

**KIDNEY DIALYSIS FOUNDATION**

ANNUAL REPORT

PERITONEAL DIALYSIS PROGRAMME

2007

**Prepared by**

Dr Grace  
Medical Director

*With input from:*

Theresa Soh  
Coordinator, Patient Services

Lay Kwee Chin  
Patient Services, Senior Executive

Sheron Tan  
Charge Nurse

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## EXECUTIVE SUMMARY

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 is contracted out to a dialysis provider and the current provider is Baxter Healthcare Pte Ltd.

This report covers medical data collated at the end of 2007.

**Patient demographics:** There were 117 patients on the PD programme as of 31 Dec 2007. Sixty-nine patients joined the programme during the year; one patient from Tan Tock Seng Hospital re-entered the programme and 68 patients from the Singapore General Hospital were transferred from the Singapore Children's Society (SCS) programme to KDF in Dec 2007.

The mean age of the prevalent 117 patients was  $55 \pm 11$  years; 57 (48.7%) were male, 60 (51.3%) female; Chinese-90, Malay-22, Indian-4, Others-1. Eighty-one were on CAPD and 36 on APD. The major cause of end-stage renal failure was diabetic nephropathy making up 47.8% of the new patients and 45.3% of the existing patients. The mean age of entry into the programme increased from  $46 \pm 9.3$  years in 2003 to  $56 \pm 11.6$  years in 2007.

**Hospitalisations** (excludes the 68 patients from SGH): 57.4% of the patients were admitted in the year. The admission rate was 1.06 episodes per patient year or 15.81 days per patient year. The rates in diabetics were higher than the non-diabetics (1.32 versus 0.68 episodes per patient year and 22.9 versus 5.42 days per patient year, respectively).

**Dialysis Parameters** (excludes the 68 patients from SGH)

**Dialysis Adequacy:** The total KT/V was  $2.20 \pm 0.43$  with 82.5% of the patients meeting the minimum target of 1.7.

**Peritonitis Rate:** The peritonitis rate was 1 in 43.7 patient months.

**Anaemia:** The mean haemoglobin was  $9.8 \pm 2.0$  g/dl with 93% on erythropoietin. Only five (11.6%) patients had a haemoglobin above the target level of 12 g/dl.

**Serum Albumin:** The patients tended to have a low serum albumin level with a mean of  $30.3 \pm 3.9$  g/L. More than half (58.7%) of the patients could not meet the lower limit of normal which is 37 g/L.

**Lipid profiles:** The mean LDL cholesterol was  $2.8 \pm 0.9$  mmol/L and triglyceride of  $2.7 \pm 2.32$  mmol/L. The mean HDL cholesterol level was  $1.1 \pm 0.4$  mmol/L. 72.5% of the patients were on lipid-lowering agents.

**Transplant Waiting List:** 23.9% of the patients were on the National Transplant waiting list while another 44.4% were not medically eligible for transplantation.

## **PERITONEAL DIALYSIS PROGRAMME**

### **STAFFING**

#### **Medical**

The Medical Director (Peritoneal Dialysis) continues to review patients once in 6 months following their routine blood investigations. The patients also go for follow-up with their referring 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 supervised by the Patient Services Manager Ms Theresa Soh, and assisted by Ms Lay Kwee Chin, Senior Executive, Patient Services and Ms Joyce Lim, Nurse Clinician (from September 2007). The centre is managed by a dialysis provider, Baxter Healthcare Pte Ltd and S/N Aishah was the charge nurse when the PD centre was in Kreta Ayer. S/N Aishah resigned in July 2007 and NM Sheron Tan took over as the charge nurse with staff from Baxter Healthcare as of July 2007. The centre was relocated to the Ghim Moh Dialysis Centre in July 2007.

#### **DIETETICS**

Baxter Healthcare Pte Ltd provides a dietitian, Ms Wong Yue Feng, from Food and Nutrition Specialists Pte Ltd, to counsel patients. The patients were seen once every six months at the same time as their follow-up with the Medical Director.

#### **PATIENT WELFARE**

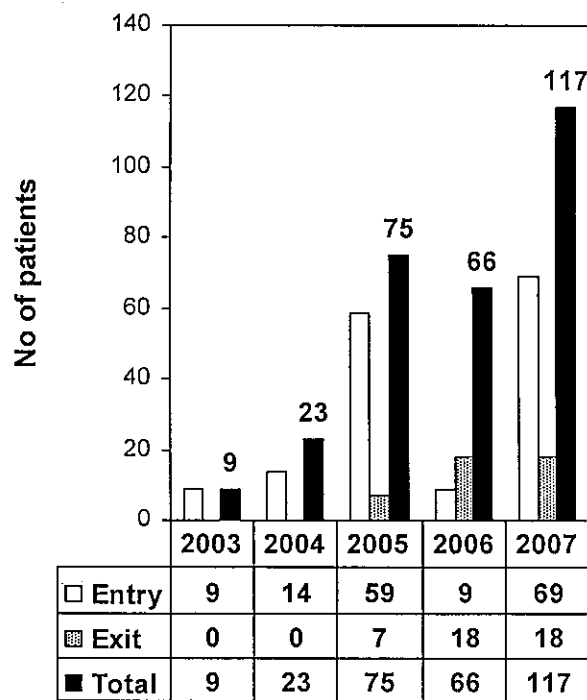
Patients continued to receive subsidies for their dialysis and erythropoietin on a case by case basis and were managed by Welfare Officer, Ms Daphne Cheong (from Feb 07 to April 07) and Ms Rena Lee (from June 07).

