 \pm 0.24	1.01 \pm 0.24
• % < 1.2	63.6	75	71	74	78	93.2
S Albumin (g/l)						
• Mean \pm SD	34.3 \pm 3.4	33.9 \pm 3.8	33.9 \pm 3.4	34.5 \pm 3.4	35 \pm 3.2	34.1 \pm 3.5
• % <40	95.7	90.0	90.3	88.4	93.5	95.7
• % <35	59.1	50.0	51.1	48.8	49.3	49.8

Supplemental feeds were provided upon the advice of the centre's dieticians to patients at a highly subsidized price from September 2011. A total 63 patients are on Beneprotein.

I. MINERAL METAB

Table 7I-1 : Serum Calcium levels

	2005	2006	2007*	2008	2009	2010	2011	2012
Mean S Calcium (mmol/L)	2.44	2.38	2.44	2.46	2.46	2.3	2.37	2.39
SD	0.25	0.22	0.21	0.20	0.21	0.23	0.18	0.20
Min		1.26	1.79	2.01	1.73	1.68	1.86	1.71
Max		2.88	3.04	3.06	3.2	3.79	2.92	3.3

* S Calcium corrected for S Albumin reported from 2007

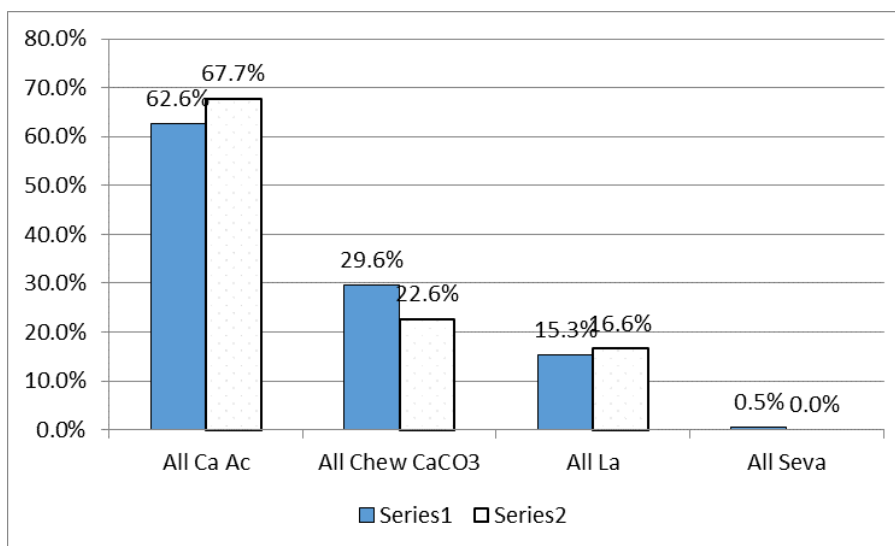
The mean corrected serum calcium value was 2.39 ± 0.20 mmol/l. Low calcium dialysate is currently in use for almost half of the patients (105/235, 44.7%). Its use appears to be dropping.

Table 7I-2 : Serum Phosphate levels

	2005	2006	2007	2008	2009	2010	2011	2012
Mean S PO4 (mmol/L)	1.88	1.75	1.79	1.55	1.65	1.54	1.5	1.57
SD	0.51	0.44	0.52	0.38	0.47	0.47	0.42	0.44
% with S PO4 > 2.0 mmol/l	41.6	29.1	31.7	11	11.8	18.4	11	14.0
% with S PO4 > 1.78 mmol/l (KDOQI)						30.0	24.0	28.0
Min	0.38	0.49	0.66	0.62	0.7	0.42	0.57	0.56
Max	3.63	3.37	3.65	2.55	3.25	3.12	2.57	3.3

