KIDNEY DIALYSIS FOUNDATION

MEDICAL ANNUAL REPORT

2015

Prepared by

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1. INTRODUCTION

The Kidney Dialysis Foundation is now in its 20th year of operations having opened 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	RT*DV

Legend: ARC = AsiaRenalCare
FMC = Fresenius Medicare
RT = Renal Team
RT*DV= Davita until Sep2015, taken over by Renal Team
* 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, the Nursing Consultant stepped down in Dec 2015.

This report covers medical data collated at the end of 2015.

2. THE DIALYSIS CENTRES

The location and prevalent number of patients as of 31 Dec 2015 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	95
2	San Wang Wu Ti – KDF Centre	15 +1 isolation	16	71
3	KDF – Ghim Moh Centre	19 +1 isolation	20	80
4	Peritoneal Dialysis Centre	Not applicable	Nil	35

All haemodialysis centres operate 3 shifts a day.

HAEMODIALYSIS PROGRAMME

2015

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 2015, there were 23 new entrants.

Thirty-six (36) patients exited the programme (1 transplant, 17 deaths, 1 transfers to PD programme, 12 to non-PD programmes, 4 withdrew from dialysis/terminated and 1 incarcerated). In the prevalent population, average age was 59.9 $\pm$ 10.8 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 37.4%, diabetic nephropathy 38.6%.

All patients (100%) are using high flux dialysers. Average blood flow was 282 $\pm$ 36.9 ml/min. 93.1% of patients dialyse 4 hours or more. 80.1% of patients use a native arteriovenous fistula. Dialysis adequacy as measured by single pool KT/V is >1.2 in 96.3% of patients.

Mean hemoglobin was 11.0 $\pm$ 1.4 g/dl. About 86% of all patients are on EPO. About 7.3 % of patients are considered Fe deficient.

There has been significant improvement in S Albumin of with only 45.5% of patients having Albumin<40 g/l compared with 49.8% the previous year.

Diabetes as a comorbidity was present in 46.6% of the population.

There was no significant changes in virology status. Hep B positivity was 5.3%, HCV 6.9%, HepB and HCV 0.4%.

Less patients were registered on the National Transplant waiting list (9.2%), 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 Titus Lau
5. Dr Grace Lee
6. Dr Pwee Hock Swee
7. Dr Tan Han Khim
8. Dr Tan Seng Hoe
9. Dr Yeoh Lee Ying
10. Dr Ng Tsun Gun
11. Dr Adrian Liew
12. Dr Sheryl Gan (step down in July 2015)
13. Dr Manish Kaushik
14. 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 with Ms Sunitha Silvanathan, Clinical Nurse and Ms Theresa Soh (Clinical Coordinator) till Dec 2015.

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)
- Renal Team at Ghim Moh Centre (contract from Oct 2015 to Sep 2019)

The Dialysis Provider is responsible for rostering of the nursing services. Staff numbers inclusive of the charge nurse as at 31 Dec 2015 is listed as follows:

Centre	Renal trained SN	SN	AN	DT	Total
Bishan	3	10	2	0	18
SWWT	2	9	2	0	13
Ghim Moh	3	12	0	0	15
Grand total					46

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

*14 machines were replaced November 2015 with F4008SNG, Fresenius Medical Care

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 7 Renatron machines in the two centres (four in Bishan and three in Kreta Ayer) linked to the Renalog Reprocessing Management (RM). Ghim Moh centre managed by Renal Team started single use in Oct 2015, the two Renatron machines, one was transferred to Bishan centre for use and one was put away.

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) with advice from Ms Theresa Soh (Clinical Coordinator) 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, Lee Sze Mien by Renal Team 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 till May 2015. Ms Viviene Lim joined in May 2015.

Consistent with its mission, KDF patients are heavily subsidised.

The number of Medifund recipients 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
2015	82	33.3

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

Two (2) patients received civil service benefits.

DIALYSIS REVIEWS

Apart from the rounds which are carried out on a monthly basis by the doctors, problem cases are reviewed at Patient Services meetings by the Senior Nurse Clinician, Clinical Nurse or designee and Staff Nurse in charge of the patient 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, PD patients 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 2015, we had 246 patients dialysing in 3 centres – 95 patients at Bishan Centre (BS), 71 at Kreta Ayer (SWWT) and 80 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	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
New Cases	10	13	18	26	28	12	32	31	12	11
New Cases (interim)	3	3	3	7	7	15	31	30	13	10
Re-enter KDF	0	1	1	0	3	2	2	0	3	2
Total Entries	**13**	**17**	**22**	**33**	**38**	**29**	**65**	**61**	**28**	**23**
EXIT										
Transfer Out to non-KDF Programs	0	1	0	5	1	7	5	2	10	12
Transfer Out to KDF PD	3	2	2	1	2	3	7	3	4	1
Transplant	10	6	4	4	2	1	4	2*	2	1
Withdraw from Dialysis/Default	0	2	0	1	4	4	2	3	5	5
Deaths	11	2	9	8	8	20	13	18	16	17
Total Exits	**24**	**13**	**15**	**19**	**17**	**35**	**31**	**28**	**37**	**36**
Total No of Pt	**161**	**165**	**172**	**186**	**207**	**201**	**235**	**268**	**259**	**246**

* Cadaveric/Deceased Donor

Table 7A-2 –Mode of Dialysis

Interim HD		12
- Newly initiated subsequently permanent HD	8	
- Newly initiated awaiting PD		
- Newly initiated Bridge to Transplant	1	
- PD complications for temp HD	1	
- PD complications to permanent HD		
- Failed tx, back on HD	1	
- had been on dx, transferred from other VWO centre	1	
Permanent HD [not via interim route]		11
- newly initiated	8	
- failed PD program, re-enter program		
- had been on dx, transferred to VWO from private	1	
- failed tx, back on HD	2	
TOTAL		23

Table 7A-3 – Source of Referral

	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
SGH	10	14	18	16	25	22	52	53	25	22
NUH	2	1	2	11	8	3	6	7	1	1
TTSH	1	1	1	1	2	1	3	0	1	0
AH / KPTH		1	0	4	3	3	4	1	1	0
Private	0	0	1	1	0	0	0	0	0	0
Total Entries	**13**	**17**	**22**	**33**	**38**	**29**	**65**	**61**	**28**	**23**

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

	2010		2011		2012		2013		2014		2015	
Etiology	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chronic glomerulonephritis	14	*36.8*	6	*20.7*	18	*27.7*	13	*21.3*	*3*	10.7	*8*	34.8
Diabetic nephropathy	14	*36.8*	14	*48.3*	27	*41.5*	37	*60.7*	*16*	57.1	*13*	56.5
Lupus nephritis	0	*0*	0	*0*	1	*1.5*	0	*0*	*0*	0	*0*	0
Obstructive uropathy	1	*2.6*	2	*6.9*	1	*1.5*	0	*0*	*1*	3.6	*0*	0
PCKD	2	*5.3*	1	*3.4*	2	*3.1*	0	*0*	*0*	0	*0*	0
TB kidney	*0*	0	*0*	1	*1.5*	0	*0*	*0*	*0*	0	*0*	0
Hypertension	1	*2.6*	1	*3.4*	2	*3.1*	3	*4.9*	*2*	7.1	*0*	0
Others	4	*10.6*	4	*13.8*	6	*9.2*	4	*6.6*	*5*	17.9	*1*	4.3
Unknown Etiology	2	*5.3*	1	*3.4*	6	*9.2*	4	*6.6*	*1*	3.6	*1*	4.3
Total	38	*100*	29	*100*	65	*100*	61	*100*	*28*	100	*23*	100

The majority of new cases were patients with diabetes mellitus (56.5%) and chronic GN (34.8%).

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

	2010		2011		2012		2013		2014		2015	
Etiology	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chr glomerulonephritis	93	*44.9*	88	*43.8*	96	*41.4*	97	*36.2*	*92*	35.5	92	37.4
Diabetic nephropathy	62	*30.0*	57	*28.4*	69	*29.7*	98	*36.6*	*97*	37.5	95	38.6
Lupus nephritis	10	*4.8*	10	*5.0*	9	*3.9*	9	*3.4*	*9*	3.5	8	3.3
Obstructive uropathy	2	*1.0*	2	*1.0*	2	*0.9*	2	*0.8*	*3*	1.2	3	1.2
PCKD	5	*2.4*	6	*3.0*	8	*3.4*	10	*3.7*	*7*	2.7	5	2.0
TB kidney	0	*0*	1	*0.5*	2	*0.9*	2	*0.8*	*2*	0.7	2	0.8
HT	4	*1.9*	5	*2.5*	7	*3.0*	10	*3.7*	*10*	3.9	8	3.3
VUR	2	*1.0*	2	*1.0*	3	*1.3*	3	*1.1*	*3*	1.2	2	0.8
Others	10	*4.8*	13	*6.5*	17	*7.3*	18	*6.7*	*18*	6.9	16	6.5
Unknown Etiology	19	*9.2*	17	*8.5*	22	*9.4*	21	*7.8*	*18*	6.9	15	6.1
Total	207	*100*	201	*100*	232	*100*	268	*100*	*259*	*100*	*246*	*100*

There are now more patients with diabetic nephropathy (38.6%) than chronic glomerulonephritis (37.4%)

Gender

Table 7B-3 – Gender of New Patients

	2010		2011		2012		2013		2014		2015	
Gender	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Males	21	*55.3*	18	*62.1*	28	*43*	35	*57.4*	*20*	*71.4*	*11*	*47.8*
Females	17	*44.7*	11	*37.9*	37	*57*	26	*42.6*	*8*	*28.6*	*12*	*52.2*
Total	38	*100*	29	*100*	65	*100*	61	*100*	*28*	*100*	*23*	*100*

Table 7B-4 – Gender of Prevalent Patients

	2010		2011		2012		2013		2014		2015	
Gender	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Males	96	*46.4*	96	*47.5*	112	*47.7*	133	*49.6*	*130*	*50.2*	*120*	*48.8*
Females	111	*53.6*	105	*52.4*	123	*52.3*	135	*50.4*	*129*	*49.8*	*126*	*51.2*
Total	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*	*246*	*100*

At the end of 2015, the ratio of male to female patients was 120:126.

