KIDNEY DIALYSIS FOUNDATION

MEDICAL ANNUAL REPORT

2014

Prepared by

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1. INTRODUCTION

The Kidney Dialysis Foundation started operations in 1996 with only one hemodialysis 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 this center was taken over from MOH. The second hemodialysis centre at Bishan commenced operations in November 1997 with 43 patients transferred from the former Tan Tock Seng Dialysis Centre. A third hemodialysis centre called the San Wang Wu Ti - KDF Centre started operations on 1 Sept 03. A peritoneal dialysis centre built to support peritoneal dialysis services started operations on 1 Jul 03.

The centre at AH stopped operations in April 2005 when the lease expired. KDF's 4th hemodialysis centre started operations in Ghim Moh on 16 July 2007. The Peritoneal Dialysis Centre also shifted from Kreta Ayer to Ghim Moh.

Service Providers for the centres have been as follows:

	AH	BS	KA	GM
1996	ARC			
1997	ARC	ARC		
1998	ARC	ARC		
1999	ARC	ARC		
2000	ARC	ARC		
2001	FMC	ARC		
2002	FMC	ARC		
2003	FMC	ARC	FMC	
2004	FMC	ARC	FMC	
2005	FMC	ARC	FMC	
2006		ARC	FMC	
2007		ARC	FMC	ARC
2008		ARC	FMC	ARC
2009		ARC	FMC	ARC
2010		ARC	FMC	ARC
2011		DV *	FMC	ARC
2012		DV	FMC	DV *
2013		DV	FMC *	DV
2014		DV	FMC	DV
2015		DV	FMC	DV

Legend: ARC = AsiaRenalCare
FMC = Fresenius Medicare
* Contract renewed

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) and Ms Sunitha d/o Silvanathan (Clinical Nurse) headed the paramedical team comprising Nursing, Patient Welfare and Dietetic Services. Ms Theresa Soh was the Nursing Consultant.

This report covers medical data collated at the end of 2014.

2. THE DIALYSIS CENTRES

The location and prevalent number of patients as of 31 Dec 2014 are listed below:

	Centre	Location
1	KDF-Bishan Centre	Block 197, Bishan Street 13 #01-575/583
2	San Wang Wu Ti – KDF Centre	Block 333, Kreta Ayer Road #03-33
3	KDF – Ghim Moh Centre	Blk 6 Ghim Moh Road #01-188
4	KDF Peritoneal Dialysis	Blk 6 Ghim Moh Road #01-188

Dialysis Stations and Patient number

	Centre	No. of Regular + Isolation Stations	Total stations	Patient No
1	KDF-Bishan Centre	19 + 1 isolation	20	101
2	San Wang Wu Ti – KDF Centre	15 +1 isolation	16	75
3	KDF – Ghim Moh Centre	19 +1 isolation	20	83
4	Peritoneal Dialysis Centre	Not applicable	Nil	38

All haemodialysis centres operate 3 shifts a day.

HAEMODIALYSIS PROGRAMME

2014

3. EXECUTIVE SUMMARY (HD)

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 2013, there were 61 new entrants.

Thirty-one (28) patients exited the programme (2 transplant, 18 deaths, 3 transfers to PD programme, 2 to non-PD programmes, 3 withdrew from dialysis/terminated). In the prevalent population, average age was 58.7 $\pm$ 10.5 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 36.2%, diabetic nephropathy 36.6%.

Almost all patients (98%) are using high flux dialysers. Average blood flow was 270 $\pm$ 34 ml/min. 86.6% of patients dialyse 4 hours or more. 76.5% of patients use a native arteriovenous fistula. Dialysis adequacy as measured by single pool KT/V is >1.2 in 95.8% of patients.

Mean hemoglobin was 10.9 $\pm$ 1.5 g/dl. About 91.4% of all patients are on EPO. About 15.3 % of patients are considered Fe deficient.

There has been significant improvement in S Albumin of with only 54% of patients having Albumin<40 g/l compared with 95.7% the previous year.. 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 6.0%, HCV 7.1.%, HepB and HCV 0.7 %.

Less patients were registered on the National Transplant waiting list (10.4%), likely due to more patients having comorbidities in an aging population and a large influx of new patients.

I. HAEMODIALYSIS PROGRAMME

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 (step down Dec 2014)
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 (step down from July 2014)
14. Dr Sheryl Gan (with effect from Feb 2014 and step down in July 2015)
15. Dr Manish Kaushik (with effect from April 2014 to Dec 2015)
16. Dr Htay Htay (with effect from July 2014 to Dec 2015)
17. Dr Sobhana (with effect from Dec 2014 to Dec 2016)

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

NURSING

The overall standard of nursing is overseen by Ms Lay Kwee Chin, Senior Nurse Clinician,
Ms Sunitha Silvanathan, Clinical Nurse and Ms Theresa Soh, Nursing Consultant.

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 renewed in Aug 2013 to Jul 2018)
- 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 2014 is listed as follows:

Centre	Renal trained SN	SN	AN	DT	Total
Bishan	3	10	2	0	15
SWWT	2	9	2	0	13
Ghim Moh	3	12	0	0	15
Grand total					43

Training & Education

The Senior Nurse Clinician 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.

These were located as follows:

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

WATER TREATMENT SYSTEMS

Water Treatment is essential for safe hemodialysis therapy.

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.

Centre	Vendor	Year Installed
Bishan	Gambro	2009
Kreta Ayer	Gambro	2012
Ghim Moh	Transmedic	2007

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 local and international 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) 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 and Lee Sze Mien by DaVita and Ms Liow Min Choo by Fresenius Medical Care.

PATIENT WELFARE

Mr Jeffrey Loy, Welfare Executive in charge of SWWT and PD. Ms Rena Lee was in charge of Bishan and Ghim Moh patients.

Consistent with its mission, KDF patients are heavily subsidised.

The number of Medifund receipients were as follows:

Year	**No of Patients**	**% of HD pt**
2011		40.3
2012	105	44.7
2013	149	55.6
2014	86	33.2

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. This format was stopped in 2014. According to MOH circular No. MH24:60/8 internal Quality Assurance Committee comprising Medical Director, KDF General Manager, and Service Provider Manager and nursing personnel was set up to review adverse events and mortality and morbidity cases regularly. These meetings are held once every 2 months with the providers

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

KDF haemodialysis centres provide long term low dependency dialysis to the needy. Application requires both a social assessment as well as a medical assessment.

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.

As at 31 December 2014, we had 259 patients dialysing in 3 centres – 101 patients at Bishan Centre (BS), 75 at Kreta Ayer (SWWT) and 83 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	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
New Cases	5	10	13	18	26	28	12	32	31	12
New Cases (interim)	6	3	3	3	7	7	15	31	30	13
Re-enter KDF	0	0	1	1	0	3	2	2	0	3
Total Entries	**11**	**13**	**17**	**22**	**33**	**38**	**29**	**65**	**61**	**28**
EXIT										
Transfer Out to non-KDF Programs	3	0	1	0	5	1	7	5	2	10
Transfer Out to KDF PD	5	3	2	2	1	2	3	7	3	4
Transplant	6	10	6	4	4	2	1	4	2*	2
Withdraw from Dialysis/Default	1	0	2	0	1	4	4	2	3	5
Deaths	5	11	2	9	8	8	20	13	18	16
Total Exits	**20**	**24**	**13**	**15**	**19**	**17**	**35**	**31**	**28**	**37**
Total No of Pt	**172**	**161**	**165**	**172**	**186**	**207**	**201**	**235**	**268**	**259**

* Cadaveric/Deceased Donor

Table 7A-2 –Mode of Dialysis

Interim HD		14
- Newly initiated subsequently permanent HD	10	
- Newly initiated awaiting PD	3	
- Newly initiated Bridge to Transplant		
- PD complications for temp HD	1	
- PD complications to permanent HD		
- Failed tx, back on HD		
Permanent HD [not via interim route]		14
- newly initiated	11	
- failed PD program, re-enter program	2	
- had been on dx, transferred to VWO from private		
- failed tx, back on HD	1	
TOTAL		28

Table 7A-3 – Source of Referral

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
SGH	19	8	10	14	18	16	25	22	52	53	25
NUH	0	0	2	1	2	11	8	3	6	7	1
TTSH		2	1	1	1	1	2	1	3	0	1
AH / KPTH				1	0	4	3	3	4	1	1
Private	0	1	0	0	1	1	0	0	0	0	0
Total Entries	**19**	**11**	**13**	**17**	**22**	**33**	**38**	**29**	**65**	**61**	**28**

No patients were on interim haemodialysis while awaiting living related transplant but a few patients were waiting to enter the KDF Peritoneal Dialysis program.

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

	2009		2010		2011		2012		2013		2014	
Etiology	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chronic glomerulonephritis	6	*18.1*	14	*36.8*	6	*20.7*	18	*27.7*	13	*21.3*	*3*	*10.7*
Diabetic nephropathy	20	*60.6*	14	*36.8*	14	*48.3*	27	*41.5*	37	*60.7*	*16*	*57.1*
Lupus nephritis	1	*3.1*	0	*0*	0	*0*	1	*1.5*	0	*0*	*0*	*0*
Obstructive uropathy	0	*0*	1	*2.6*	2	*6.9*	1	*1.5*	0	*0*	*1*	*3.6*
PCKD	1	*3.1*	2	*5.3*	1	*3.4*	2	*3.1*	0	*0*	*0*	*0*
TB kidney	*0*	0	*0*	0	*0*	1	*1.5*	0	*0*	*0*	*0*	*0*
Hypertension	0	*0*	1	*2.6*	1	*3.4*	2	*3.1*	3	*4.9*	*2*	*7.1*
Others	0	*0*	4	*10.6*	4	*13.8*	6	*9.2*	4	*6.6*	*5*	*17.9*
Unknown Etiology	5	*15.1*	2	*5.3*	1	*3.4*	6	*9.2*	4	*6.6*	*1*	*3.6*
Total	33	*100*	38	*100*	29	*100*	65	*100*	61	*100*	*28*	*100*

The majority of new cases were patients with diabetes mellitus (57.1%) and chronic GN (10.7%).

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

	2009		2010		2011		2012		2013		2014	
Etiology	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chr glomerulonephritis	86	*46.2*	93	*44.9*	88	*43.8*	96	*41.4*	97	*36.2*	*92*	35.5
Diabetic nephropathy	53	*28.5*	62	*30.0*	57	*28.4*	69	*29.7*	98	*36.6*	*97*	37.5
Lupus nephritis	10	*5.4*	10	*4.8*	10	*5.0*	9	*3.9*	9	*3.4*	*9*	3.5
Obstructive uropathy	0	*0*	2	*1.0*	2	*1.0*	2	*0.9*	2	*0.8*	*3*	1.2
PCKD	3	*1.6*	5	*2.4*	6	*3.0*	8	*3.4*	10	*3.7*	*7*	2.7
TB kidney	1	*0.5*	0	*0*	1	*0.5*	2	*0.9*	2	*0.8*	*2*	0.7
HT	4	*2.2*	4	*1.9*	5	*2.5*	7	*3.0*	10	*3.7*	*10*	3.9
VUR	2	*1.1*	2	*1.0*	2	*1.0*	3	*1.3*	3	*1.1*	*3*	1.2
Others	9	*4.8*	10	*4.8*	13	*6.5*	17	*7.3*	18	*6.7*	*18*	6.9
Unknown Etiology	18	*9.7*	19	*9.2*	17	*8.5*	22	*9.4*	21	*7.8*	*18*	6.9
Total	186	*100*	207	*100*	201	*100*	232	*100*	268	*100*	*259*	*100*

There are now more patients with diabetic nephropathy (37.5%) than chronic glomerulonephritis (35.5%)

Gender

Table 7B-3 – Gender of New Patients

	2009		2010		2011		2012		2013		2014	
Gender	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Males	16	*48.5*	21	*55.3*	18	*62.1*	28	*43*	35	*57.4*	*20*	*71.4*
Females	17	*51.5*	17	*44.7*	11	*37.9*	37	*57*	26	*42.6*	*8*	*28.6*
Total	33	*100*	38	*100*	29	*100*	65	*100*	61	*100*	*28*	*100*

Table 7B-4 – Gender of Prevalent Patients

	2009		2010		2011		2012		2013		2014	
Gender	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Males	87	*46.8*	96	*46.4*	96	*47.5*	112	*47.7*	133	*49.6*	*130*	*50.2*
Females	99	*53.2*	111	*53.6*	105	*52.4*	123	*52.3*	135	*50.4*	*129*	*49.8*
Total	186	*100*	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*

At the end of 2014, the ratio of male to female patients was 130:129.