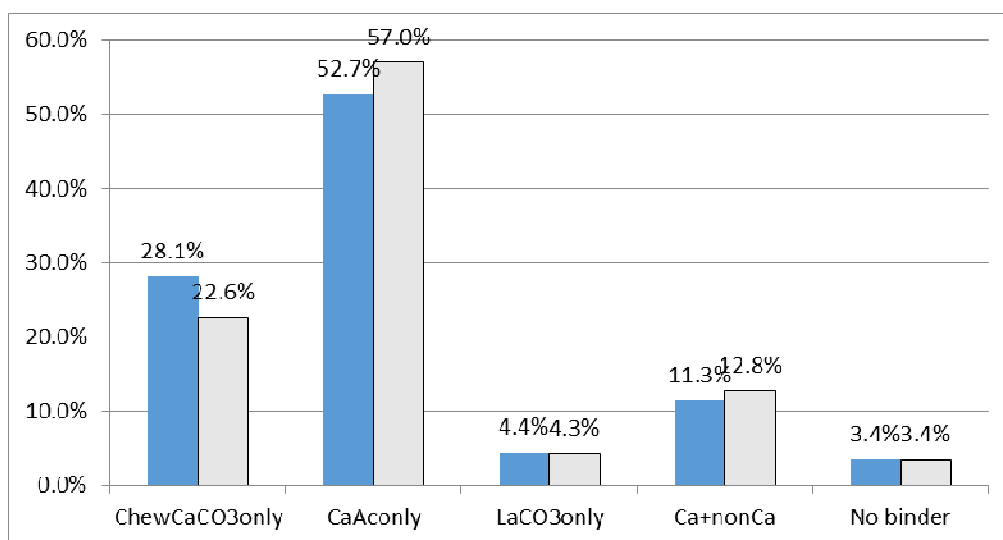
Mean S Phosphate was 1.57 ± 0.44 mmol/l. The patients having values above 2.0 mmol/l was 14% as compared to 11% the previous year.

Fig 7I-1a : Phosphate binders in use by type



Majority of patients are on calcium-based phosphate binders of which 70.0% [159/227] are on calcium acetate.

Fig 7I-1b : Phosphate binders in use by combination



Non calcium non-aluminum binders (Lanthanum and Sevelemar) use has increased to 17.1%. A small proportion (12.8%) [30/227] used calcium based binders in combination with non-Ca-non-Aluminium binders. KDF provides a subsidy for these expensive phosphate binders. No patient was on Aluminium.

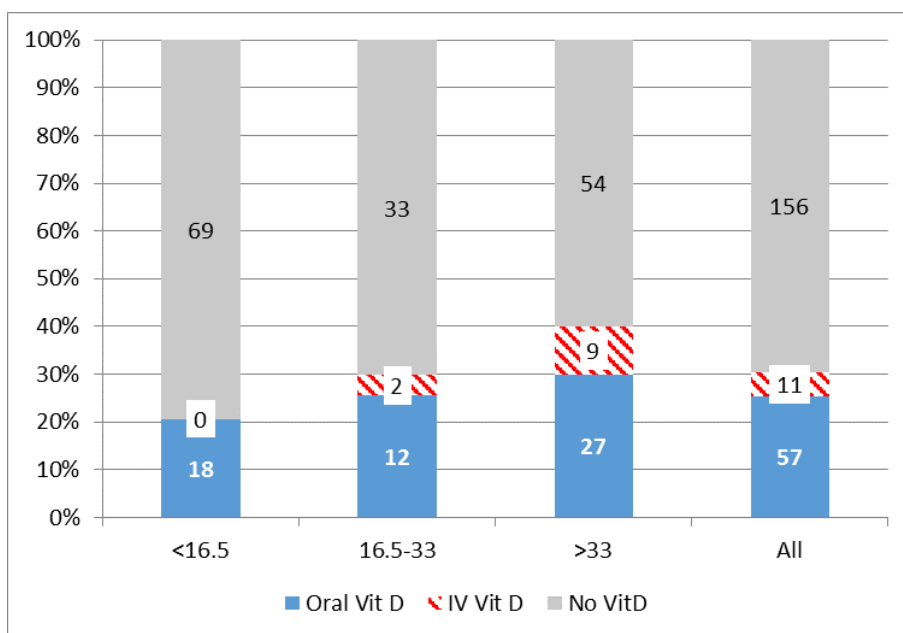
The KDOQI guidelines of 2003 (AJKD Vol 42 October 2003 Suppl 3) recommends treatment for patients on dialysis (CKD Stage 5) when iPTH exceed 33 pmol/l should be treated with Vit D analogs to main the PTH at 16.5-33 pmol/l. Recent KDIGO guidelines recommend keeping iPTH within 2-9 times of the upper limit.