Ethnic Distribution

Table 7B-5 – Ethnic Distribution of New Patients

	2010		2011		2012		2013		2014		2015	
Race	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	27	*71.0*	20	*67.0*	37	*56.9*	38	*62.3*	*21*	*80.8*	*12*	*52.2*
Malay	6	*15.8*	8	*27.6*	18	*27.7*	17	*27.9*	*2*	*7.7*	*7*	*30.4*
Indian	5	*13.2*	1	*3.4*	9	*13.8*	6	*9.8*	*3*	*11.5*	*4*	*17.4*
Others	0	*0*	0	*0*	1	*1.5*	0	*0*	*0*	*0*	*0*	*0*
Total	38	*100*	29	*100*	65	*100*	61	*100*	*26*	*100*	*23*	*100*

Table 7B-6 – Ethnic Distribution of Prevalent Patients

	2010		2011		2012		2013		2014		2015	
Race	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	153	*73.9*	145	*72.1*	163	*69.4*	184	*68.7*	*180*	*69.5*	*169*	*68.7*
Malay	38	*18.4*	42	*20.9*	54	*23*	61	*22.8*	*59*	*22.8*	*55*	*22.4*
Indian	16	*7.7*	14	*7.0*	17	*7.2*	*22*	*8.2*	*20*	*7.7*	*22*	*8.9*
Others	0	*0*	0	*0*	1	*0.4*	0	*0*	*0*	*0*	*0*	*0*
Total	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*	*246*	*100*

The ethnic distribution of our prevalent patients was 68.7% Chinese, 22.4% Malays and 8.9% Indians.

Age

The mean age at entry in 2015 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	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Mean Age (years)	56.7	56.9	56.5	56.1	59.1	58.0
SD	10.4	12.5	12.5	9.3	12.5	14.9
Min	34.5	32.7	23.5	30.7	30.6	29.0
Max	81.9	78.9	80.2	74.1	78.0	85.1

Average age of new patients with diabetic nephropathy was 57.7 years compared with 59.7 years in non-diabetics.

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

Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Mean Age (years)	57.4	57.7	58.7	58.7	59.5	59.9
SD	10.3	10.8	10.8	10.5	10.6	10.8
Min		28.0	29.0	30.0	31.4	29.3
Max		86.0	87.0	88.0	89.0	86.0

Age of the prevalent dialysis population at the end of 2015 was 59.9 $\pm$ 10.8 years (median 60.7). 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	2010		2011		2012		2013		2014		2015	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Diabetic	20	52.6	19	65.5	31	47.7	35	59.3	8	30.8	14	60.9
IHD n oth cardiac dis	22	57.9	6	20.7	21	32.3	20	33.9	7	26.9	9	39.1
CVA	4	10.5	1	3.4	1	1.5	1	1.7	2	7.7	1	4.3
PVD	4	10.5	1	3.4	6	9.2	7	11.9	0	0	3	13.0

Table 7B-10 – Common Comorbidities in Prevalent patients

Year	2010		2011		2012		2013		2014		2015	
	n	%	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Diabetics	69	33.3	67	33.3	81	34.5	107	39.9	110	42.5	115	46.6
IHD n oth cardiac	57	27.5	45	23.4	46	19.6	71	26.5	77	29.7	60	24.4
CVA	14	6.8	11	5.5	11	4.7	12	4.5	14	5.4	13	5.3
PVD	11	5.3	7	3.5	11	4.7	15	5.6	11	4.2	12	4.9

The proportion of diabetics in the prevalent dialysis population has increased to 46.6%.

The proportion of patients with cardiac problems has reduced 24.4%.

HOSPITALIZATIONS

Hospitalizations during the period 1 January 2015 to 31 December 2015 were analyzed and expressed as episodes and days hospitalized per patient year of dialysis programme. There were 556 hospitalization episodes in 199 patients. Thus, 70.6% of the patients were ever admitted that year.

Table 7B-11 – Admission Rates

	2011		2012		2013		2014		2015	
	No	%	No	%	No	%	No	%	No	%
No of Patients admitted in ref year	160/235	69.9%	180/266	67.7	212/296	71.6	209/294	71.1	199/282	70.6
- Diab pt adm / all diab	75/97	77.3%	80/99	80.8	99/118	83.9	117/126	92.9	117/134	87.3
- Non-diab pt adm / all	89/138	64.5%	100/154	64.9	113/150	75.3	92/168	54.8	82/221	55.4

DEATHS AND WITHDRAWALS

A total of 36 patients left the programme. Reasons were as follows:

- 1 patient was on interim haemodialysis and transferred to PD programme;,
- 1 patient received a deceased donor transplant
- 4 patients withdrew from dialysis treatment
- 1 was incarcerated
- 12 patients transferred to other centres (3 to NKF; 8 to high dependency dialysis.

One was temporarily dialyzing at a private centre while undergoing rehabilitation in a community hospital. He was not considered out of programme as he is expected to return to KDF.

There were 17 deaths –

- 6 from cardiac
- 1 from infection
- 2 from pneumonia
- 2 from , ischemic bowel / bowel infarction
- 1 from ESRD
- 1 each from pulmonary hypertension , Type A aortic dissection, aortic stenosis,
- 2 died at home.

Table 7B-13 – Deaths and Withdrawals

	2010	2011	2012	2013	2014	2015
Transfers						
- PD	3	3	7	3	4	1
- Other	1	7	5 (hi-dep)	3 (1 hi-dep)	10 (5 hi-dep)	12 (9 hi-dep)
Transplants	2	1	4	2	2	1
Withdrawals	1	4	2	2	5	5
Deaths	8	20	13	18	16	17
Total	**17**	**35**	**31**	**28**	**37**	**36**

D. DIALYSIS PARAMETERS

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

Table 7D-1: Types of Dialyzers used

	2010		2011		2012		2013		2014		2015	
	n	***%***	**n**	***%***	**n**	***%***	**n**	***%***	**n**	***%***	**n**	**%**
F6	1	*0.5*	2	*1*	0	*0*	6	*2*	*1*	*0.4*	0	*0*
HF50	19	*9.2*	21	*10*	22	*9.4*	19	*7*	*17*	*6.6*	14	*5.7*
HF60	37	*17.9*	49	*24*	60	*25.5*	66	*25*	*62*	*23.9*	63	*25.6*
HF80	15	*7.2*	32	*16*	36	*15.3*	51	*19*	*56*	*21.6*	54	*22.0*
HF100	8	*3.9*	12	*6*	14	*6*	24	*9*	*24*	*9.3*	24	*9.8*
PolyFlux6L	0	*0*	0	*0*	3	*1.3*	0	*0*	*1*	*0.4*	0	*0*
F70S	0	*0*	0	*0*	0	*0*	0	*0*	*23*	*8.9*	0	*0*
PolyFlux14	77	*37.2*	45	*22*	56	*23.8*	46	*17*	*24*	*9.3*	41	*16.7*
PolyFlux17	34	*16.4*	30	*15*	33	*14*	43	*16*	*39*	*15.1*	37	*15*
PolyFlux21	16	*7.7*	10	*5*	11	*4.7*	13	*5*	*12*	*4.6*	13	*5.3*
TOTAL	207	*100*	201	*100*	235	*100*	268	*100*	*259*	*100*	246	*100*

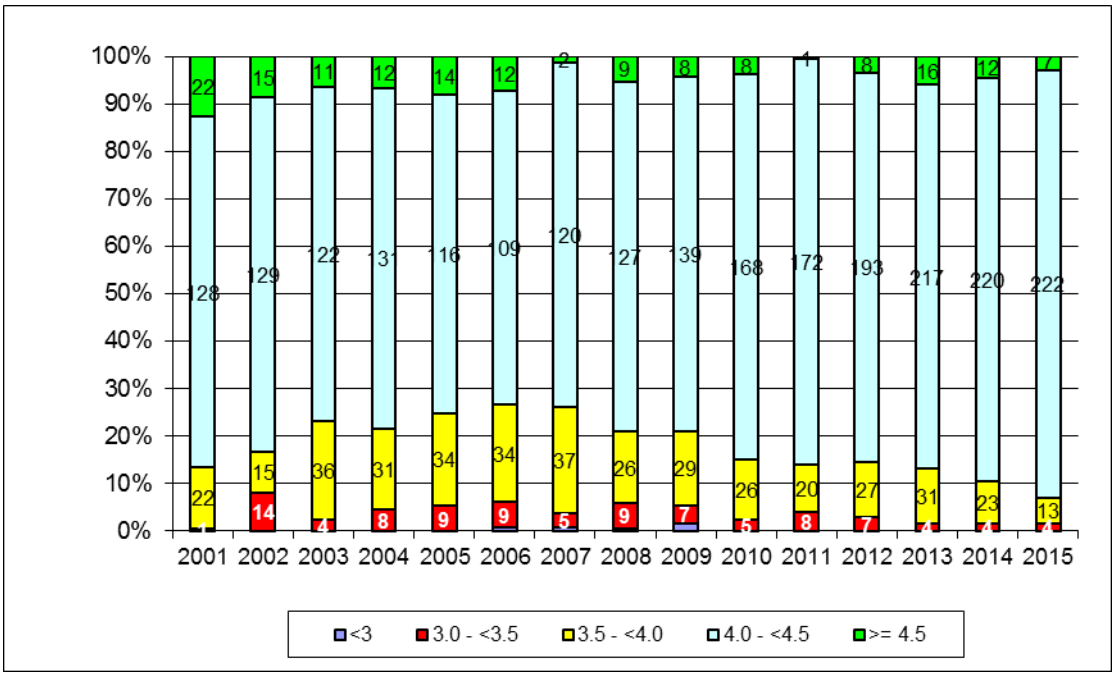
All were using high flux dialyzers.