Ethnic Distribution

Table 7B-5 – Ethnic Distribution of New Patients

	2009		2010		2011		2012		2013		2014	
Race	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	18	*54.6*	27	*71.0*	20	*67.0*	37	*56.9*	38	*62.3*	*21*	*80.8*
Malay	11	*33.3*	6	*15.8*	8	*27.6*	18	*27.7*	17	*27.9*	*2*	*7.7*
Indian	4	*12.1*	5	*13.2*	1	*3.4*	9	*13.8*	6	*9.8*	*3*	*11.5*
Others	0	*0*	0	*0*	0	*0*	1	*1.5*	0	*0*	*0*	*0*
Total	33	*100*	38	*100*	29	*100*	65	*100*	61	*100*	*26*	*100*

Table 7B-6 – Ethnic Distribution of Prevalent Patients

	2009		2010		2011		2012		2013		2014	
Race	**n**	***%***	**n**	***%***	**n**	***%***	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	138	*74.2*	153	*73.9*	145	*72.1*	163	*69.4*	184	*68.7*	*180*	*69.5*
Malay	36	*19.4*	38	*18.4*	42	*20.9*	54	*23*	61	*22.8*	*59*	*22.8*
Indian	12	*6.4*	16	*7.7*	14	*7.0*	17	*7.2*	22	*8.2*	*20*	*7.7*
Others	0	*0*	0	*0*	0	*0*	1	*0.4*	0	*0*	*0*	*0*
Total	186	*100*	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*

The ethnic distribution of our prevalent patients was 69.5% Chinese, 22.8% Malays and 7.7% Indians.

Age

The mean age at entry in 2014 was 59.1 $\pm$ 12.5 years (median, 61.6). Twelve (12) patients were above the age of 65 years

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

Year	2009	2010	2011	2012	2013	2014
Mean Age (years)	56.6	56.7	56.9	56.5	56.1	59.1
SD	12.5	10.4	12.5	12.5	9.3	12.5
Min	26	34.5	32.7	23.5	30.7	30.6
Max	76	81.9	78.9	80.2	74.1	78.0

Average age of new patients with diabetic nephropathy was 56.7 years compared with 60.2 years in non-diabetics.

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

Year	2009	2010	2011	2012	2013	2014
Mean Age (years)	56.2	57.4	57.7	58.7	58.7	59.5
SD	10.3	10.3	10.8	10.8	10.5	10.6
Min			28.0	29.0	30.0	31.4
Max			86.0	87.0	88.0	89.0

Age of the prevalent dialysis population at the end of 2014 was 59.5 $\pm$ 10.6 years (median 60.4). 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	2009		2010		2011		2012		2013		2014	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Diabetic	22	71	20	52.6	19	65.5	31	47.7	35	59.3	8	30.8
IHD n oth cardiac dis	15	48.4	22	57.9	6	20.7	21	32.3	20	33.9	7	26.9
CVA	7	22.6	4	10.5	1	3.4	1	1.5	1	1.7	2	7.7
PVD	5	16.1	4	10.5	1	3.4	6	9.2	7	11.9	0	0

Table 7B-10 – Common Comorbidities in Prevalent patients

Year	2009		2010		2011		2012		2013		2014	
	n	%	n	%	n	%	**n**	**%**	**n**	**%**	**n**	**%**
Diabetics	65	34.9	69	33.3	67	33.3	81	34.5	107	39.9	99	38.2
IHD n oth cardiac	59	31.7	57	27.5	45	23.4	46	19.6	71	26.5	77	29.7
CVA	15	8.1	14	6.8	11	5.5	11	4.7	12	4.5	14	5.4
PVD	7	3.8	11	5.3	7	3.5	11	4.7	15	5.6	11	4.2

The proportion of diabetics in the prevalent dialysis population has reduced 38.2%.

The proportion of patients with cardiac problems has increased 29.7%.

DEATHS AND WITHDRAWALS

A total of 37 patients left the programme. Reasons were as follows:

Three (3) patients was on interim haemodialysis and transferred to PD programme; 1 patient converted to PD, 2 patients received a deceased donor transplant
5 patients withdrew from dialysis treatment.
10 patients transferred to other centres.

There were 16 deaths – 7 from cardiac causes, 1 from septicaemia/ infection 3 from pneumonia, 1 from ESRD, 1 each from burns, cancer and acute haemorrhage into meningioma, and 1 died at overseas.

Table 7B-13 – Deaths and Withdrawals

	2008	2009	2010	2011	2012	2013	2014
Transfers							
- PD	2	2	3	3	7	3	4
- Other	-	4 (high dep)	1	7	5 (high dep)	3 (1 to high dep)	10 (5 high dep)
Transplants	4	4	2	1	4*	2	2
Withdrawals	-	1	1	4	2	2	5
Deaths	9	8	8	20	13	18	16
Total	**15**	**19**	**17**	**35**	**31**	**28**	**37**

* 3 cadaveric donors and 1 living related donor

D. DIALYSIS PARAMETERS

We aim to put all patients are on high flux dialyzers.

Table 7D-1: Types of Dialyzers used

	2009		2010		2011		2012		2013		2014	
	n	***%***	**n**	***%***	**n**	***%***	**n**	***%***	**n**	***%***	**n**	***%***
F6	2	*1*	1	*0.5*	2	*1*	0	*0*	6	*2*	*1*	*0.4*
HF50	17	*9*	19	*9.2*	21	*10*	22	*9.4*	19	*7*	*17*	*6.6*
HF60	40	*22*	37	*17.9*	49	*24*	60	*25.5*	66	*25*	*62*	*23.9*
HF80	9	*5*	15	*7.2*	32	*16*	36	*15.3*	51	*19*	*56*	*21.6*
HF100	9	*5*	8	*3.9*	12	*6*	14	*6*	24	*9*	*24*	*9.3*
PolyFlux6L	0	*0*	0	*0*	0	*0*	3	*1.3*	0	*0*	*1*	*0.4*
F70S	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	*23*	*8.9*
PolyFlux14	65	*35*	77	*37.2*	45	*22*	56	*23.8*	46	*17*	*24*	*9.3*
PolyFlux17	30	*16*	34	*16.4*	30	*15*	33	*14*	43	*16*	*39*	*15.1*
PolyFlux21	14	*8*	16	*7.7*	10	*5*	11	*4.7*	13	*5*	*12*	*4.6*
FB210U	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	*0*	*0*
TOTAL	186	*100*	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*

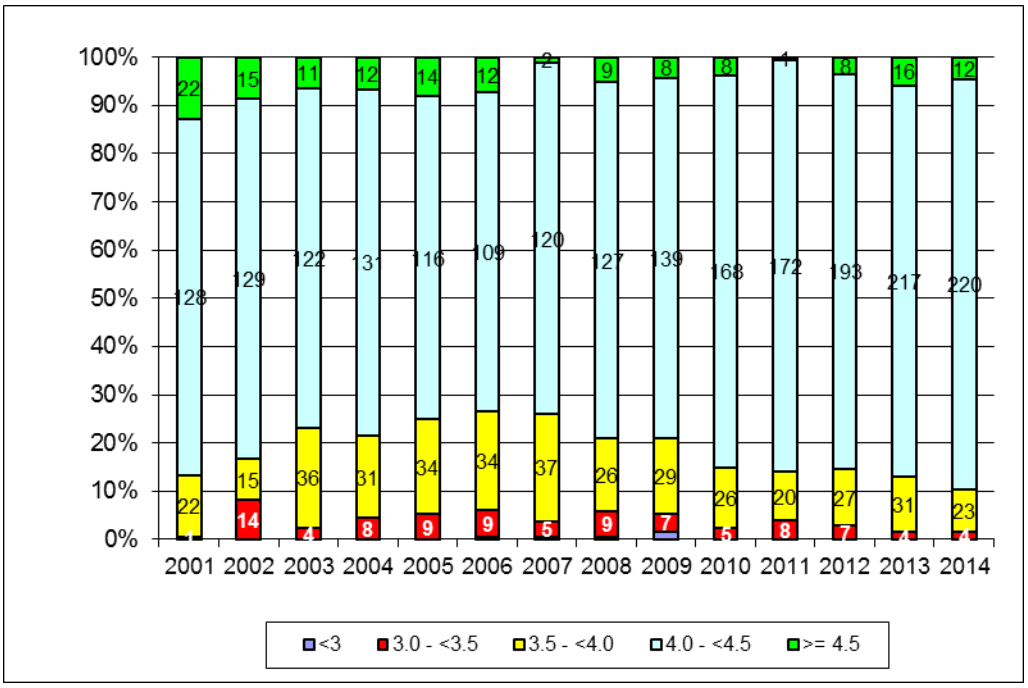
Only 6 patients (2 %) were using low flux dialyzers.

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

ml/min	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Mean	272	273	270	267	267	267	270	276
Std Dev	36	34	35	31	34	33.4	33.9	35.2
Min	180	150	150	150	180	200	180	200
Max	360	360	360	360	360	360	360	400

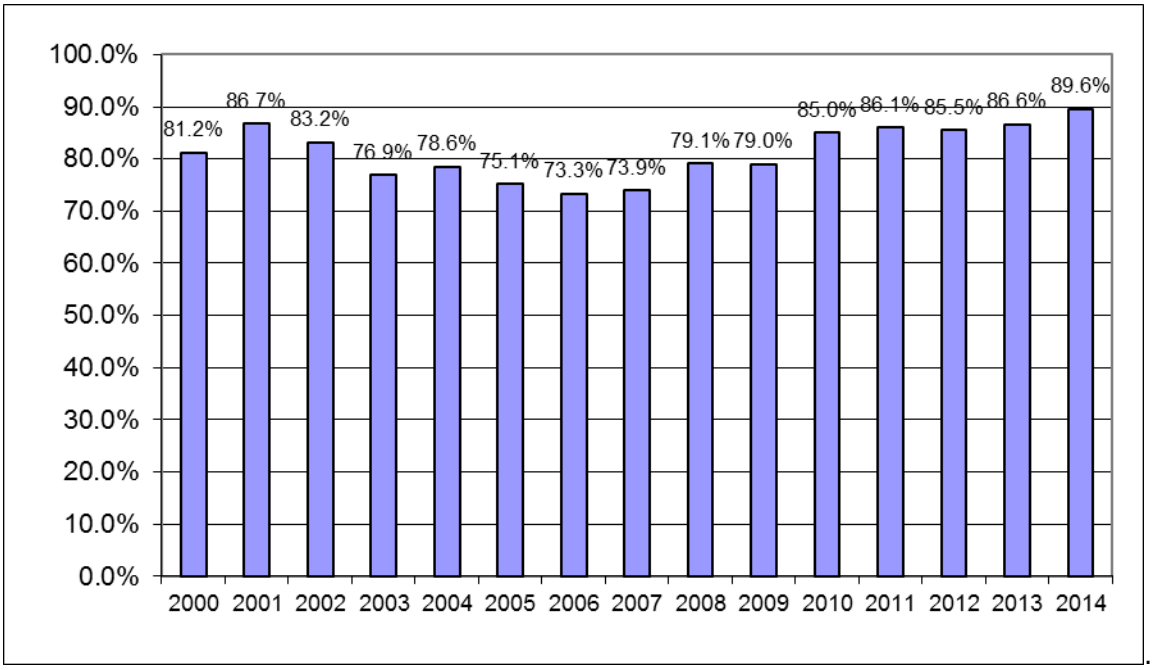
Blood flow is set at a minimum of 200 ml/min and averaged 276 $\pm$ 35.2 ml/min, median 280 mml/min (range 200 -400).