Table 7I-3 : PTH levels

	2008	%	2009	%	2010	%	2011	%	2012	%
<16.5	52	31.3	71	38.4	80	39.2	77	38.9	87	38.8
16.5-33	27	16.3	31	16.8	38	18.6	45	22.1	47	21.0
>33.0	87	52.4	83	44.9	86	42.2	76	38.4	90	40.2
Total	166	100	185	100	204	100	198	100	224	100

40.2% (90) patients have intact parathyroid hormone levels elevated beyond 33 pmol/l. Hyperparathyroid bone disease is still a significant problem in the dialysis population.

Fig 7I-2 : Parathyroid Hormone levels and Vit D Treatment



In the group with low PTH (<16.5 pmol/l) which constitutes 38.8% (87 patients) of all cases, only 7.9% (16) were on oral Vit D and none on iv Vit D.

K/DOQI aims for a PTH level of 16.5 – 33 pmol/l. Only 21% of all patients had PTH values in this range. 40% (36/90) 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. One patient is on Paricalcitol.

The newer KDIGO guidelines suggest a target PTH between 2 – 9 times the upper limit of normal (approx. 50 pmol/l)

A total of 35 patients had parathyroidectomy bringing the prevalent rate to 14.9% (35/235).

J. DIABETICS

The prevalent number of diabetic patients was 92 (39.1%) This is not surprising as diabetic nephropathy is the etiology of ESRD in more than half of all new cases.

K. HYPERTENSION

81.3% (191/235) have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

Table 7K-1 : Use of Antihypertensive Agents by number of Drugs

	2007	2008	2009	2010	2011	2012
None	37.0%	29.7%	27.4%	22%	22%	19%
1 Drug	31.5%	28.5%	28.5%	33%	31%	34%
2 Drugs	23.0%	27.3%	26.3%	27%	29%	26%
3 Drugs	6.1%	9.9%	14%	14%	14%	19%
4 drugs	2.4%	4.7%	3.8%	4%	3%	3%
	100%	100%	100%	100%	100%	100%

About 19% of the patients were not on antihypertensives and another 34% on one drug only.

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

Table 7K-2 : Use of Antihypertensive Agents by Drug Type

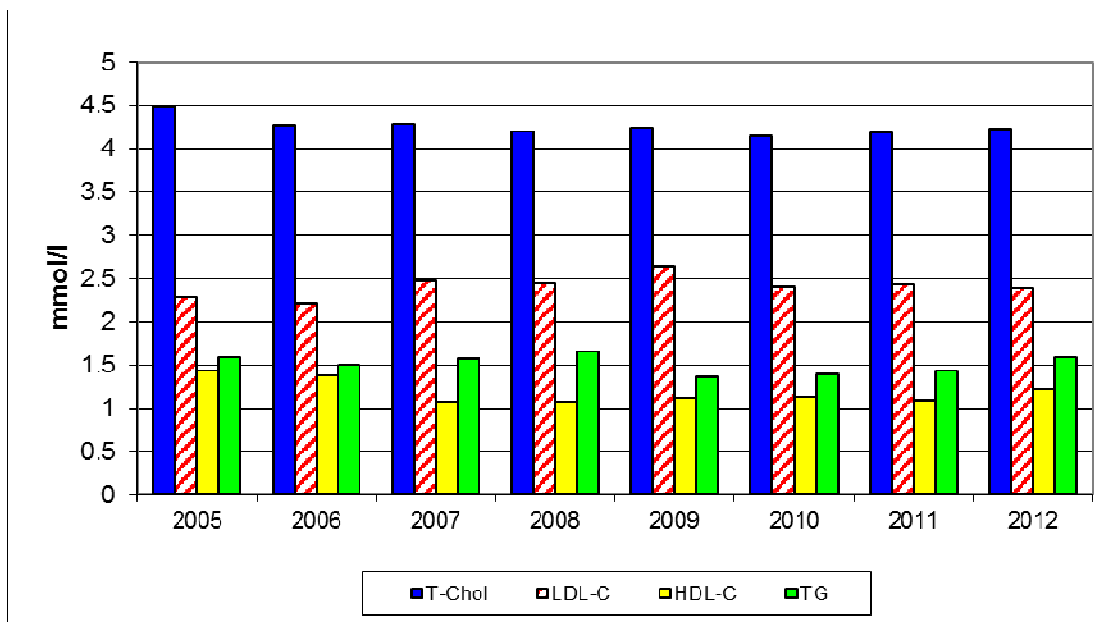
	2007	2008	2009	2010	2011	2012
None	37.0%	29.7%	27.4%	22.2%	21.9%	11%
Beta blockers	38.8%	43.6%	47.3%	50.2%	53.7%	35%
Calcium channel Blockers	33.3%	43.6%	43%	45.9%	49.8%	27%
ACEI / ARB	26.7%	33.7%	37.6%	36.2%	32.8%	24%
Others	4.8%	4.7%	13.4%	5.8%	7%	3%