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

ml/min	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Mean	267	267	267	270	276	282
Std Dev	31	34	33.4	33.9	35.2	36.9
Min	150	180	200	180	200	200
Max	360	360	360	360	400	400

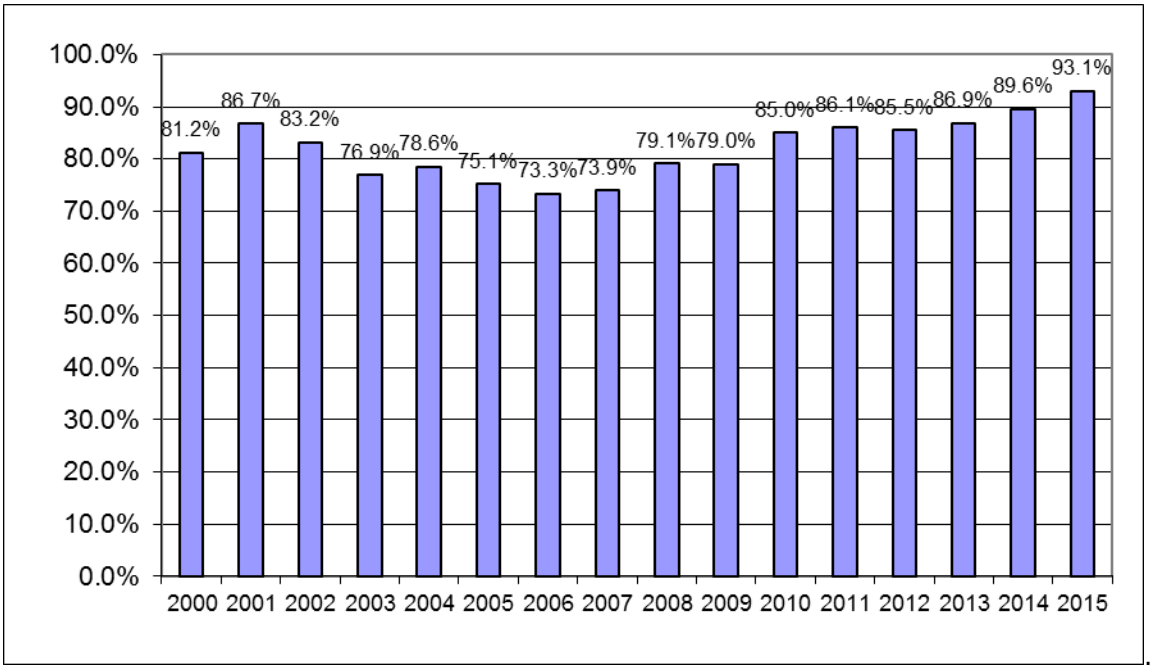
Blood flow is set at a minimum of 200 ml/min and averaged 282 ± 36.9 ml/min, median 280 mml/min (range 200 -400).

Fig 7D-1: Dialysis Time Per Session



Most patients (93.1%) [229/246] dialyze for 4 hours or more as compared to the previous year (89.6%).

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 wef Oct 2015.

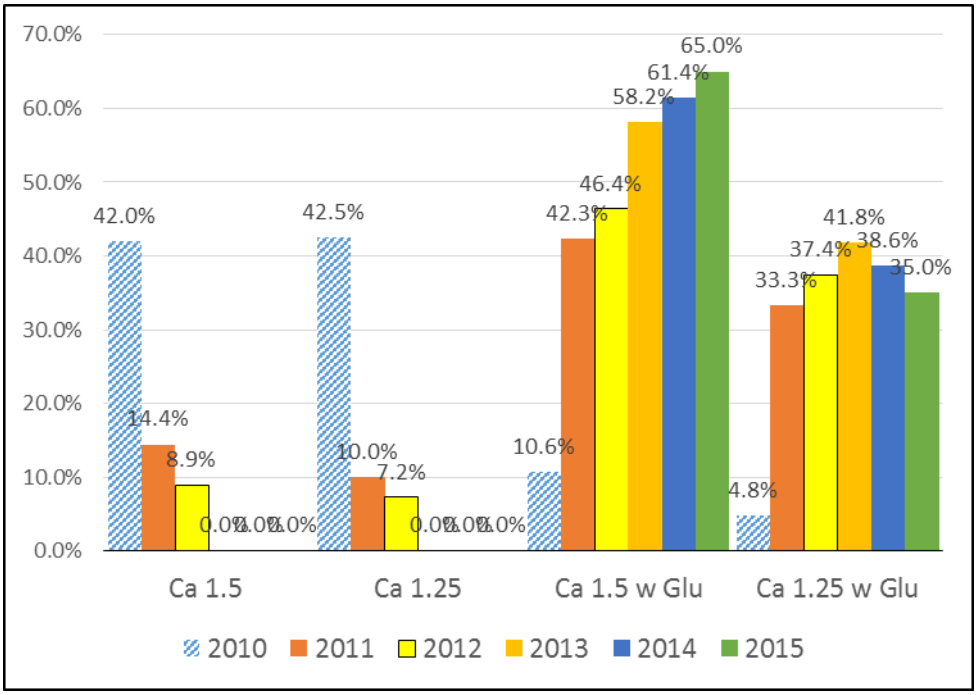
DIALYSATE

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

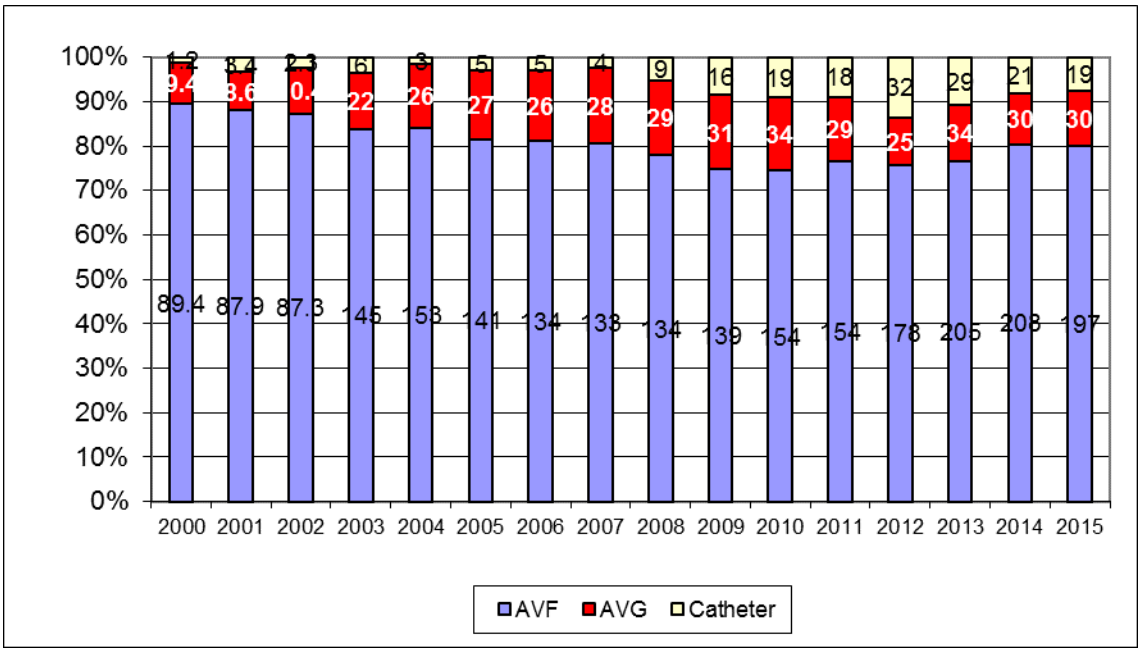
Dialysate containing 1.5 mmol/L calcium and 11 mmol/L glucose was first introduced in SWWT centre on 2nd December 2008 for diabetic and elderly patients. All patients in Bishan centre were provided with dialysate with glucose with either calcium 1.5 or 1.2 mmol/L from July 2011. With effect from September 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



About the same proportion of patients (80.1%, 197/346), were using AV fistulae compared with the previous year (80.3%). Thirty patients or 12.2% (30/246) were using grafts and 7.7% (19/246) on temporary catheters.

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:

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

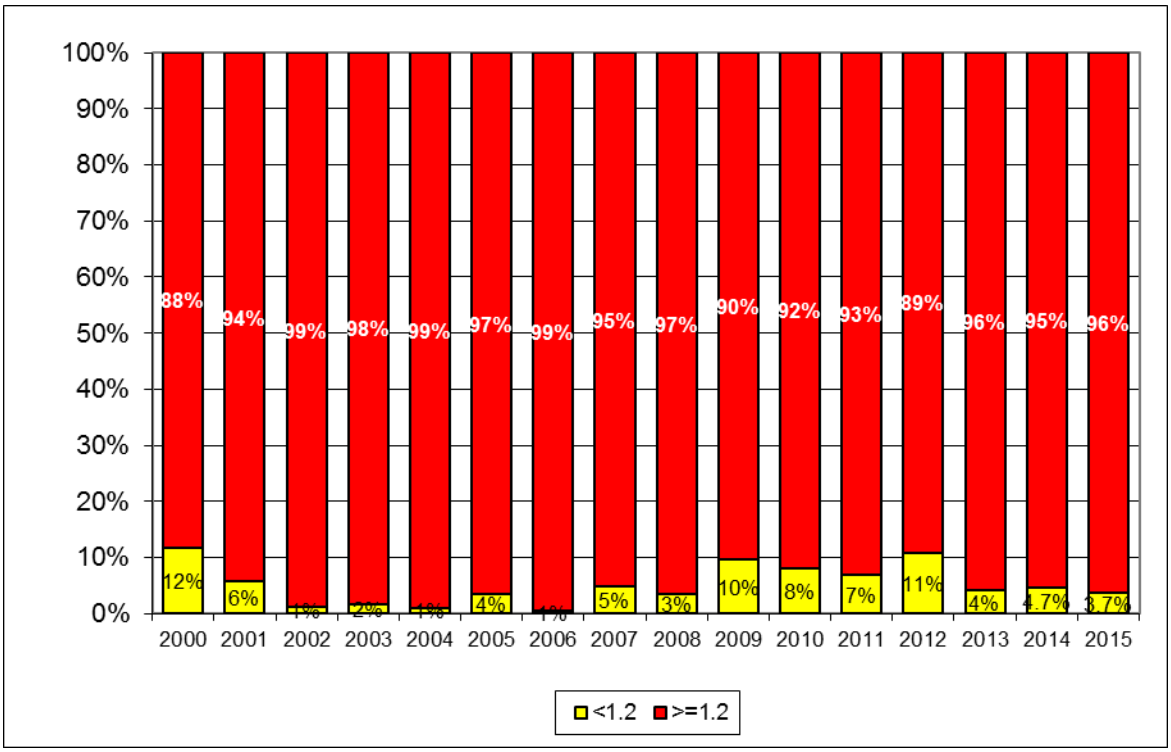
where R = post/pre urea
UF = ultrafiltration in litres
W = post dialysis weight

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

Our patients weighed 62.7 $\pm$ 15.6 kg (median 62 kg, range 35 – 130 kg).