Fig 7D-1: Dialysis Time Per Session



Most patients (89.6%) [232/259] dialyze for 4 hours or more as compared to the previous year (86.6%).

Fig 7D-2: Percentage of patients Dialyzing 4 hours or more per session



DIALYZER REUSE

All centres use the Renatron System. Maximum reuse is 15 times. The following is the practice for virology positive cases

HIV positive cases: There are no HIV positive cases

Hep B positive cases: No reuse is practiced for Hep B positive cases in all centres.

HCV positive cases: Bishan and SWWT centres reuse HCV positive dialysers while Ghim Moh centre practices single use.

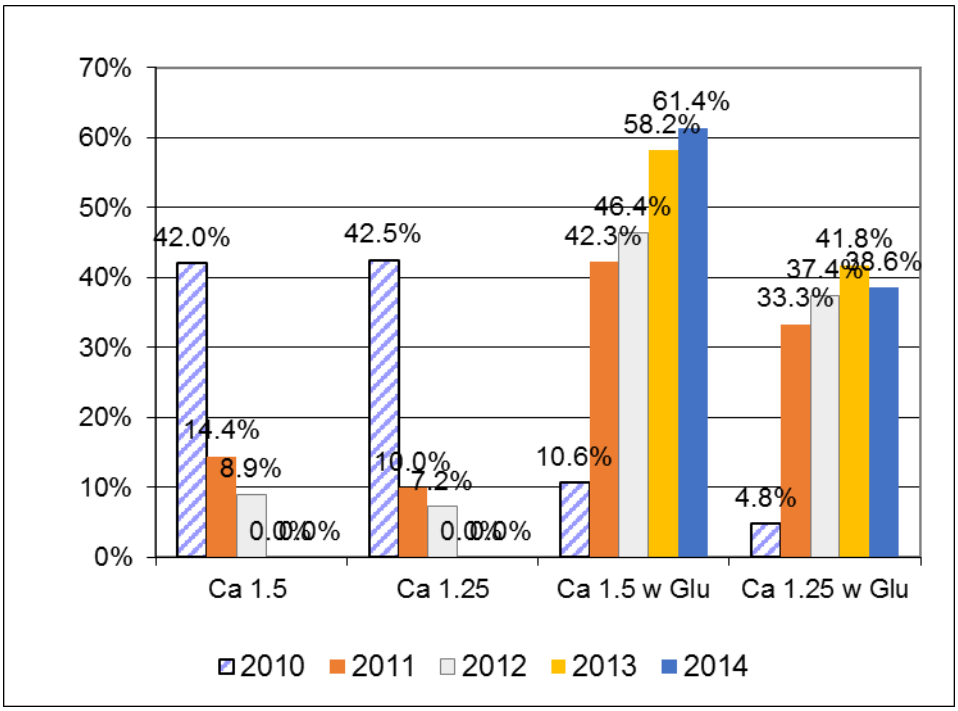
DIALYSATE

Dialysate available contains

- potassium value of 2.0 mmol/L
- calcium of 1.5 mmol/L and 1.2 mmol/L
- glucose of 11 mmol/L

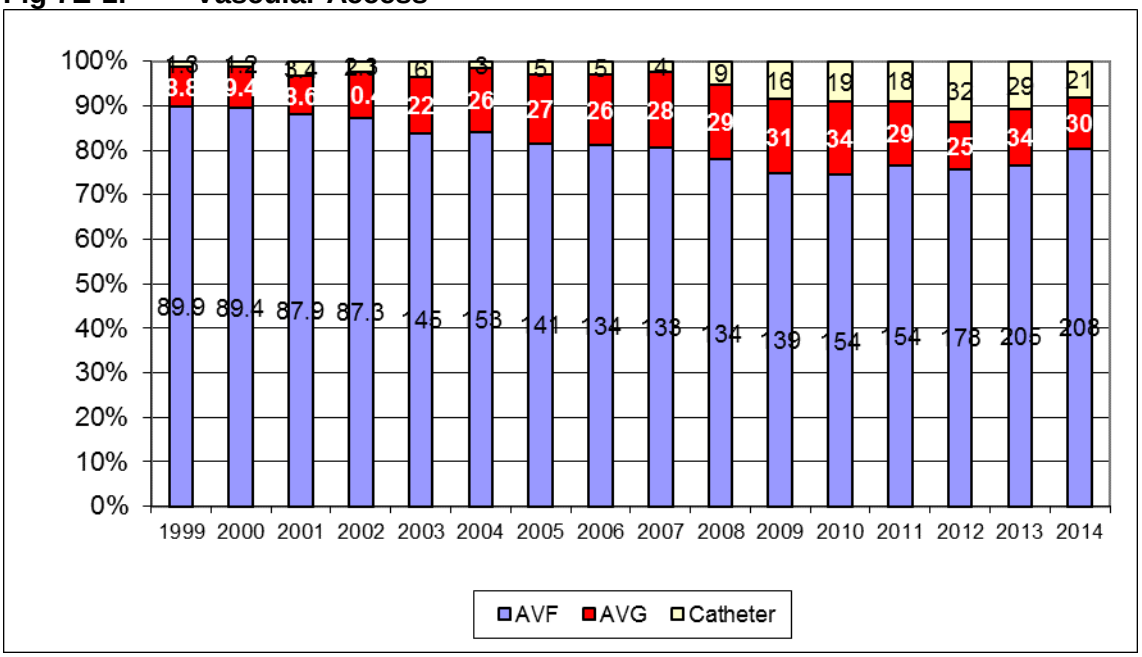
Dialysate containing 1.5 mmol/L calcium and 11 mmol/L glucose was first introduced in SWWT centre on 2nd December 2008 for diabetic and elderly patients. All patients in Bishan centre were provided with dialysate with glucose with either calcium 1.5 or 1.2 mmol/L from July 2011. With effect from September 2013, all patients in SWWT centre were also provided with glucose containing dialysate. By the end of 2013, non-glucose containing dialysate had been phased out.

Fig 7D-3: Dialysate Calcium and Glucose



E. VASCULAR ACCESS

Fig 7E-1: Vascular Access



More patients (80.3%), were using AV fistulae compared with the previous year (76.5%). Thirty patients or 11.6% (30/259) were using grafts and 8.1% on temporary catheters (8.1%).

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:

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

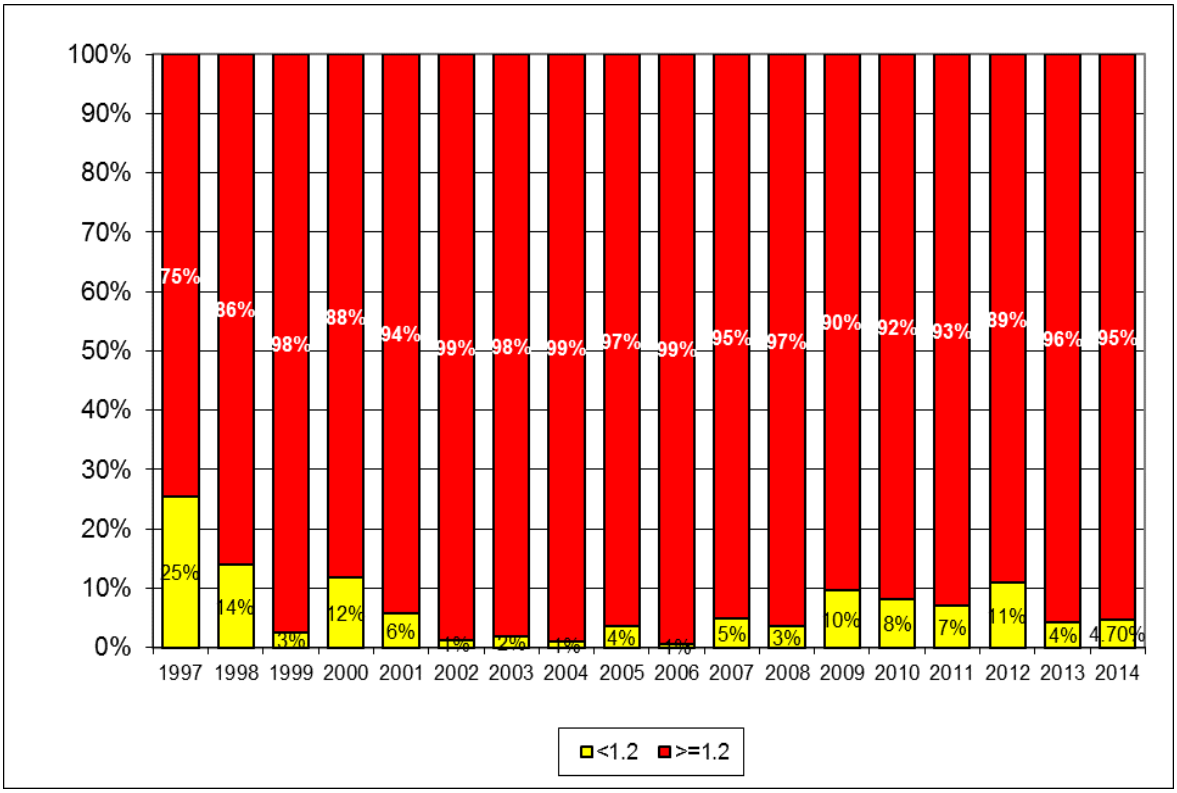
where
R = post/pre urea
UF = ultrafiltration in litres
W = post dialysis weight

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

Our patients weighed 62.9 $\pm$ 15.9 kg (median 61.8 kg, range 35.3 – 141.2 kg).

The proportion of patients with KT/V of 1.2 or greater in November / December 2014 was 95.3%.

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



The proportion of patients with low KT/V is now 4.7%.

G. ANAEMIA

The mean Hb was calculated to be 11.0 ± 1.3 g/dl (range 7.0 – 15.5). This has been stable over the past few years. The percentage of patients with a haemoglobin count of less than 10 g/dl was 22.8% slightly lower than last year (25.4%).