These are not mutually exclusive.

L. HYPERLIPIDEMIA

Mean total cholesterol and HDL-Cholesterol and Treiglyceride levels increased marginally compared with the previous year LDL-cholesterol ratio and triglyceride level decreased.

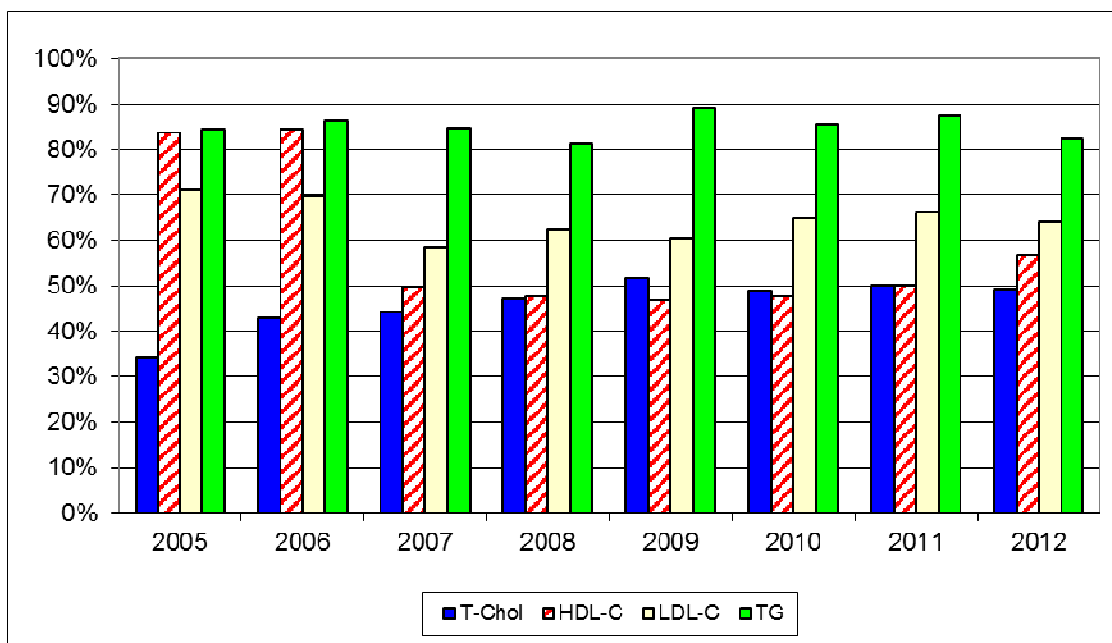
Fig 7L-1: Lipids



MOH 2/2006 guidelines for high risk groups were used to assess the proportion of patients with optimized levels:

- cholesterol (<4.1 mmol/l)
- HDL-cholesterol (≥ 1.0 mmol/l)
- LDL cholesterol (<2.6 mmol/l)
- TG (<2.3 mmol/l)

Fig 7L-2: Percentage of patients achieving target levels as recommended by MOH guidelines 2006



The percentage of patients achieving MOH targets for TG (<2.3 mmol/l) remains quite high 80%. However, for LDL cholesterol (<2.6 mmol/l) it was 62.1%. Only around 50% of the patients achieved the other targets – total cholesterol (<4.1 mmol/l) 47.7% and HDL-cholesterol (>=1.0 mmol/l) 54.9%.