The proportion of patients with KT/V of 1.2 or greater in November / December 2015 was 96.3%.

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



The proportion of patients with low KT/V is now 3.7%.

G. ANAEMIA

The mean Hb was calculated to be 11.0 ± 1.4 g/dl (range 6.7 – 15.3). This has been stable over the past few years. The percentage of patients with a haemoglobin count of less than 10 g/dl was 23.2% slightly higher than last year (21.2%).

Fig 7G-1: Average Hemoglobin

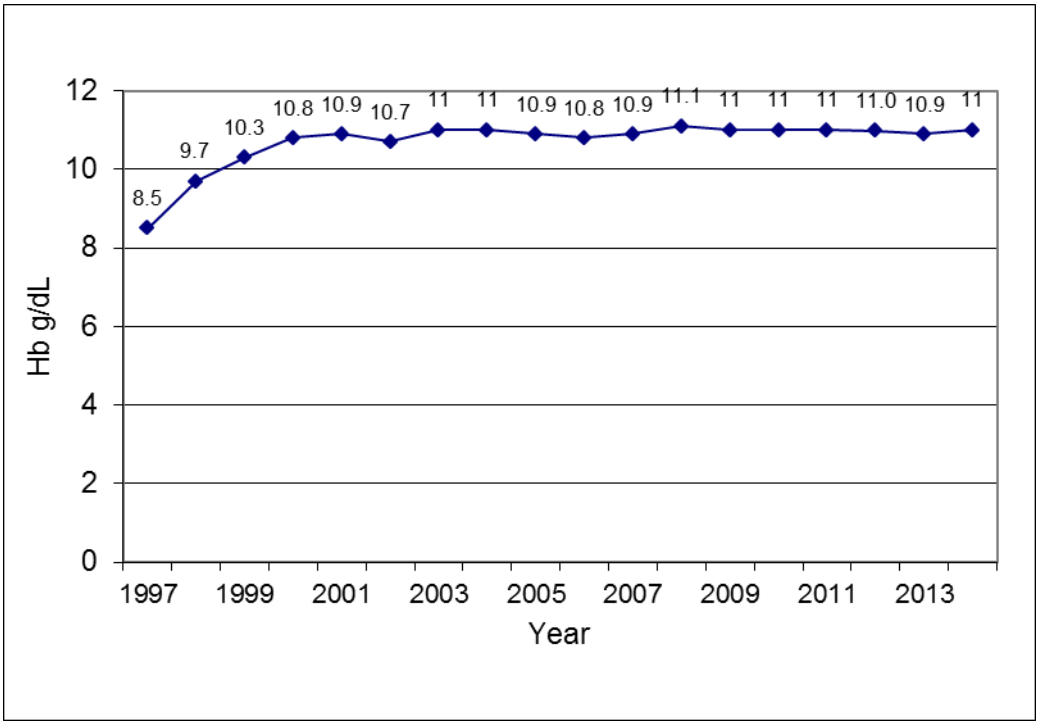


Fig 7G-2: Hb Frequency

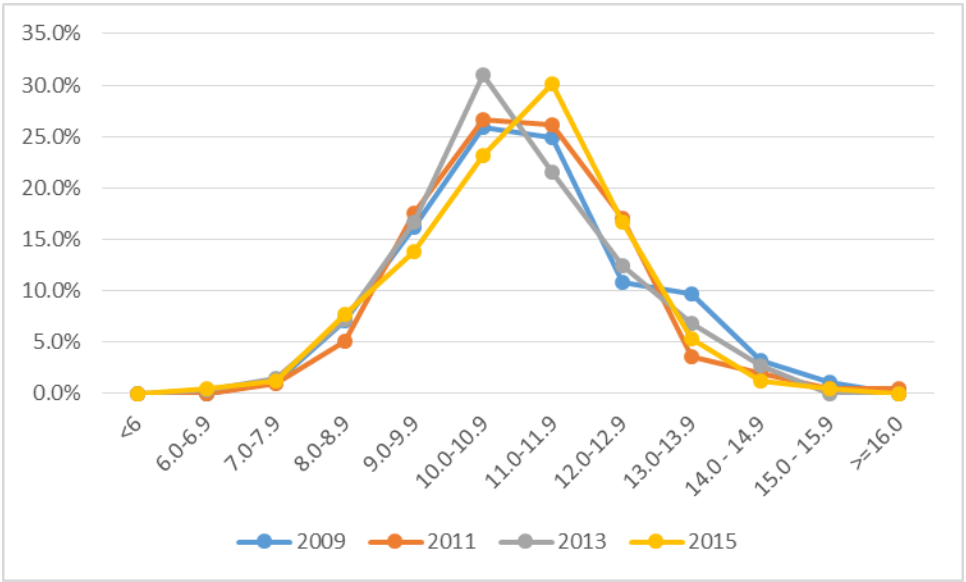
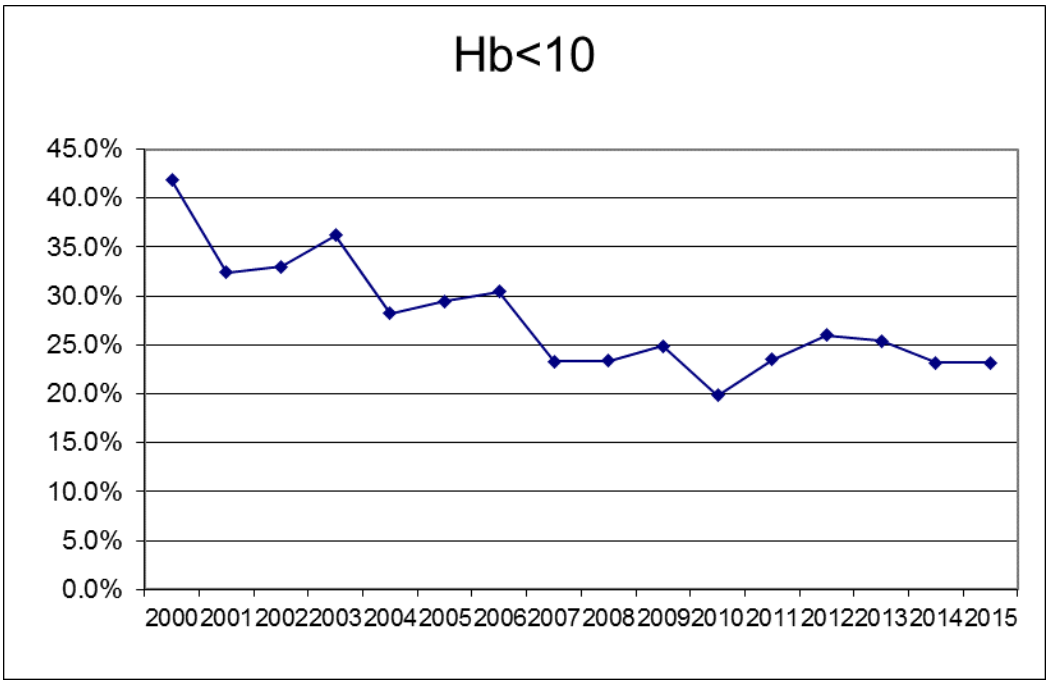


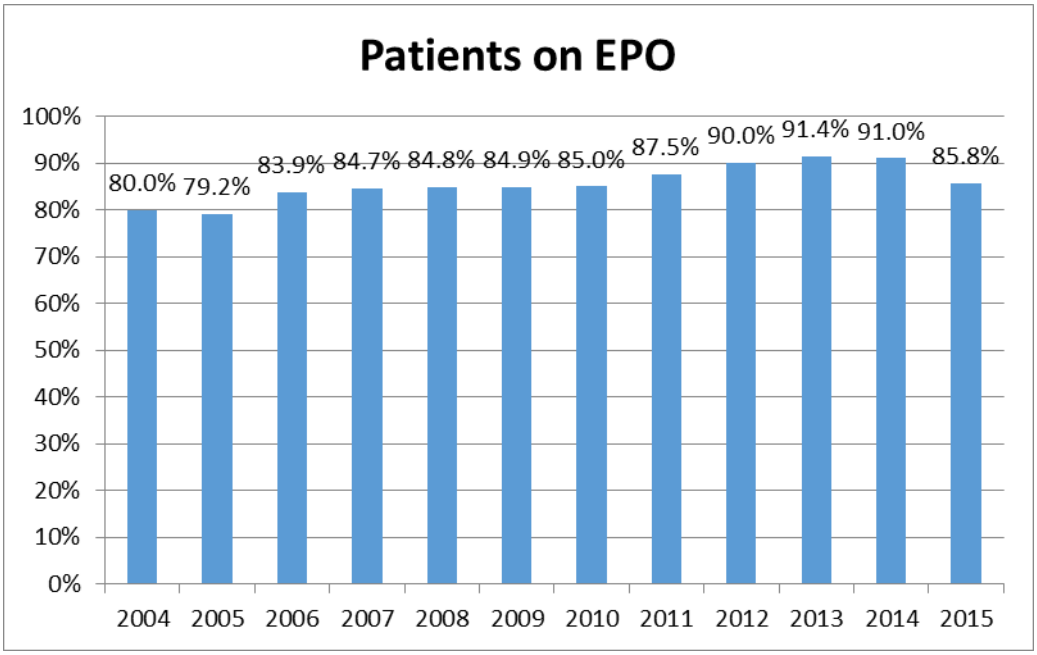
Fig 7G-3: Hb <10



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 increased 23.2%. The proportion of patients on ESA is around 85.8%.