Fig 7G-1: Average Hemoglobin

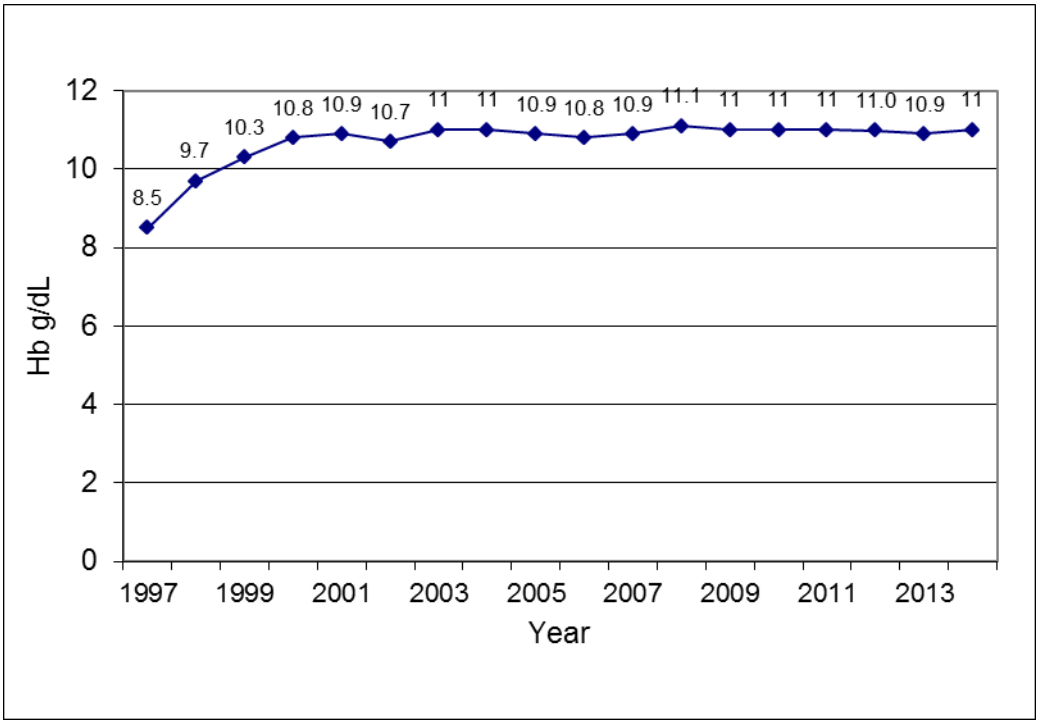


Fig 7G-2: Hb Frequency

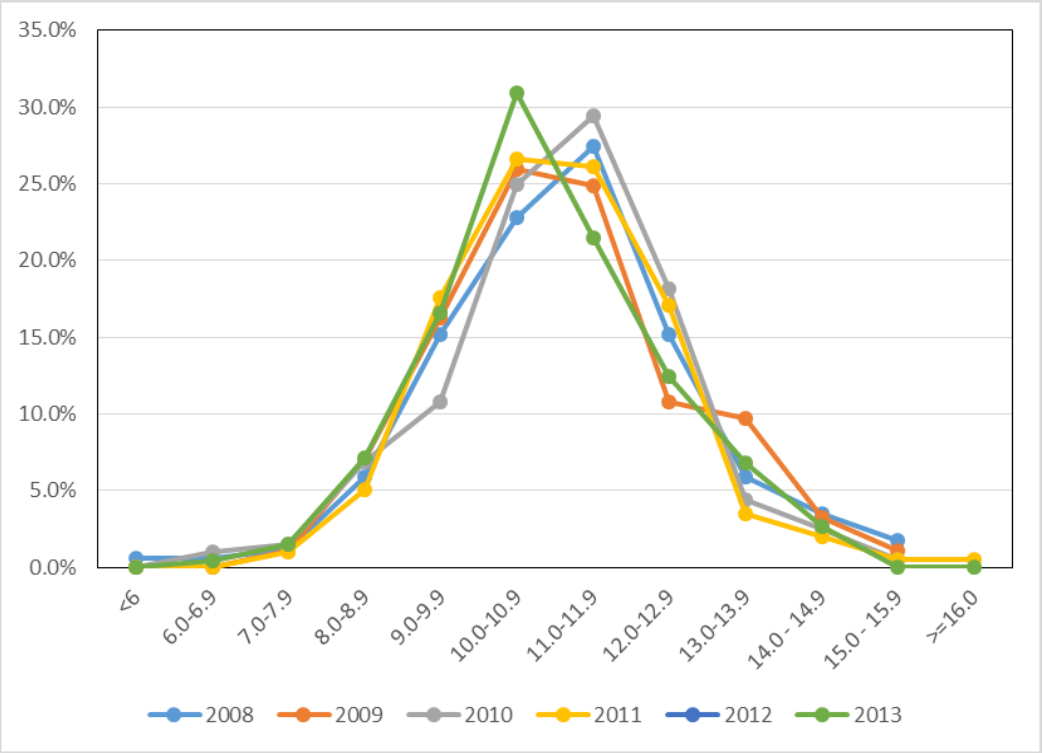
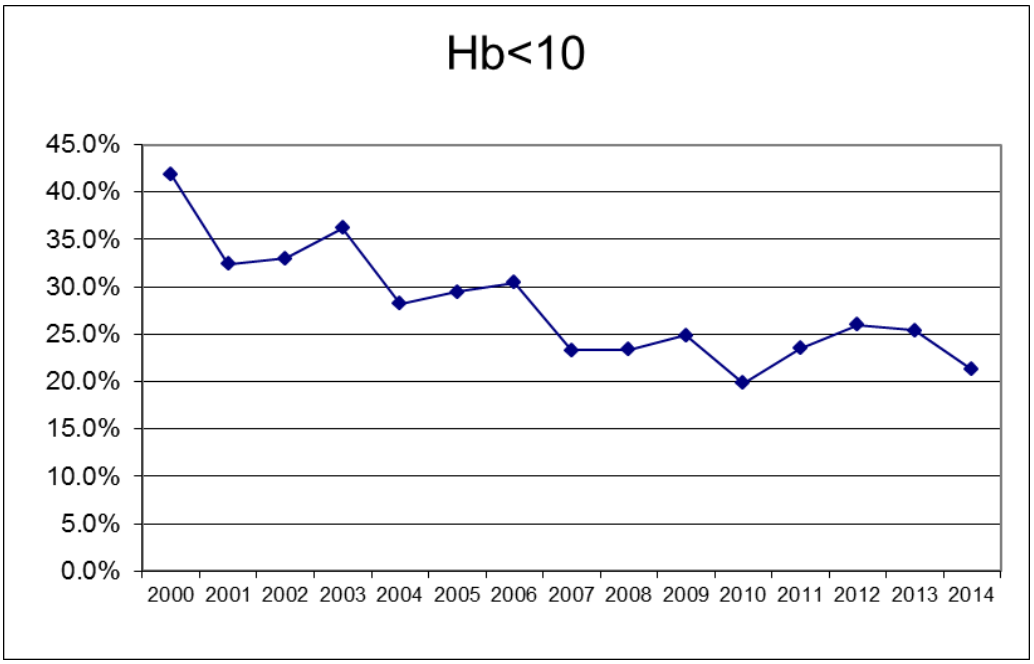


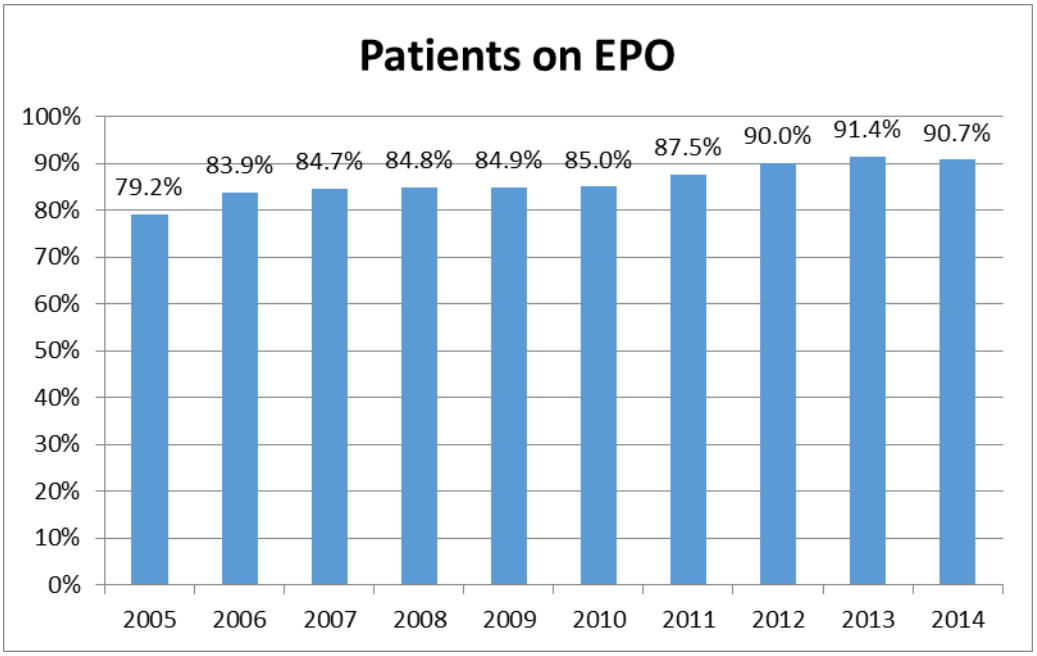
Fig 7G-3: Hb <10



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 has decreased 21.3%. The proportion of patients on ESA is around 90%.

Fig 7G-4: Proportion of Patients on ESA



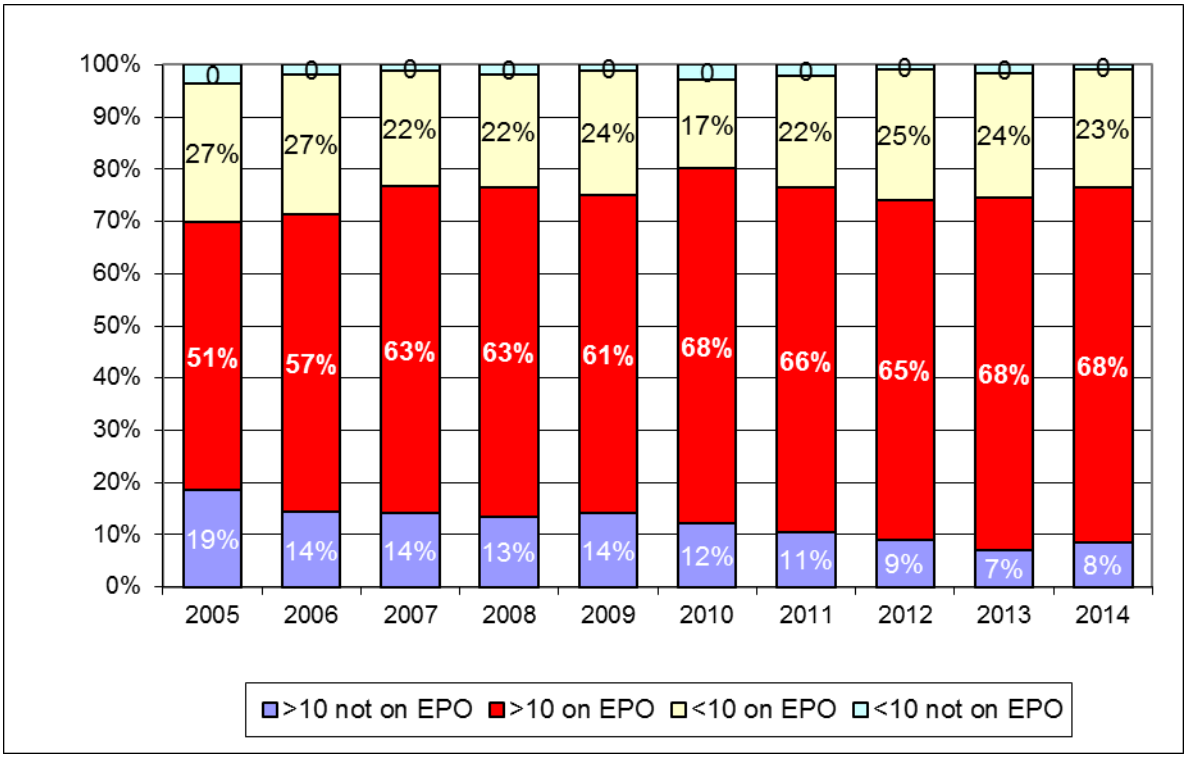
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy.