The proportion of patients on drug therapy has decreased to 74.5% (175/235). HMG-CoA reductase inhibitors were the most commonly used drug (98.9%),

M. HEPATITIS SEROPOSITIVITY

6.4% are hepatitis B carriers, 8.5% are anti-HCV positive for Hepatitis C antibody. Four patients (1.7%) had received interferon treatment and HCV PCR was tested negative. Two patients (0.9%) are both anti-HCV and HepBsAg positive.

Table 7M-1 : Hepatitis Rates

	2005	2006	2007	2008	2009	2010	2011	2012
HepB only	5.2%	6.2%	6.7%	6.4%	6.5%	6.3%	4.5%	6.4%
HCV only	9.8%	10.6%	9.1%	8.7%	8%	7.7%	4.9%	8.5%
HepB & HCV	1.7%	1.2%	1.2%	1.2%	1%	1%	1%	0.9%

VACCINATION

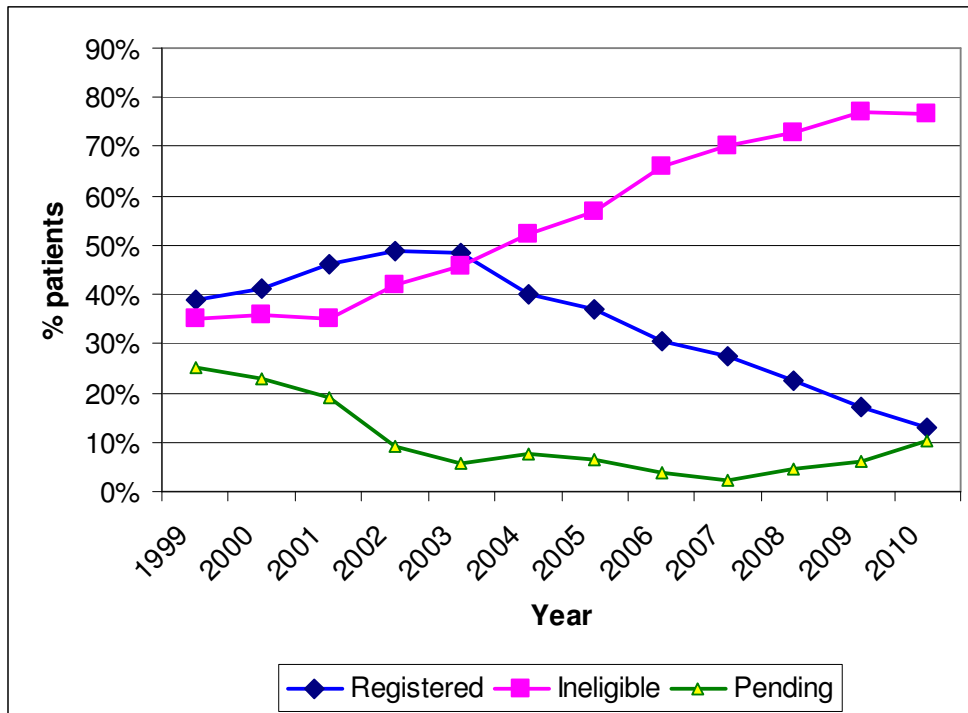
Hepatitis B

Thirty-one (15.4%) non immune patients with Hepatitis B antibody <10 were vaccinated and 12 (6%) patients were advised to be vaccinated. Financial assistance was extended to 9 needy patients

N. TRANSPLANT WAITING LIST

Only 24 patients (10.2%) are on the waiting list. More patients (70) have not been assessed with the larger influx of new cases this year. The number of ineligible patients grow as KDF takes in more patients with comorbidities since admission criteria was relaxed.

Fig 7N-1: Proportion of patients on the Transplant Waiting List



8. CONCLUSION

This year, we have had a large influx of new patients bringing along with them problems more unique to the newly initiated patients such as securing a permanent vascular access, more frequent hospital visits and medication titration.

As before, we found high hospitalization rates among the diabetics and it remains a challenge to manage these patients who not only require medical care but are in the lower socioeconomic strata.

It is obvious that focus of care for these patients will continue to change as time progresses

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

A/PROF CHOONG HUI LIN
MEDICAL DIRECTOR