Fig 7G-4: Proportion of Patients on ESA



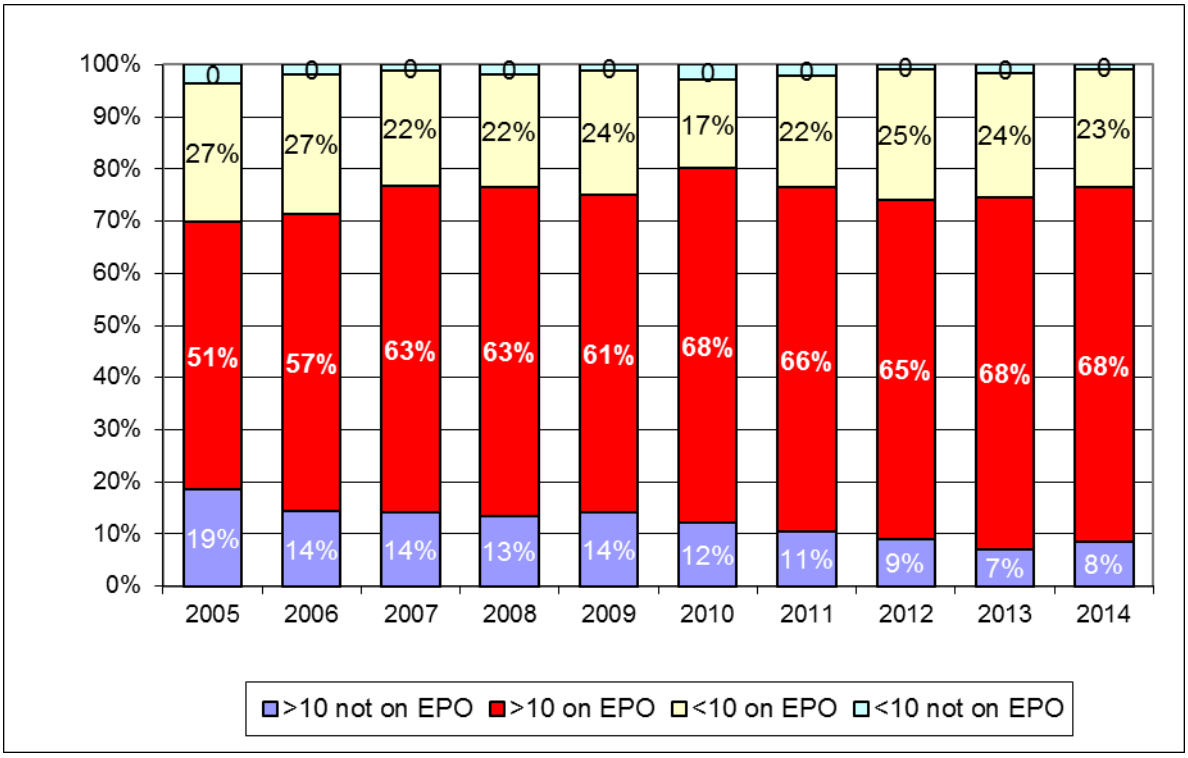
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy.

Patients who were on EPO used on the average 97.7 ± 209.7 units/kg/wk (median 90.9) in 2015

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.

Thirty-five (35) patients (14.2%) were not on EPO. They had a mean Hb of 12.1 g/dl (range 9.5 – 15.3). Only 3 patients (1.2%) 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

	2010	2011	2012	2013	2014	2015
Mean (%)	34.2	34.6	32.8	33.4	34.8	36.3
SD	15	15	15	15.3	16	16.5
% pats w TFSat <20%	11.1%	10.4%	13.6%	15.3%	12%	11.4%
Average HB when TFSat<20% (g/dl)	10.4	10.8	11.2	10.5	10.4	10.3
% pats w TFSat <30%					43.4	40.7
Average HB when TFSat<30% (g/dl)					10.8	10.7
% pats w TFSat >20%	87.9	88.6	83.8	84.0	88.0	88.6
% pats w TFSat >= 30%					56.6	59.3
Average HB when TFSat>20% (g/dl)	11	11	11	11	11.1	11

As at the end of 2015, mean transferrin saturation was 36.3 $\pm$ 16.5 % (range 8.0 –105.0). The proportion of patients with transferrin saturation of less than 20% was 11.4%, lower than the previous year. 50% (14/28) 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 11.0 g/dl compared with 9.2 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

	2010	2011	2012	2013	2014	2015
Mean	525	543	597	626	725	859
SD	392	356	454	467	521	649
% pats w Ferritin < 200	14.5%	15.4%	16.4%	14.6%	6.6%	7.3%

Using S Ferritin of 200 mg/ml, 7.3% are iron deficient

H. NUTRITION

Substantial improvement 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. Remained the same 39.5±3.1 (2015). The number of patients with Serum albumin less than 40 g/dl was 45.5%. Much improvement as compared to last year (49.8%).

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

	2009	2010	2011	2012	2013	2014	2015
NPCR (g/kgBW)							
• Mean ± SD	1.09 ± 0.26	1.06 ± 0.26	1.05 ± 0.24	1.01 ± 0.24	1.07 ± 0.24	1.07 ± 0.25	1.1 ± 0.2
• % < 1.2	71	73.9	78.4	79.6	72	71.8	70.7
S Albumin (g/l)							
• Mean ± SD	33.9 ± 3.4	34.5 ± 3.4	35 ± 3.2	34.1 ± 3.5	38.8 ± 3.6	39.9 ± 3.8	39.5 ± 3.1
• % <40	90.3	88.4	93.5	95.7	54.1	49.8	45.5
• % <35	51.1	48.8	49.3	49.8	15.7	8.5	9.8

Supplemental feeds were provided upon the advice of the centre's dieticians to patients at a highly subsidized price from September 2011. A total 31 patients are on Beneprotein.

I. MINERAL METAB

Table 7I-1 : Serum Calcium levels

	2008	2009	2010	2011	2012	2013	2014	2015
Mean S Calcium (mmol/L)	2.46	2.46	2.3	2.37	2.39	2.26	2.29	2.32
SD	0.20	0.21	0.23	0.18	0.20	0.22	0.18	0.2
Min	2.01	1.73	1.68	1.86	1.71	1.79	1.85	1.76
Max	3.06	3.2	3.79	2.92	3.3	3.93	2.93	3.34

* S Calcium corrected for S Albumin reported from 2007

The mean corrected serum calcium value was 2.32 ± 0.2 mmol/l. Low calcium dialysate is currently in use for 35.0% of the patients (86/246).

Table 7I-2 : Serum Phosphate levels

	2008	2009	2010	2011	2012	2013	2014	2015
Mean S PO4 (mmol/L)	1.55	1.65	1.54	1.5	1.57	1.52	1.49	1.5
SD	0.38	0.47	0.47	0.42	0.44	0.43	0.41	0.4
% with S PO4>2.0 mmol/l	11	11.8	18.4	11	14.0	11.6	7.7	11.0
% with S PO4 >1.78 mmol/l (KDOQI)			30.0	24.0	28.0	23.5	25.1	22.8
Min	0.62	0.7	0.42	0.57	0.56	0.37	0.45	0.54
Max	2.55	3.25	3.12	2.57	3.3	2.92	2.85	2.98

Mean S Phosphate was 1.5 $\pm$ 0.4 mmol/l. The patients having values above 2.0 mmol/l was 11.0% as compared to 7.7% the previous year.

Table 7I-3 : PTH levels

	2011	%	2012	%	2013	%	2014	%	2015	%
<16.5	77	*38.9*	87	*38.8*	90	*34.9*	82	*32.3*	65	*26.6*
16.5-33	45	*22.1*	47	*21.0*	61	*23.6*	58	*22.8*	69	*28.3*
>33.0	76	*38.4*	90	*40.2*	107	*41.4*	114	*44.9*	110	*45.1*
Total	198	*100*	224	*100*	258	*100*	254	*100*	244	*100*

45.1% (110) 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 104 (46.3%) This is not surprising as diabetic nephropathy is the etiology of ESRD in more than half of all new cases.

K. HYPERTENSION

78.0% (192/246) have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

M. HEPATITIS SEROPOSITIVITY

5.3% are hepatitis B carriers, 6.9% are anti-HCV positive for Hepatitis C antibody. Three patients (1.2%) had received interferon treatment and HCV PCR was tested negative. One patient (0.4%) is both anti-HCV and HepBsAg positive. There was one case of Hepatitis C seroconversion in Jun 15.

Table 7M-1 : Hepatitis Rates

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
HepB only	5.2%	6.2%	6.7%	6.4%	6.5%	6.3%	4.5%	6.4%	6.0%	5.4%	5.3%
HCV only	9.8%	10.6%	9.1%	8.7%	8%	7.7%	4.9%	8.5%	7.1%	6.2%	6.9%
HCV Treated	No data	No data	2.4%	2.3%	2.2%	1.9%	1.9%	1.7%	1.7%	1.2%	1.2%
HepB & HCV	1.7%	1.2%	1.2%	1.2%	1%	1%	1%	0.9%	0.7%	0.8%	0.4%

N. TRANSPLANT WAITING LIST

Only 23 patients (9.2%) are on the waiting list. More patients (145) 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 is similar to the previous year. Patients are getting older and there are more challenges with multiple comorbidities.

While we have lesser episodes of hospitalization rates, each episode is longer. Admission days among the diabetics is twice that of the non-diabetic 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

2015

II. PERITONEAL DIALYSIS PROGRAMME

1. EXECUTIVE SUMMARY (PD)

The Peritoneal Dialysis Centre of the Kidney Dialysis Foundation is located at the Ghim Moh 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 2015.