Patients who were on EPO used on the average 105.2 ± 59.4 units/kg/wk (median 91.5) in 2013

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 used Eprex until Dec 2013 when there was changed to Recormon after a tender exercise. Bishan centre continued to use Recormon.

Twenty-four (24) patients (9.3%) were not on EPO. They had a mean Hb of 12.5 g/dl (range 8.5 – 15.5). Only 2 patients (0.8%) 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. The proportion of patients with Hb>10 g/dl not requiring EPO was 8 %.

IRON STATUS

Table 7G-1 : Transferrin Saturation

	2008	2009	2010	2011	2012	2013	2014
Mean (%)	37.9	36.7	34.2	34.6	32.8	33.4	34.8
SD	18.2	17	15	15	15	15.3	16
% pats w TFSat <20%	9.9%	10.8%	11.1%	10.4%	13.6%	15.3%	12%
Average HB when TFSat<20% (g/dl)	11.4	10.9	10.4	10.8	11.2	10.5	10.4
% pats w TFSat <30%							43.4
Average HB when TFSat<30% (g/dl)							10.8
% pats w TFSat >20%	90.1	88.7	87.9	88.6	83.8	84.0	88.0
% pats w TFSat >= 30%							56.6
Average HB when TFSat>20% (g/dl)	11	11	11	11	11	11	11.1

As at the end of 2014, mean transferrin saturation was 34.8 $\pm$ 16 % (range 8.3 – 87.9). The proportion of patients with transferrin saturation of less than 20% was 12%, lower than the previous year. 41.9% (13/31) 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 11.1 g/dl compared with 10.4 g/dl for those whose TF Sat was <20% .

The KDIGO guidelines of 2012 suggested target iron levels TSat >30% and S Ferritin >500 ng/mL if ESA dose reduction is aimed at.

Table 7G-2: Ferritin

	2008	2009	2010	2011	2012	2013	2014
Mean	580	547	525	543	597	626	725
SD	573	333	392	356	454	467	521
% pats w Ferritin < 200	17.5%	10.3%	14.5%	15.4%	16.4%	14.6%	6.6%

Using S Ferritin of 200 mg/ml, 6.6% are iron deficient

H. NUTRITION

Substantial ijprovement in mean S Albumin has been seen in the last 2 years 38.8 [2013] and 39.9 ± 3.8 g/l [2014] as a result of supplemental protein powder provided at a very reduced price. The number of patients with Serum albumin less than 40 g/dl was 49.8%. Much improvement as compared to last year (54.1%).

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

	2007	2008	2009	2010	2011	2012	2013	2014
NPCR (g/kgBW)								
• Mean ± SD	1.14 ± 0.24	1.07 ± 0.23	1.09 ± 0.26	1.06 ± 0.26	1.05 ± 0.24	1.01 ± 0.24	1.07 ± 0.24	1.07 ± 0.25
• % < 1.2	64.8	75	71	73.9	78.4	79.6	72	71.8
S Albumin (g/l)								
• Mean ± SD	34.3 ± 3.4	33.9 ± 3.8	33.9 ± 3.4	34.5 ± 3.4	35 ± 3.2	34.1 ± 3.5	38.8 ± 3.6	39.9 ± 3.8
• % <40	95.7	90.0	90.3	88.4	93.5	95.7	54.1	49.8
• % <35	59.1	50.0	51.1	48.8	49.3	49.8	15.7	8.5

Supplemental feeds were provided upon the advice of the centre's dieticians to patients at a highly subsidized price from September 2011. A total 36 patients are on Beneprotein.

I. MINERAL METAB

Table 7I-1 : Serum Calcium levels

	2005	2006	2007*	2008	2009	2010	2011	2012	2013	2014
Mean S Calcium (mmol/L)	2.44	2.38	2.44	2.46	2.46	2.3	2.37	2.39	2.26	2.29
SD	0.25	0.22	0.21	0.20	0.21	0.23	0.18	0.20	0.22	0.18
Min		1.26	1.79	2.01	1.73	1.68	1.86	1.71	1.79	1.85
Max		2.88	3.04	3.06	3.2	3.79	2.92	3.3	3.93	2.93

* S Calcium corrected for S Albumin reported from 2007

The mean corrected serum calcium value was 2.29 ± 0.18 mmol/l. Low calcium dialysate is currently in use for 38.6% of the patients (100/259).

Table 7I-2 : Serum Phosphate levels

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mean S PO4 (mmol/L)	1.88	1.75	1.79	1.55	1.65	1.54	1.5	1.57	1.52	1.49
SD	0.51	0.44	0.52	0.38	0.47	0.47	0.42	0.44	0.43	0.41
% with S PO4>2.0 mmol/l	41.6	29.1	31.7	11	11.8	18.4	11	14.0	11.6	7.7
% with S PO4 >1.78 mmol/l (KDOQI)						30.0	24.0	28.0	23.5	25.1
Min	0.38	0.49	0.66	0.62	0.7	0.42	0.57	0.56	0.37	0.45
Max	3.63	3.37	3.65	2.55	3.25	3.12	2.57	3.3	2.92	2.85

Mean S Phosphate was 1.49 $\pm$ 0.41 mmol/l. The patients having values above 2.0 mmol/l was 7.7% as compared to 11.6% the previous year.

Table 7I-3 : PTH levels

	2010	%	2011	%	2012	%	2013	%	2014	%
<16.5	80	*39.2*	77	*38.9*	87	*38.8*	90	*34.9*	*82*	*32.3*
16.5-33	38	*18.6*	45	*22.1*	47	*21.0*	61	*23.6*	*58*	*22.8*
>33.0	86	*42.2*	76	*38.4*	90	*40.2*	107	*41.4*	*114*	*44.9*
Total	204	*100*	198	*100*	224	*100*	258	*100*	*254*	*100*

44.9% (114) patients have intact parathyroid hormone levels elevated beyond 33 pmol/l. Hyperparathyroid bone disease is still a significant problem in the dialysis population.

J. DIABETICS

The prevalent number of diabetic patients was 99 (38.2%) This is not surprising as diabetic nephropathy is the etiology of ESRD in more than half of all new cases.

K. HYPERTENSION

62.5% (162/259) have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

M. HEPATITIS SEROPOSITIVITY

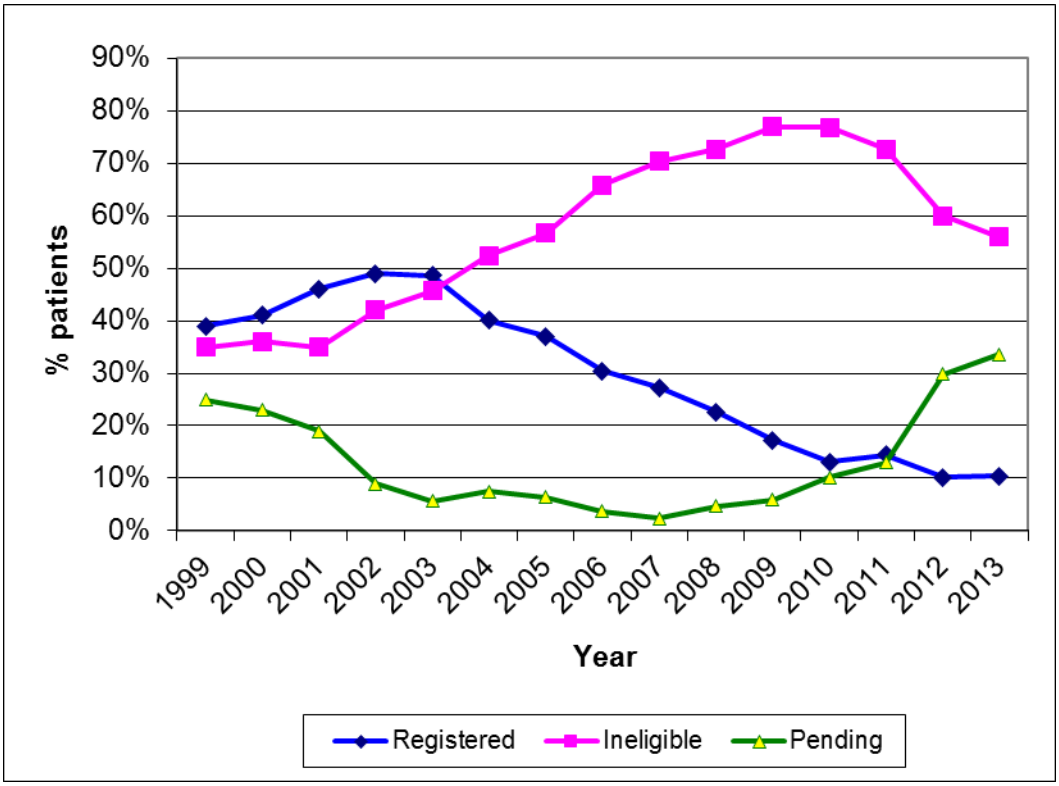
5.4% are hepatitis B carriers, 6.2% are anti-HCV positive for Hepatitis C antibody. Three patients (1.2%) had received interferon treatment and HCV PCR was tested negative. Two patients (0.8%) are both anti-HCV and HepBsAg positive.

Table 7M-1 : Hepatitis Rates

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
HepB only	5.2%	6.2%	6.7%	6.4%	6.5%	6.3%	4.5%	6.4%	6.0%	5.4%
HCV only	9.8%	10.6%	9.1%	8.7%	8%	7.7%	4.9%	8.5%	7.1%	6.2%
HCV Treated	No data	No data	2.4%	2.3%	2.2%	1.9%	1.9%	1.7%	1.7%	1.2%
HepB & HCV	1.7%	1.2%	1.2%	1.2%	1%	1%	1%	0.9%	0.7%	0.8%

N. TRANSPLANT WAITING LIST

Only 27 patients (10.4%) are on the waiting list. More patients (105) 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.



8. CONCLUSION

The number of new patients this year has dropped with the centres filling up. Patients are getting older and there are more challenges with multiple comorbidities.

We have 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.

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

A/PROF CHOONG HUI LIN
MEDICAL DIRECTOR

PERITONEAL DIALYSIS PROGRAMME

2014

II PERITONEAL DIALYSIS PROGRAMME

9. EXECUTIVE SUMMARY

10. STAFFING

11. PATIENT POPULATION

    A. Stock and Flow
    B. Demographics
        - Etiology of Renal Failure
    C. Deaths / Transfers
    D. Hospitalisations
    E. Dialysis Parameters
        - Dialysis Adequacy
        - Anaemia and Use of Erythropoietin
        - Serum Albumin
        - Mineral Metabolism
        - Lipid Profiles
    F. Transplant Waiting List
    G. Interim Haemodialysis

12. ACTIVITIES OF THE PD CENTRE

13. CONCLUSION

9. EXECUTIVE SUMMARY (PD)

The Peritoneal Dialysis Centre of the Kidney Dialysis Foundation is located at the GhimMoh Centre and the programme started on 1 July 2003. The dialysis service was formerly contracted out to a dialysis provider but since 1 January 2010 the programme has been directly administered by KDF.

This report covers medical data collated at the end of 2014.

Demographics: There were 38 patients on the PD programme as of 31 Dec 2014. Ten patients joined the programme (SGH 9, NUH 1).
The mean age of the prevalent patients was 57.7 ± 11.2 years; 14 (36.8%) were male, 245 (63.2%) female; Chinese - 32, Malay – 5, Indian - 1. Twenty-two were on CAPD and 16 on APD. The major cause of end-stage renal failure in new patients was diabetic nephropathy (60%). In the existing patients, the major causes of end-stage renal failure were chronic glomerulonephritis (no biopsy) (28.9%) and diabetic nephropathy (28.9%).Diabetic nephropathy (60%) was the commonest cause of end-stage renal failure in the new patients. The age of entry into the programme was 60 ± 10 years.

Deaths and Withdrawals: There were 4 deaths and 6 withdrawals. Of the 6 withdrawals, two received a kidney transplant and three were transferred to hemodialysis because of PD-related infections. One patient transferred electively to haemodialysis.

The death rate was 8.3% based on total number of patients in the year and the mean age at death was 70.4 ± 8.4 years.

Hospitalisations: 75% of the patients were admitted in the year. The admission rate was 1.59 episodes per patient year or 22.4 days per patient year. Peritonitis accounted for 22.0% of all admissions.

Dialysis Parameters

Dialysis Adequacy: The total KT/V was 2.08 ± 0.25 with 96.4% of the patients meeting the minimum target of 1.7.

Anaemia: The mean haemoglobin was 10.3 ± 1.9 g/dl with 92.1% on erythropoietin.

Serum Albumin: There has been an improvement in serum albumin levels with a mean of 34.9 ± 4.0 g/L. 2.7% were below 30 g/L. Fourteen patients received a subsidy for protein supplements.

Mineral Metabolism: The mean corrected serum calcium was 2.5 ± 0.21 mmol/L, serum phosphate 1.83 ± 0.53 mmol/L and iPTH 61.6 ± 54.5 pmol/L. Most (78.9%)

patients were on calcium supplements and 26.3% were on Lanthanum carbonate and 7.9% on Sevelamer.

Lipid profiles: The mean LDL cholesterol was 2.83 ± 1.05 mmol/L and triglyceride 1.97 ± 1.14 mmol/L. The mean HDL cholesterol level was 1.14 ± 0.30 mmol/L.

Transplant Waiting List: 18.4% of the patients were on the National Transplant waiting list while the majority was medically not eligible for transplantation or pending assessment.

II. PERITONEAL DIALYSIS PROGRAMME

10. STAFFING

MEDICAL

The Medical Director (Peritoneal Dialysis) continues to review patients monthly. Patients are reviewed once in 6 months following their routine blood investigations. The patients also go for follow-up with their primary physicians in restructured hospitals every 6 months or less. Urgent medical cover has been arranged with family physicians working in the vicinity using the same clinics as those arranged for the hemodialysis patients.

NURSING

The PD programme is managed by PD Clinical Nurse Fan Fung Yin, Florence with assistance from Patient Services Senior Nurse Clinician Ms Lay Kwee Chin, and Clinical Nurse Ms Sunitha. Baxter Healthcare continues to provide service in doing home visits. Fresenius Medical Care provide home visit to patients who are on Fresenius system.

DOCTOR'S REVIEW AND DIET COUNSELLING

Patients are counselled on their blood tests results and diet by both the doctor and PD nurse when they come for review or for procedures.

PATIENT WELFARE

Patients continued to receive subsidies for their dialysis and medications (erythropoietin, Lanthanum carbonate and Bene protein supplements) on a case to case basis. Welfare Officer, Mr Jeffrey Loy reviews and recommends the fee revision on an annual basis.

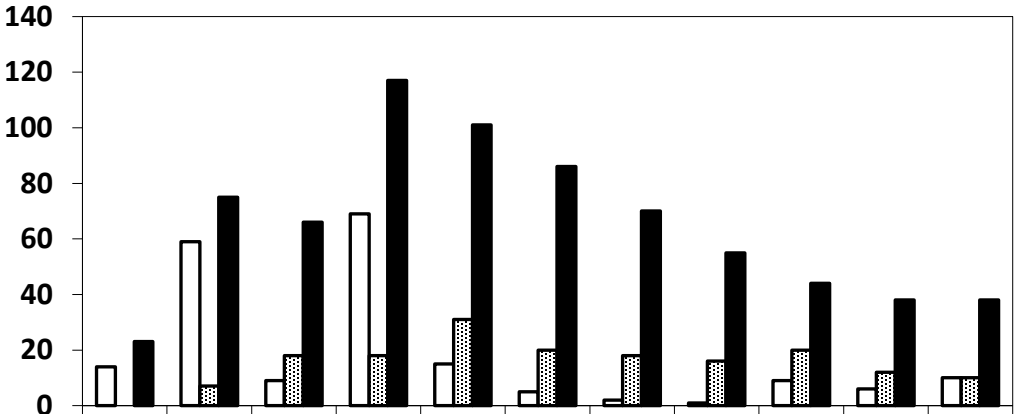
11. PATIENT POPULATION

A. Stock and Flow

There were 38 patients on the PD programme as of 31 December 2014. A total of ten patients (1 from NUH, 9 from SGH) were accepted into the PD programme during the period of 1 Jan – 31 Dec 2014.

During the same period of 1 Jan – 31 Dec 2014, 10 patients exited the programme; there were 4 transfers to haemodialysis, 4 deaths and 2 transplants.

Fig 1: Patient Stock and Flow



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Entry	14	59	9	69	15	5	2	1	9	6	10
Exit	0	7	18	18	31	20	18	16	20	12	10
Total	23	75	66	117	101	86	70	55	44	38	38

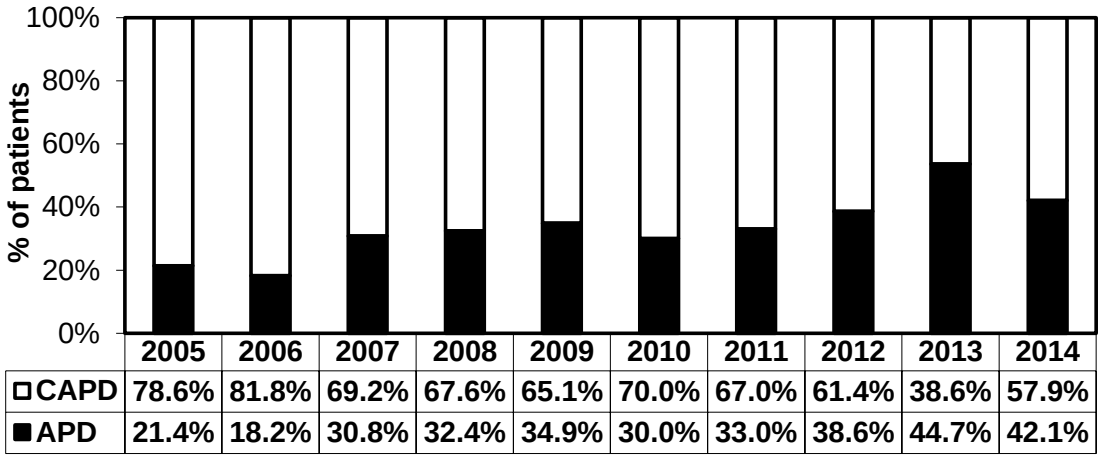
Table 1: Source of Referral

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SGH	7	12	22	2	68	15	5	1	0	7	1	9
NUH	2	2	35	6	0	0	0	1	0	1	5	1
Private / TTSH	0	0	2	1	1	0	0	0	0	1	-	-
AH	-	-	-	-	-	-	-	-	1	-	-	-
Total Entries	9	14	59	9	69	15	5	2	1	9	6	10

B. Demographics & Patient characteristics

The mean age of the existing 38 patients was 57.7 ± 11.2 years, with a continued preponderance of females [Male: 14 (36.8%), Female: 24 (63.2%)]. The ethnic distribution was similar to the general population. The mean age at entry of the ten new patients was 60 ± 10 years; 7 male, 3 female. Twenty-two patients were on CAPD and 16 on APD. The proportion of patients on APD was 42.1% which is slightly lower than the previous year of 44.7% of the PD population. Diabetic nephropathy was the commonest cause of end-stage renal disease in the new patients and accounted for 28.9% of patients in the prevalent patients.

Figure 2: Modality of PD



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
□CAPD	78.6%	81.8%	69.2%	67.6%	65.1%	70.0%	67.0%	61.4%	38.6%	57.9%
■APD	21.4%	18.2%	30.8%	32.4%	34.9%	30.0%	33.0%	38.6%	44.7%	42.1%

Table 2: Gender of new patients

	2008		2009		2010		2011		2012		2013		2014	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Male	5	33.3	3	60.0	1	50.0	0	0	3	33.3	1	16.7	7	70
Female	10	66.7	2	40.0	1	50.0	1	100	6	66.7	5	83.3	3	30
Total	15	100	5	100	2	100	1	100	9	100	6	100	10	100

Table 3: Gender of prevalent patients

	2008		2009		2010		2011		2012		2013		2014	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Male	45	44.6	41	47.7	28	40.0	21	38.2	16	36.4	13	34.2	14	36.8
Female	56	55.4	45	52.3	42	60.0	35	61.8	28	63.6	25	65.8	24	63.2
Total	101	100	86	100	70	100	55	100	44	100	38	100	38	100

Table 4: Ethnic distribution of new patients

	2008		2009		2010		2011		2012		2013		2014	
	n	**%**	**n**	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	12	80.0	4	80.0	1	50	1	100	6	66.7	3	50	8	80
Malay	1	6.7	1	20.0	1	50	0	0	2	22.2	3	50	1	10
Indian	2	13.3	0	0	0	0	0	0	1	11.1	0	0	1	10
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	15	100	5	100	2	100	1	100	9	100	6	100	10	100

Table 5: Ethnic distribution of prevalent patients

	2008		2009		2010		2011		2012		2013		2014	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	76	75.2	64	74.4	52	74.3	41	74.5	37	84.1	31	81.6	32	84.2
Malay	18	17.8	16	18.6	15	21.4	13	23.6	6	13.6	7	18.4	5	13.2
Indian	7	6.9	6	7.0	3	4.3	1	1.8	1	2.3	0	0	1	2.6
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	101	100	86	100	70	100	55	100	44	100	38	100	38	100

Table 6: Mean age at entry into programme

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Mean age (years)	59	56	57	44	62.4	65	54	53	60
SD	13.9	11.6	11.7	11.9	8.1	-	14.7	19.5	10

Table 7: Mean age of existing patients

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Mean age (years)	54	55	54	54	56	54	52	56.3	57.7
SD	11.3	11	10.7	10	10.9	10.7	11.3	13.3	11.2

Table 8: Etiology of end-stage renal disease in new patients

	2008		2009		2010		2011		2012		2013		2014	
Etiology	n	%	n	**%**	n	%	n	%	n	%	n	%	n	%
Chronic GN (no biopsy)	4	30.8	1	20.0	-	-	-	-	3	33.3	1	16.7	1	10
IgA nephropathy	-	-	-	-	-	-	-	-	1	11.1	1	16.7	-	-
SLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Focal sclerosing GN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Drug induced GN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Membranous GN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diabetic nephropathy	9	60.0	3	60.0	2	100.0	1	100.0	4	44.5	2	33.3	6	60
PCKD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renal calculi	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renovascular disease	-	-	-	-	-	-	-	-	-	-	-	-	2	20
TB Kidney	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	2	13.13	1	20.0	-	-	-	-	-	-	-	-	1	10
Unknown	-	-	-	-	-	-	-	-	1	11.1	2	33.3	-	-
Total	**15**	**100.0**	**5**	**100.0**	**2**	**100.0**	**1**	**100.0**	**9**	**100.0**	**6**	**100.0**	**10**	**100**

Table 9: Etiology of end-stage renal disease in existing patients

	2008		2009		2010		2011		2012		2013		2014	
Etiology	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chronic GN (no biopsy)	30	29.7	28	32.6	24	34.3	19	34.5	18	40.9	14	36.8	11	28.9
IgA nephropathy	8	7.9	6	7	5	7.1	4	7.3	3	6.8	4	10.5	4	10.6
SLE	2	2.0	2	2.3	2	3.0	2	3.6	2	4.5	1	2.6	1	2.6
Focal sclerosing GN	2	2.0	2	2.3	1	1.4	1	1.8	1	2.3	1	2.6	-	-
Drug induced GN	1	1.0	1	1.2	-	-	-	-	-	-	-		-	-
Diabetic nephropathy	39	38.6	30	34.9	24	34.3	17	30.9	11	25	8	21.1	11	28.9
PCKD	4	3.9	4	4.7	4	5.7	4	7.3	2	4.5	2	5.3	2	5.3
Renal calculi	1	1.0	1	1.2	1	1.4	1	1.8	1	2.3	1	2.6	1	2.6
Renovascular disease	-	-	-	-	-	-	-	-	-	-	-		1	2.6
TB Kidney	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	6	5.9	5	5.8	4	5.7	3	5.5	2	4.5	2	5.3	2	5.3
Unknown	8	7.9	7	8.1	5	7.1	4	7.3	4	9.2	5	13.2	5	13.2
Total	**101**	**100.0**	**86**	**100.0**	**70**	**100.0**	**55**	**100.0**	**44**	**100.0**	**38**	**100.0**	**38**	**100**

C. DEATHS / TRANSFERS

There were 4 deaths and 6 withdrawals in 2014. The causes of death are shown in Table 10. Of the four deaths, 1 died from septicemia, 2 of other causes and 1 died at home.