Demographics: There were 35 patients on the PD programme as of 31 Dec 2015. Three patients from SGH joined the programme during the year.
The mean age of the prevalent patients was 51.7 ± 10.6 years; 12 (34.3%) were male, 23 (65.7%) female; Chinese - 28, Malay – 6, Indian - 1. Nineteen were on CAPD and 16 on APD. The major cause of end-stage renal failure in new patients was diabetic nephropathy (67%). In the existing patients, the major cause of end-stage renal failure was chronic glomerulonephritis (no biopsy) (31.4%). Diabetic nephropathy was the cause of end-stage renal failure in 25.7% of the existing patients. The age of entry into the programme was 52 ± 14 years.

Deaths and Withdrawals: There were 3 deaths and 3 withdrawals. The three withdrawals were a result of PD-related infections and the patients were transferred to hemodialysis.
The death rate was 7.3% based on total number of patients in the year and the mean age at death was 71.2 ± 14.1 years.

Hospitalisations: 56.1% of the patients were admitted in the year. The admission rate was 1.41 episodes per patient year or 15 days per patient year. Peritonitis accounted for 24.5% of all admissions.

Dialysis Parameters
Dialysis Adequacy: The total KT/V was 2.09± 0.46 with 79.2% of the patients meeting the minimum target of 1.7.

Anaemia: The mean haemoglobin was 10.4± 1.3 g/dl with 71.4% on erythropoietin.

Serum Albumin: There has been an improvement in serum albumin levels with a mean of 34.5 ± 5.2 g/L. 15.6% were below 30 g/L. Twelve patients received a subsidy for protein supplements.

Mineral Metabolism: The mean corrected serum calcium was 2.4± 0.15 mmol/L, serum phosphate 1.7± 0.46 mmol/L and iPTH 78.1±78.6 pmol/L. Most (68.6%) patients were on calcium supplements and 37.1% were on Lanthanum carbonate and 8.6% on Sevelamer.

Lipid profiles: The mean LDL cholesterol was 2.63 ± 1.02 mmol/L and triglyceride 1.95 ± 2.14 mmol/L. The mean HDL cholesterol level was 1.12 ± 0.41 mmol/L.

Transplant Waiting List: 8.6% of the patients were on the National Transplant waiting list while the majority was medically not eligible for transplantation or pending assessment.

2. STAFFING

MEDICAL

The Medical Director (Peritoneal Dialysis) conducts the PD Clinic 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 Nurse Clinician Fan Fung Yin, Florence with assistance from Patient Services Senior Nurse Clinician Ms Lay Kwee Chin, and Clinical Nurse Ms Sunitha. Baxter Healthcare and Fresenius Medical Care provide home visits for their respective patients.

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 by case basis. Welfare Officer, Mr Jeffrey Loy reviews and recommends the fee revision on an annual basis.

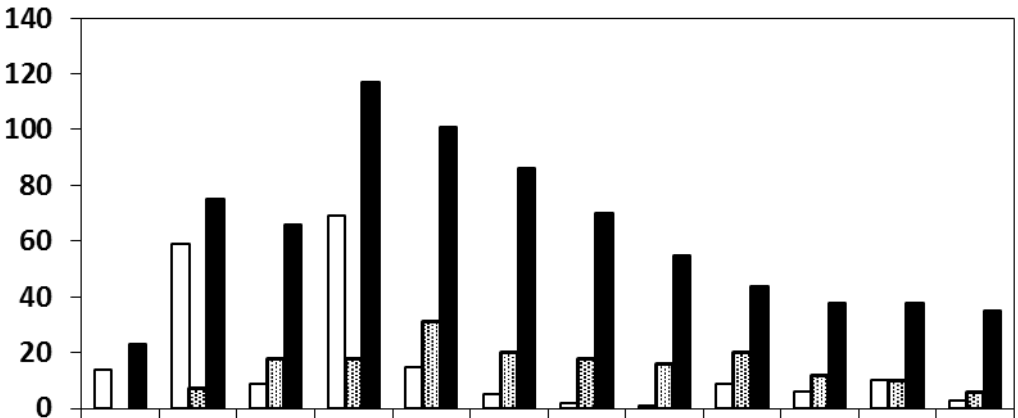
3. PATIENT POPULATION

A. Stock and Flow

There were 35 patients on the PD programme as of 31 December 2015. A total of three patients from SGH were accepted into the PD programme during the period of 1 Jan – 31 Dec 2015.

During the same period of 1 Jan – 31 Dec 2015, 6 patients exited the programme; there were 3 transfers to haemodialysis and 3 deaths.

Fig 1: Patient Stock and Flow



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Entry	14	59	9	69	15	5	2	1	9	6	10	3
Exit	0	7	18	18	31	20	18	16	20	12	10	6
Total	23	75	66	117	101	86	70	55	44	38	38	35

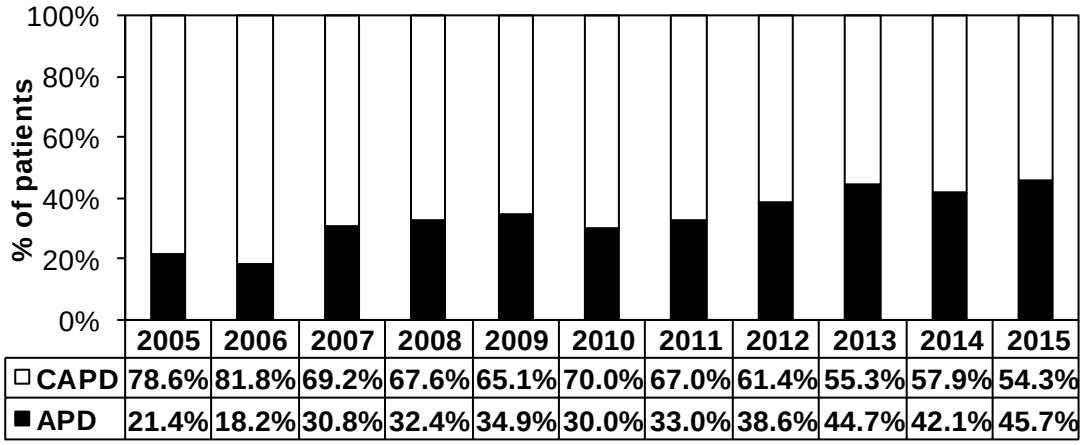
Table 1: Source of Referral

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SGH	7	12	22	2	68	15	5	1	0	7	1	9	3
NUH	2	2	35	6	0	0	0	1	0	1	5	1	0
Private/ TTSH	0	0	2	1	1	0	0	0	0	1	0	0	0
AH	0	0	0	0	0	0	0	0	1	0	0	0	0
Total Entries	9	14	59	9	69	15	5	2	1	9	6	10	3

B. Demographics &Patient characteristics

The mean age of the existing 35 patients was 51.7± 10.6 years, with a continued preponderance of females [Male: 12 (34.3%), Female: 23 (65.7%)]. The ethnic distribution was similar to the general population. The mean age at entry of the three new patients was 52 ± 14 years; 1 male, 2 female. Nineteen patients were on CAPD and 16 on APD. The proportion of patients on APD was 45.7% which is slightly higher than the previous year of 42.1% of the PD population. Diabetic nephropathy was the commonest cause of end-stage renal disease in the new patients and accounted for 25.7% of patients in the prevalent patients.

Figure 2: Modality of PD



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
□ CAPD	78.6%	81.8%	69.2%	67.6%	65.1%	70.0%	67.0%	61.4%	55.3%	57.9%	54.3%
■ APD	21.4%	18.2%	30.8%	32.4%	34.9%	30.0%	33.0%	38.6%	44.7%	42.1%	45.7%

Table 2: Gender of new patients

	2009		2010		2011		2012		2013		2014		2015	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Male	3	60.0	1	50.0	0	0	3	33.3	1	16.7	7	70	1	33
Female	2	40.0	1	50.0	1	100	6	66.7	5	83.3	3	30	2	67
Total	5	100	2	100	1	100	9	100	6	100	10	100	3	100

Table 3: Gender of prevalent patients

	2009		2010		2011		2012		2013		2014		2015	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Male	41	47.7	28	40.0	21	38.2	16	36.4	13	34.2	14	36.8	12	34.3
Female	45	52.3	42	60.0	35	61.8	28	63.6	25	65.8	24	63.2	23	65.7
Total	86	100	70	100	55	100	44	100	38	100	38	100	35	100

Table 4: Ethnic distribution of new patients

	2009		2010		2011		2012		2013		2014		2015	
	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	4	80.0	1	50	1	100	6	66.7	3	50	8	80	3	100
Malay	1	20.0	1	50	0	0	2	22.2	3	50	1	10	0	0
Indian	0	0	0	0	0	0	1	11.1	0	0	1	10	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	100	2	100	1	100	9	100	6	100	10	100	3	100

Table 5: Ethnic distribution of prevalent patients

	2009		2010		2011		2012		2013		2014		2015	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chinese	64	74.4	52	74.3	41	74.5	37	84.1	31	81.6	32	84.2	28	80
Malay	16	18.6	15	21.4	13	23.6	6	13.6	7	18.4	5	13.2	6	17.1
Indian	6	7.0	3	4.3	1	1.8	1	2.3	0	0	1	2.6	1	2.9
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	86	100	70	100	55	100	44	100	38	100	38	100	35	100

Table 6: Mean age at entry into programme

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Mean age (years)	59	56	57	44	62.4	65	54	53	60	52
SD	13.9	11.6	11.7	11.9	8.1	-	14.7	19.5	10	14

Table 7: Mean age of existing patients

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Mean age (years)	54	55	54	54	56	54	52	56.3	57.7	51.7
SD	11.3	11	10.7	10	10.9	10.7	11.3	13.3	11.2	10.6

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

	2009		2010		2011		2012		2013		2014		2015	
Etiology	n	**%**	n	%	n	%	n	%	n	%	n	%	**n**	**%**
Chronic GN (no biopsy)	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	3	60.0	2	100	1	100	4	44.5	2	33.3	6	60	2	67
PCKD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renal calculi	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Renovascular disease	-	-	-	-	-	-	-	-	-	-	2	20	-	-
TB Kidney	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	1	20.0	-	-	-	-	-	-	-	-	1	10	1	33
Unknown	-	-	-	-	-	-	1	11.1	2	33.3	-	-	-	-
Total	**5**	**100**	**2**	**100**	**1**	**100**	**9**	**100**	**6**	**100**	**10**	**100**	**3**	**100**