The reasons for withdrawal from PD are shown in Table 11. Three patients were transferred to hemodialysis due to peritonitis, 1 chose to transfer to hemodialysis electively and 2 patients received a renal transplant.

The death rate was 8.3% based on total number of patients in the year. The mean age at death in 2014 was 70.4 ± 8.4 years.

Table 10: Cause of Death

	2008		2009		2010		2011		2012		2013		2014	
Cause of Death	n	%	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Acute Myocardial Infarction	10	41.7	1	7.2	1	9.1	1	11.1	1	8.3	1	14.3	-	-
Other Cardiac	2	8.3	5	35.7	2	18.2	-	-	2	16.7	-	-	-	-
Cerebrovascular Accident	-	-	-	-			-	-	-	-	-	-	-	-
Infections	5	20.8	3	21.4	3	27.2	4	44.4	3	25.0	4	57.1	1	25
Liver Failure	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malignancy	1	4.2	-	-	1	9.1	-	-	-	-	-	-	-	-
Accidental	-	-	-	-	-	-	-	-	1	8.3	-	-	-	-
Bleeding from Gastro-intestinal Tract	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Died at Home	5	20.8	3	21.4	2	18.2	1	11.1	2	16.7	1	14.3	1	25
Others	1	4.2	2	14.3	2	18.2	3	33.4	3	25.0	1	14.3	2	50
Total	**24**	**100.0**	**14**	**100.0**	**11**	**100.0**	**9**	**100.0**	**12**	**100.0**	**7**	**100.0**	**4**	**100**
Death Rate	**17.4%**		**13.2%**		**12.5%**		**12.7%**		**18.8%**		**14%**		**8.3%**	

Table 11: Reason of Withdrawal

	2008		2009		2010		2011		2012		2013		2014	
Reason of Withdrawal	n	%	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
PD related Infection	5	71.4	3	50	5	71.4	4	57.1	5	62.5	3	60	1	16.7
Technical Reason	-	-	-	-	2	28.6	1	14.3	-	-	-	-	2	33.3
Elective transfer to HD	1	14.3	-	-	-	-	-	-	-	-	-	-	1	16.7
Transplant	1	14.3	3	50	-	-	2	28.6	1	12.5	2	40	2	33.3
Others	-	-	-	-	-	-	-	-	*2	25	-	-	-	-
Total	**7**	**100**	**6**	**100**	**7**	**100**	**7**	**100**	**8**	**100**	**5**	**100**	**6**	**100**

* Patients withdrew to be on palliative care.

D. HOSPITALISATIONS

There were 69 admissions in 36 patients and 75% of the patients in the PD programme were admitted in the year. The admission rate was 1.59 episodes per patient year or 22.4 days per patient year. There was no difference in the hospitalization rates between the diabetic and non-diabetic patients. Peritonitis accounted for 22.0% of the total admissions.

When compared to the previous year (2013), the rates of hospitalization appear higher.

Table 12: Hospitalisations

HOSPITALISATION	ALL		DM		NON-DM	
	2013	**2014**	2013	**2014**	2013	**2014**
Number of patients ever in prog	50	**48**	18	**18**	32	**30**
Total patient years	43		15.2		27.8	
Number of patients ever admitted	29	**36**	11	**14**	18	**22**
Admission episodes	56	**69**	24	**28**	32	**41**
Admission days	769	**969**	406	**382**	363	**587**
Days hospitalized						
PD related – technical	5	**8**	5	**8**	0	**0**
- infection	127	**403**	17	**152**	110	**251**
Other Infections	124	**19**	109	**12**	15	**7**
Others	513	**539**	275	**210**	513	**329**
% patients ever admitted	58	**75**	61.1	**77.8**	56.3	**73.3**
Episodes per patient year	1.30	**1.59**	1.58	**1.69**	1.15	**1.53**
Days per patient year	17.9	**22.4**	26.7	**23.1**	13.1	**22.0**
Days per patient year						
PD related – technical	0.12	**0.19**	0.32	**0.48**	0.0	**0.0**
- infection	2.95	**9.32**	1.12	**9.2**	3.95	**9.39**
Other Infections	2.88	**0.43**	7.17	**0.73**	0.54	**0.26**
Others	11.93	**12.47**	18.09	**12.71**	18.45	**12.31**
% of admissions						
PD related - technical	1.8	**1.4**	4.2	**3.6**	0.0	**0.0**
- infections	10.7	**20.3**	8.3	**17.9**	12.5	**22.0**
Other Infections	12.5	**2.9**	20.8	**3.6**	6.3	**2.4**
Others	75	**75.3**	66.7	**75.0**	81.2	**75.6**

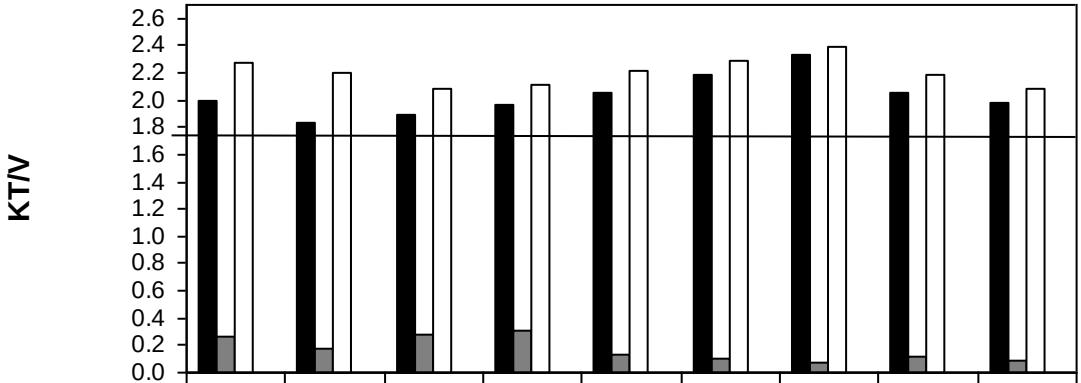
Hospitalisations during the period Jan-Dec 2014 were analysed and expressed as days hospitalized per patient year of dialysis programme.

E. DIALYSIS PARAMETERS

Dialysis Adequacy

Dialysis adequacy is assessed using the total KT/V and is measured 6 monthly. The minimum target total KT/V is 1.7. The total KT/V (which is the sum of the dialysate and residual KT/V) of the cohort was 2.08 ± 0.25. It is encouraging to note that the dialysate KT/V (1.98 ± 0.29) is also above the minimum target and this implies that no change in the dialysis prescription would be required when the patient loses residual renal function. One patient did not achieve the minimum target of 1.7.

Fig 3: KT/V



	2006	2007	2008	2009	2010	2011	2012	2013	2014
■ Dialysate	2.00	1.84	1.89	1.97	2.06	2.18	2.33	2.05	1.98
SD	0.4	0.34	0.39	0.5	0.35	0.37	0.37	0.35	0.29
▒ Residual	0.26	0.17	0.28	0.31	0.13	0.11	0.08	0.12	0.09
SD	0.3	0.25	0.32	0.43	0.34	0.25	0.2	0.39	0.18
□ Total KT/V	2.27	2.2	2.09	2.12	2.21	2.29	2.39	2.19	2.08
SD	0.5	0.43	0.41	0.49	0.44	0.33	0.38	0.42	0.25
% achieving KT/V 1.7	90.0%	82.5%	74.6%	81.9%	92.2%	100.0%	100.0%	92.3%	96.4%

Table 13: KT/V

	2008	2009	2010	2011	2012	2013	2014
N	71 (30 not done)	83 (3 not done)	64 (6 not done)	50 (5 not done)	39 (7 not done)	38	28 (10 not done)
Total KT/V	2.09 ± 0.41	2.12 ± 0.49	2.21 ± 0.44	2.29 ± 0.33	2.39 ± 0.38	2.19 ± 0.42	2.08 ± 0.25
Dialysate KT/V	1.89 ± 0.39	1.97 ± 0.5	2.06 ± 0.35	2.18 ± 0.37	2.33 ± 0.37	2.05 ± 0.35	1.98 ± 0.29
Residual KT/V	0.28 ± 0.32	0.31 ± 0.43	0.13 ± 0.34	0.11 ± 0.25	0.08 ± 0.2	0.12 ± 0.39	0.09 ± 0.18
% patients with KT/V ≥ 1.7	74.6 (18/71<1.7)	81.9 (15/83 <1.7)	92.2 (5/64 <1.7)	100.0	100.00	92.1 (3/38<1.7)	96.4 (1/28<1.7)

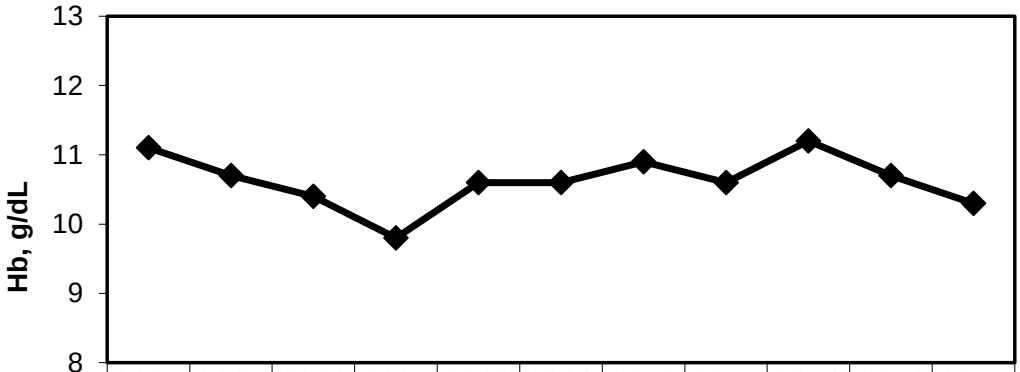
Peritonitis

Patients who develop peritonitis are treated at their primary hospitals. As such, the KDF PD programme only captures data of hospitalizations for peritonitis. There were 12 admissions for peritonitis and 2 for catheter-related infections during the period of 1 Jan to 31 Dec 2014. Three patients transferred to hemodialysis because of peritonitis.

Anaemia

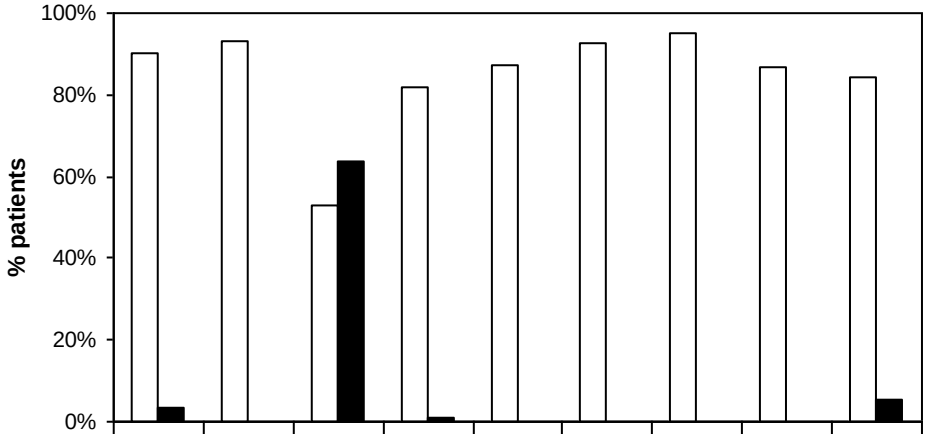
The mean haemoglobin was 10.3 ± 1.9 g/dl with 92.1% (35/38) of the patients receiving erythropoietin (EPO). The mean dose of EPO was 96.29±45.85 U/kg BW/week (range 35.3 – 199.0 U/kg BW/week). The mean haemoglobin has remained stable except for the slight dip to 9.8 g/dl in 2007.

Fig 4: Mean Haemoglobin Level



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	11.1	10.7	10.4	9.8	10.6	10.6	10.9	10.6	11.2	10.7	10.3
SD	1.8	1.8	1.6	2.0	1.9	1.9	1.8	1.9	1.9	1.8	1.9

Fig 5: Percentage of patients on EPO



	2006	2007	2008	2009	2010	2011	2012	2013	2014
□ Total % on EPO	90.0%	93.0%	53.0%	82.0%	87.1%	92.7%	95.3%	86.8%	84.2%
■ < 10, not on EPO	3.3%	0.0%	63.6%	1.0%	0.0%	0.0%	0.0%	0.0%	5.3%

Table 14: Haemoglobin and Use of EPO

Hb (g/dl)	2008		2009		2010		2011		2012		2013		2014	
N	83*		86		68		54		43		38		38	
Mean ± SD	10.6 ± 1.9		10.6 ± 1.9		10.9 ± 1.8		10.6 ± 1.9		11.2 ± 1.9		10.7 ± 1.84		10.3 ± 1.88	
< 10 not on EPO	14	16.9%	1	1.0%	0	0%	0	0%	0	0%	0	0%	2	5.3%
< 10 on EPO	18	21.7%	32	37.0 %	20	29.4%	20	37.0%	10	23.3%	10	26.3%	16	42.1 %
> 10 not on EPO	25	30.1%	14	16.0 %	6	8.8%	4	7.4%	2	4.7%	5	13.2%	4	10.5 %
> 10 on EPO	26	31.3%	39	45.0 %	42	61.8%	30	55.6%	31	72.1%	23	60.5%	16	42.1 %

* 18 patients with no data (2008)

Serum Albumin

Although the mean serum albumin (34.9 ± 4.0g/L) of the prevalent patients remains below normal (37 g/L), it has improved since the introduction of a subsidy for the protein supplement, Beneprotein.

The Beneprotein subsidy program was started in October 2011 and there are currently 14 patients on Beneprotein as at end December 2014.

Table 15: Serum albumin

Albumin (g/L)	2008	2009	2010	2011	2012	2013	2014
N	82	84*	70*	54	43	37	37
Mean ± SD	30.9 ± 4.3	30.4 ± 4.4	30.9 ± 4.2	31.3 ± 3.8	31.7 ± 3.5	35.9 ±3.3	34.9 ±4.0
% < 37 g/L	52.4	93.0	88.6	96.3	90.7	54.1	57.9
% < 30 g/L	40.2	43.0	42.9	29.6	25.6	2.7	13.2

* No results in 2 patients

Mineral Metabolism

The mean corrected serum calcium was 2.5 ± 0.21 mmol/L and the mean serum phosphate was 1.83 ± 0.53 mmol/L (39.5% of patients had a serum phosphate > 1.78 mmol/L). Most of the patients (78.9%) were on calcium supplements (calcium acetate 70%, calcium carbonate 30%). Ten patients (26.3%) were also on Lanthanum carbonate (non-calcium phosphate binder) and 3 patients (7.9%) on Sevelamar. As Lanthanum is costly, the patients received a subsidy for the medication.

The mean iPTH level was 61.6 ± 54.5 pmol/L with only 23.6% of the patients falling within the limits of 16.5-33.0 pmol/L. The 2003 KDOQI guidelines recommend that the iPTH in dialysis patients (CKD Stage 5) should be maintained within the range of 16.5 – 33 pmol/L. Hyperphosphatemia is a major factor contributing to mineral bone disease and the recent availability of Lanthanum will allow better control of the problem and avoid the need for surgical parathyroidectomy. One patient underwent a parathyroidectomy.

Table 16: Percentage of patients according to iPTH levels

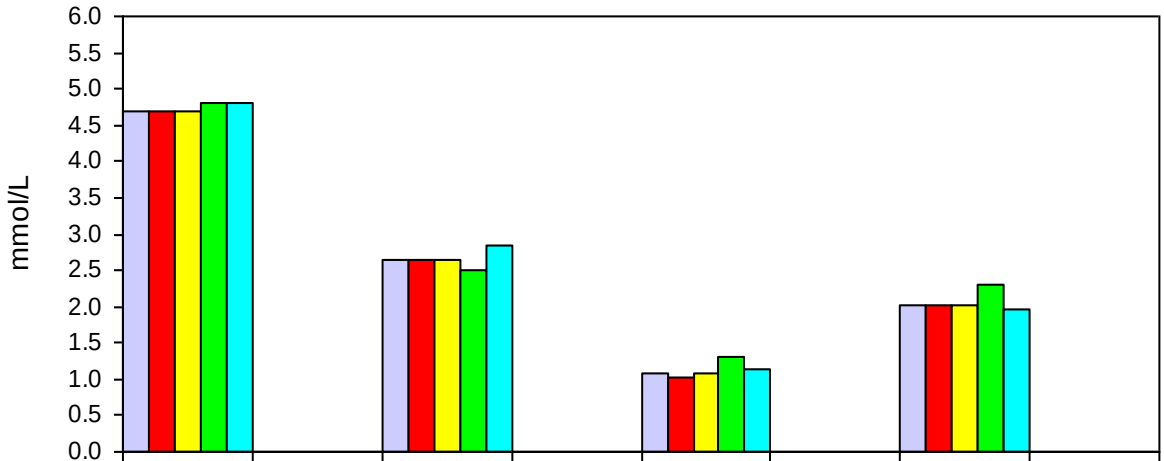
	2010		2011		2012		2013		2014	
	N	%	N	%	N	%	N	%	N	%
<16.5	10	15.9	12	23.1	10	24.4	9	23.7	7	21.2
16.5-33.0	16	25.4	13	25.0	10	24.4	7	18.4	9	27.3
>33.0	37	58.7	27	51.9	21	51.2	22	57.9	17	51.5
Total	63*	100.0	52	100.0	41	100	38	100	33	100

*Date not available for 7 patients (2010)

Hyperlipidaemia

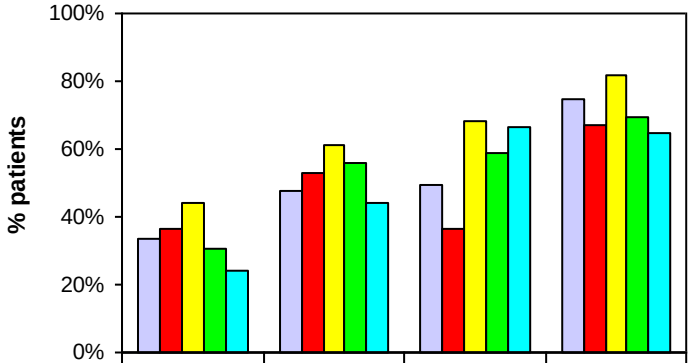
The lipid profile of the patients remained largely unchanged when compared to the previous years. The mean LDL cholesterol level was 2.83 ± 1.05 mmol/L with 44.1% of the patients achieving the recommended MOH guidelines for LDL cholesterol of < 2.6 mmol/L. The mean HDL cholesterol level was 1.14 ± 0.3 mmol/L and the mean triglyceride level was 1.97 ± 1.14 mmol/L. It remains encouraging to note that more than half of the patients (64.7%) achieve the recommended MOH guideline for triglyceride levels.

Fig 6: Lipid profile



	Total Chol	SD	LDL	SD	HDL	SD	TG	SD
2010	4.7	1.2	2.64	1.06	1.08	0.34	2.02	1.44
2011	4.7	1.1	2.64	1.03	1.03	0.28	2.02	1.1
2012	4.7	1	2.65	0.83	1.08	0.41	2.02	1.6
2013	4.8	1.7	2.5	0.68	1.3	0.4	2.3	2.9
2014	4.8	1.6	2.83	1.05	1.14	0.3	1.97	1.14

Fig 7: Lipid profile – Percentage achieving MOH target levels



	TC<4.1	LDL<2.6	HDL>=1.0	TG<2.3
2010	33.3%	47.6%	49.2%	74.6%
2011	36.3%	52.7%	36.3%	67.3%
2012	44.0%	61.0%	68.0%	82.0%
2013	30.6%	55.6%	58.7%	69.4%
2014	24.2%	44.1%	66.3%	64.7%

F. TRANSPLANT WAITING LIST

Seven (18.4%) patients were registered on the transplant register. Twenty-two patients (57.9%) were not eligible for transplant for reasons including exceeding the age limit of 60 years* (10/38 patients, 26.3%) and two patients opted out because of seropositivity for Hepatitis B or C. Seven patients were pending assessment.

*The age limit of 60 years was recently lifted and the patients now have to be reassessed for fitness for transplant.

Table 17: Transplant status

	2008		**2009**		**2010**		**2011**		**2012**		**2013**		**2014**	
N	101		86		70		55		44		38		38	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Registered	19	18.8	17	19.8	17	24.3	12	21.8	13	29.5	7	18.4	7	18.4
Not eligible	63	62.4	48	55.8	35	50	42	76.4	28	63.6	22	57.9	22	57.9
Opted out	2	2	2	2.3	2	2.9	1	1.8	2	4.5	2	5.3	2	5.3
Pending	17	16.8	19	22.1	16	22.9	0	0	1	2.3	7	18.4	7	18.4

G. INTERIM HEMODIALYSIS

Three patients required interim hemodialysis (due to peritonitis) and were subsequently converted to permanent hemodialysis in KDF HD Programme.

12. ACTIVITIES OF THE PD CENTRE

Patient Activities

The PD patients participated in the two Patient Education Seminars and an outing:
1. “Cooking with Protein Sources” at Tessensohn clubhouse on 25 May 2014,
2. “My vascular access, My lifeline!” on 19 October 2014, and a
3. Social outing to S.E.A. Aquarium on 7 December 2014.

13. CONCLUSION

The KDF PD Programme provides a complementary clinical service to patients from the public institutions. In addition to receiving a subsidy for the PD supplies, the patients also receive 6 monthly clinical reviews by the KDF doctor and more frequent reviews by the PD Nurse and home visits. They also receive subsidies for expensive medications including erythropoietin, Lanthanum carbonate and Bene protein supplements.

As before, meeting dialysis targets remains a challenge in this group of patients as compliance is often difficult to track and they have multiple co-morbidities. However, dedicated personal care from the PD dialysis nurses has certainly added quality to the dialysis programme.

We would like to thank all who have contributed to the smooth running of the programme.

Dr Grace Lee Siew Luan
Medical Director (Peritoneal Dialysis)