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

	2009		2010		2011		2012		2013		2014		2015	
Etiology	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Chronic GN (no biopsy)	28	32.6	24	34.3	19	34.5	18	40.9	14	36.8	11	28.9	11	31.4
IgA nephropathy	6	7	5	7.1	4	7.3	3	6.8	4	10.5	4	10.6	4	11.4
SLE	2	2.3	2	3.0	2	3.6	2	4.5	1	2.6	1	2.6	-	-
Focal sclerosing GN	2	2.3	1	1.4	1	1.8	1	2.3	1	2.6	-	-	-	-
Drug induced GN	1	1.2	-	-	-	-	-	-	-		-	-	-	-
Diabetic nephropathy	30	34.9	24	34.3	17	30.9	11	25	8	21.1	11	28.9	9	25.7
PCKD	4	4.7	4	5.7	4	7.3	2	4.5	2	5.3	2	5.3	1	2.9
Renal calculi	1	1.2	1	1.4	1	1.8	1	2.3	1	2.6	1	2.6	1	2.9
Renovascular disease	-	-	-	-	-	-	-	-	-		1	2.6	-	-
TB Kidney	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	5	5.8	4	5.7	3	5.5	2	4.5	2	5.3	2	5.3	3	8.6
Unknown	7	8.1	5	7.1	4	7.3	4	9.2	5	13.2	5	13.2	6	17.1
Total	**86**	**100**	**70**	**100**	**55**	**100**	**44**	**100**	**38**	**100**	**38**	**100**	**35**	**100**

C. DEATHS / TRANSFERS

There were 3 deaths and 3 withdrawals in 2015. The causes of death are shown in Table 10. Two died from pneumonia and one from pulmonary oedema.

The reasons for withdrawal from PD are shown in Table 11. Three patients were transferred to hemodialysis, two due to peritonitis and one due to tunnel tract infection.

The death rate was 7.3% based on total number of patients in the year. The mean age at death in 2015 was 71.2 ± 14.1 years.

Table 10: Cause of Death

	2009		2010		2011		2012		2013		2014		2015	
Cause of Death	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Acute Myocardial Infarction	1	7.2	1	9.1	1	11.1	1	8.3	1	14.3	-	-	-	-
Other Cardiac	5	35.7	2	18.2	-	-	2	16.7	-	-	-	-	1	33
Cerebrovascular Accident	-	-			-	-	-	-	-	-	-	-	-	-
Infections	3	21.4	3	27.2	4	44.4	3	25.0	4	57.1	1	25	2	67
Liver Failure	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malignancy	-	-	1	9.1	-	-	-	-	-	-	-	-	-	-
Accidental	-	-	-	-	-	-	1	8.3	-	-	-	-	-	-
Bleeding from Gastro-intestinal Tract	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Died at Home	3	21.4	2	18.2	1	11.1	2	16.7	1	14.3	1	25	-	-
Others	2	14.3	2	18.2	3	33.4	3	25.0	1	14.3	2	50	-	-
Total	**14**	**100**	**11**	**100**	**9**	**100**	**12**	**100**	**7**	**100**	**4**	**100**	**3**	**100**
Death Rate	**13.2%**		**12.5%**		**12.7%**		**18.8%**		**14%**		**8.3%**		**7.3%**	

Table 11: Reason of Withdrawal

	2009		2010		2011		2012		2013		2014		2015	
Reason of Withdrawal	n	%	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
PD related Infection	3	50	5	71.4	4	57.1	5	62.5	3	60	1	16.7	2	67
Technical Reason	-	-	2	28.6	1	14.3	-	-	-	-	2	33.3	1	33
Elective transfer to HD	-	-	-	-	-	-	-	-	-	-	1	16.7	-	-
Transplant	3	50	-	-	2	28.6	1	12.5	2	40	2	33.3	-	-
Others	-	-	-	-	-	-	*2	25	-	-	-	-	-	-
Total	**6**	**100**	**7**	**100**	**7**	**100**	**8**	**100**	**5**	**100**	**6**	**100**	**3**	**100**

* Patients withdrew to be on palliative care.

D. HOSPITALISATIONS

There were 51 admissions in 23 patients and 56.1% of the patients in the PD programme were admitted in the year. The admission rate was 1.41 episodes per patient year or 15 days per patient year. There was no difference in the hospitalization rates between the diabetic and non-diabetic patients. Peritonitis accounted for 24.5% of the total admissions.

When compared to the previous year (2014), the rates of hospitalization appear lower.

Table 12: Hospitalisations

HOSPITALISATION	ALL		DM		NON-DM	
	2014	**2015**	2014	**2015**	2014	**2015**
Number of patients ever in prog	48	**41**	18	**16**	30	**25**
Total patient years	43.2	**36.09**	16.5	**12.47**	26.72	**23.62**
Number of patients ever admitted	36	**23**	14	**9**	22	**14**
Admission episodes	69	**51**	28	**22**	41	**29**
Admission days	969	**578**	382	**194**	587	**384**
Days hospitalized						
PD related – technical	8	**15**	8	**0**	0	**15**
- infection	403	**106**	152	**46**	251	**60**
Other Infections	19	**19**	12	**19**	7	**0**
Others	539	**438**	210	**129**	329	**309**
% patients ever admitted	75	**56.1**	77.8	**22.0**	73.3	**34.1**
Episodes per patient year	1.59	**1.41**	1.69	**1.76**	1.53	**1.23**
Days per patient year	22.4	**16.0**	23.1	**15.6**	22.0	**16.3**
Days per patient year						
PD related – technical	0.19	**0.42**	0.48	**0**	0.0	**0.64**
- infection	9.32	**2.94**	9.2	**3.69**	9.39	**2.54**
Other Infections	0.43	**0.53**	0.73	**1.52**	0.26	**0**
Others	12.47	**12.13**	12.71	**10.34**	12.31	**13.08**
% of admissions						
PD related - technical	1.4	**2**	3.6	**0**	0.0	**2.0**
- infections	20.3	**24.5**	17.9	**12.2**	22.0	**12.2**
Other Infections	2.9	**6.1**	3.6	**6.1**	2.4	**0**
Others	75.3	**67.3**	75.0	**44.9**	75.6	**26.5**

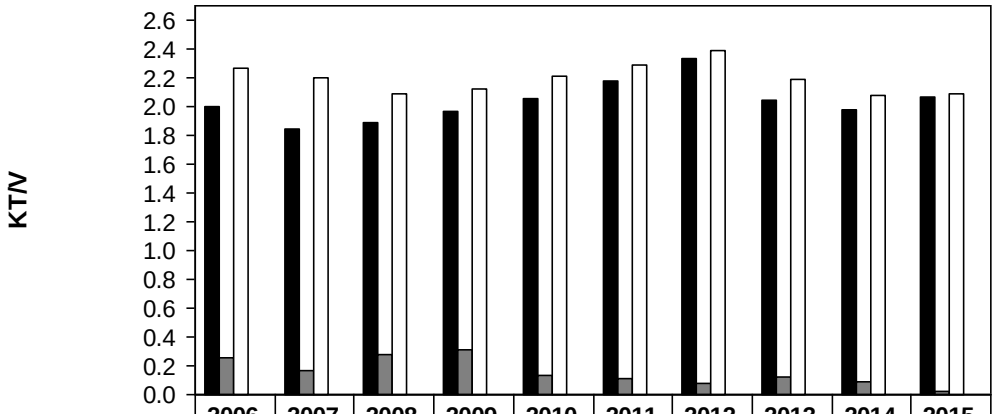
Hospitalisations during the period Jan-Dec 2015 were expressed as days hospitalized per patient year of dialysis programme.

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 2.09± 0.46. It is encouraging to note that the dialysate KT/V (2.07± 0.45) 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. Five patients did not achieve the minimum target of 1.7.

Fig 3: KT/V



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
■ Dialysate	2.00	1.84	1.89	1.97	2.06	2.18	2.33	2.05	1.98	2.07
SD	0.4	0.34	0.39	0.5	0.35	0.37	0.37	0.35	0.29	0.45
■ Residual	0.26	0.17	0.28	0.31	0.13	0.11	0.08	0.12	0.09	0.02
SD	0.3	0.25	0.32	0.43	0.34	0.25	0.2	0.39	0.18	0.06
□ Total KT/V	2.27	2.2	2.09	2.12	2.21	2.29	2.39	2.19	2.08	2.09
SD	0.5	0.43	0.41	0.49	0.44	0.33	0.38	0.42	0.25	0.46
% achieving KT/V 1.7	90.0%	82.5%	74.6%	81.9%	92.2%	100.0%	100.0%	92.1%	96.4%	79.2%

Table 13: KT/V

	2009	2010	2011	2012	2013	2014	2015
N	83 (3 not done)	64 (6 not done)	50 (5 not done)	39 (7 not done)	38	28 (10 not done)	24 (11 not done)
Total KT/V	2.12 ± 0.49	2.21 ± 0.44	2.29 ± 0.33	2.39 ± 0.38	2.19 ± 0.42	2.08 ± 0.25	2.09 ± 0.46
Dialysate KT/V	1.97 ± 0.5	2.06 ± 0.35	2.18 ± 0.37	2.33 ± 0.37	2.05 ± 0.35	1.98 ± 0.29	2.07 ± 0.45
Residual KT/V	0.31 ± 0.43	0.13 ± 0.34	0.11 ± 0.25	0.08 ± 0.2	0.12 ± 0.39	0.09 ± 0.18	0.02 ± 0.06
% patients with KT/V ≥ 1.7	81.9 (15/83 <1.7)	92.2 (5/64 <1.7)	100.0	100.0	92.1 (3/38<1.7)	96.4 (1/28<1.7)	79.2 (5/24<1.7)

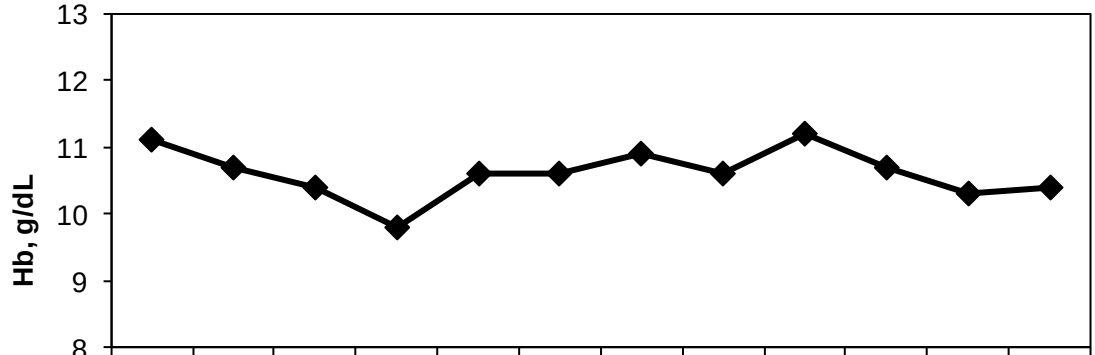
Peritonitis

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 1 for tunnel tract infection during the period of 1 Jan to 31 Dec 2015. Three patients transferred to hemodialysis because of peritonitis.

Anaemia

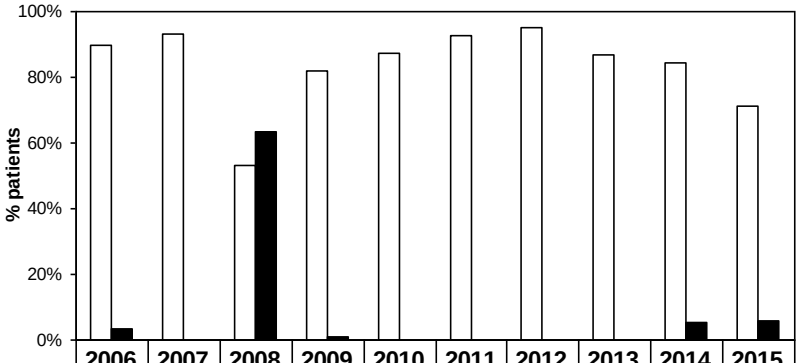
The mean haemoglobin was 10.4 ± 1.3 g/dl with 71.4% (25/35) of the patients receiving erythropoietin (EPO). The mean dose of EPO was 91.3±51.08 U/kg BW/week (range 13.5 – 195.6 U/kg BW/week). The mean haemoglobin has remained stable except for the slight dip to 9.8 g/dl in 2007.

Fig 4: Mean Haemoglobin Level



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	11.1	10.7	10.4	9.8	10.6	10.6	10.9	10.6	11.2	10.7	10.3	10.4
SD	1.8	1.8	1.6	2.0	1.9	1.9	1.8	1.9	1.9	1.8	1.9	1.3

Fig 5: Percentage of patients on EPO



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
□ Total % on EPO	90.0%	93.0%	53.0%	82.0%	87.1%	92.7%	95.3%	86.8%	84.2%	71.4%
■ < 10, not on EPO	3.3%	0.0%	63.6%	1.0%	0.0%	0.0%	0.0%	0.0%	5.3%	5.7%

Table 14: Haemoglobin and Use of EPO

Hb (g/dl)	2009		2010		2011		2012		2013		2014		2015	
N	86		68		54		43		38		38		35	
Mean ± SD	10.6 ± 1.9		10.9 ± 1.8		10.6 ± 1.9		11.2 ± 1.9		10.7 ± 1.84		10.3 ± 1.88		10.4 ± 1.29	
< 10 not on EPO	1	1.0%	0	0%	0	0%	0	0%	0	0%	2	5.3%	2	5.7%
< 10 on EPO	32	37.0%	20	29.4%	20	37.0%	10	23.3%	10	26.3%	16	42.1%	9	25.7%
> 10 not on EPO	14	16.0%	6	8.8%	4	7.4%	2	4.7%	5	13.2%	4	10.5%	5	14.3%
> 10 on EPO	39	45.0%	42	61.8%	30	55.6%	31	72.1%	23	60.5%	16	42.1%	16	45.7%

Serum Albumin

Although the mean serum albumin (34.5 ± 5.2g/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 12 patients on Beneprotein as at end December 2015.

Table 15: Serum albumin

Albumin (g/L)	2009	2010	2011	2012	2013	2014	2015
N	84	70	54	43	37	37	32*
Mean ± SD	30.4 ± 4.4	30.9 ± 4.2	31.3 ± 3.8	31.7 ± 3.5	35.9 ±3.3	34.9 ±4.0	34.5±5.2
% < 37 g/L	93.0	88.6	96.3	90.7	54.1	57.9	68.8
% < 30 g/L	43.0	42.9	29.6	25.6	2.7	13.2	15.6

* No results in 3 patients

Mineral Metabolism

The mean corrected serum calcium was 2.4± 0.15 mmol/L and the mean serum phosphate was 1.7 ± 0.46 mmol/L (34.2% of patients had a serum phosphate > 1.78 mmol/L). Most of the patients (68.6%) were on calcium supplements (calcium acetate 51.4%, calcium carbonate 17.1%). Thirteen patients (37.1%) were also on Lanthanum carbonate (non-calcium phosphate binder) and 3 patients (8.6%) on Sevelamar. As Lanthanum is costly, the patients received a subsidy for the medication.

The mean iPTH level was 78.1±78.6 pmol/L with only 6.5% 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

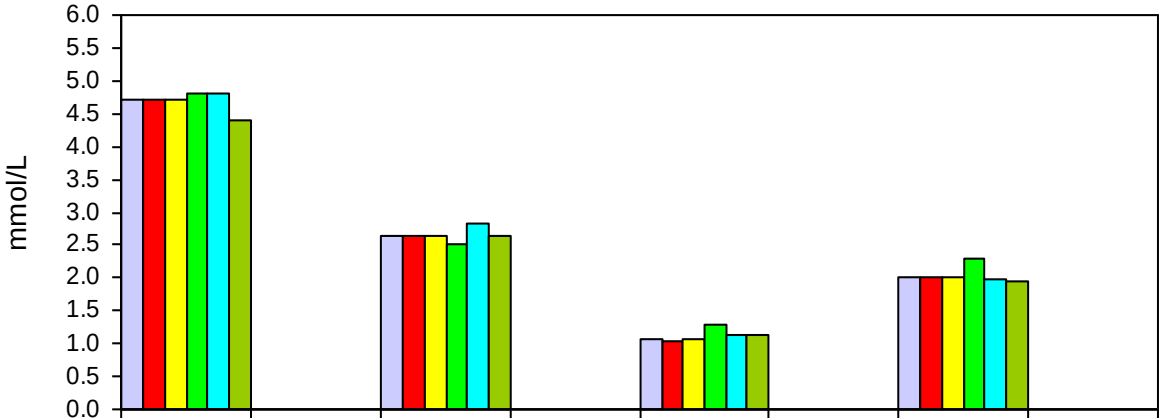
	2010		**2011**		**2012**		**2013**		**2014**		**2015**	
	N	%	N	%	N	%	N	%	N	%	**n**	**%**
<16.5	10	15.9	12	23.1	10	24.4	9	23.7	7	21.2	8	25.8
16.5-33.0	16	25.4	13	25.0	10	24.4	7	18.4	9	27.3	2	6.5
>33.0	37	58.7	27	51.9	21	51.2	22	57.9	17	51.5	21	67.7
Total	63*	100.0	52	100.0	41	100	38	100	33	100	31	100

*Date not available for 7 patients (2010)

Hyperlipidaemia

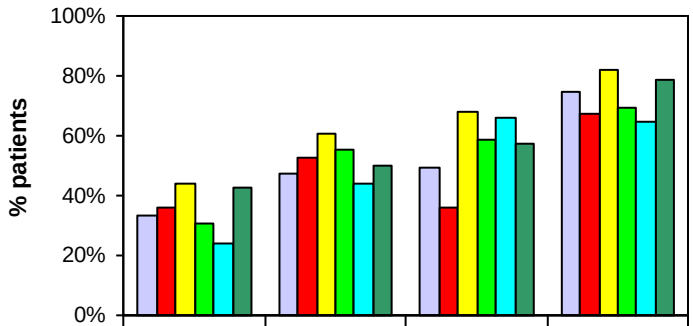
The lipid profile of the patients remained largely unchanged when compared to the previous years. The mean LDL cholesterol level was 2.63±1.02 mmol/L with 42.9% of the patients achieving the recommended MOH guidelines for LDL cholesterol of < 2.6 mmol/L. The mean HDL cholesterol level was 1.12± 0.41 mmol/L and the mean triglyceride level was 1.95±2.14 mmol/L. It remains encouraging to note that more than half of the patients (57.1%) 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
2015	4.4	1.2	2.63	1.02	1.12	0.41	1.95	2.14

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%
2015	42.9%	50.0%	57.1%	78.6%

F. TRANSPLANT WAITING LIST

Three (8.6%) patients were registered on the transplant register. Thirty patients (85.7%) were not eligible for transplant for reasons including exceeding the age limit of 60 years* (12/35 patients, 34.3%) and two patients opted out, of whom one was due to seropositivity for Hepatitis C.

*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

	2009		**2010**		**2011**		**2012**		**2013**		**2014**		**2015**	
N	86		70		55		44		38		38		35	
	n	%	n	%	n	%	n	%	n	%	n	%	**n**	**%**
Registered	17	19.8	17	24.3	12	21.8	13	29.5	7	18.4	7	18.4	3	8.6
Not eligible	48	55.8	35	50	42	76.4	28	63.6	22	57.9	22	57.9	30	85.7
Opted out	2	2.3	2	2.9	1	1.8	2	4.5	2	5.3	2	5.3	2	5.7
Pending	19	22.1	16	22.9	0	0	1	2.3	7	18.4	7	18.4	0	0

G. INTERIM HEMODIALYSIS

One patient required interim hemodialysis (due to peritonitis) in the KDF HD Programme and the one case was subsequently converted to permanent dialysis (due to membrane failure) and transferred to a private dialysis centre.

4. 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.

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