## PATIENT POPULATION

There were 117 patients on the PD programme as of 31 December 2007. Sixty-nine new cases were accepted into the PD programme during the period of 1 Jan – 31 Dec 2007; 68 from the Singapore General Hospital (SGH) and one re-entered the PD programme from Tan Tock Seng Hospital (TTSH). The 68 patients from SGH were transferred from the Singapore Children's Society (SCS) Programme and entered the KDF programme in Dec 2007.

During the same period of 1 Jan – 31 Dec 2007, 18 patients exited the programme; there were 5 transfers to hemodialysis and 13 deaths.

**Fig 1: Patient Stock and Flow**



**Table 1: Source of Referral**

	2003	2004	2005	2006	2007
SGH	7	12	22	2	68
NUH	2	2	35	6	0
Private / TTSH	0	0	2	1	1
<b>Total Entries</b>	9	14	59	9	69

### Patient characteristics

The mean age of the prevalent 117 patients was  $55 \pm 11$  years, with an almost equal male:female ratio [Male: 57 (48.7%), Female: 60 (51.3%)]. This is in contrast to the previous years where there was a female predominance. The ethnic distribution was similar to the general population. Eighty-one patients were on CAPD and 36 on APD. The major cause of end-stage renal failure in the PD programme was diabetic nephropathy making up 47.8% of the new patients and 45.3% of the existing patients. The mean age of entry into the programme increased from  $46 \pm 9.3$  years in 2003 to  $56 \pm 11.6$  years in 2007. However, the age at entry for 2007 was lower than that of the previous two years.

**Table 2: Gender of new patients**

	2003		2004		2005		2006		2007	
	N	%	n	%	n	%	n	%	n	%
Male	1	11.1	3	21.4	31	52.5	6	66.7	40	58
Female	8	88.9	11	78.6	28	47.5	3	33.3	29	42
Total	9	100.0	14	100.0	59	100.0	9	100.0	69	100.0

**Table 3: Gender of prevalent patients**

	2003		2004		2005		2006		2007	
	N	%	n	%	n	%	n	%	n	%
Male	1	90.1	4	17.4	27	36.0	27	40.9	57	48.7
Female	8	88.9	19	82.6	48	64.0	39	59.1	60	51.3
Total	9	100.0	23	100.0	75	100.0	66	100.0	117	100.0

**Table 4: Ethnic distribution of new patients**

	2003		2004		2005		2006		2007	
	N	%	n	%	n	%	n	%	n	%
Chinese	5	56.0	8	57.0	41	69.5	7	77.8	59	85.5
Malay	2	22.0	6	43.0	17	28.8	1	11.1	7	10.1
Indian	2	22.0	0	0	1	1.7	1	11.1	2	2.9
Others	0	0	0	0	0	0	0	0	1	1.4
Total	9	100.0	14	100.0	59	100.0	9	100.0	69	100.0

**Table 5: Ethnic distribution of prevalent patients**

	2003		2004		2005		2006		2007	
	N	%	n	%	n	%	n	%	n	%
Chinese	5	56.0	13	56.5	47	62.7	44	66.7	90	76.9
Malay	2	22.0	8	34.8	24	32.0	18	27.2	22	18.8
Indian	2	22.0	2	8.7	4	5.3	4	6.1	4	3.4
Others	0	0	0	0	0	0	0	0	1	0.9
<b>Total</b>	<b>9</b>	<b>100.0</b>	<b>23</b>	<b>100.0</b>	<b>75</b>	<b>100.0</b>	<b>66</b>	<b>100.0</b>	<b>117</b>	<b>100.0</b>

**Table 6: Mean age of entry into programme**

Year	2003	2004	2005	2006	2007
Mean age (years)	46	49	59	59	56
SD	9.3	7.3	10.8	13.9	11.6

**Table 7: Mean age of prevalent patients**

Year	2003	2004	2005	2006	2007
Mean age (years)	49	48	50	54	55
SD	9.0	8.1	9.5	11.3	11

**CAUSE OF END-STAGE RENAL DISEASE****Table 8: Etiology of end-stage renal disease in new patients**

Etiology	2003		2004		2005		2006		2007	
	N	%	n	%	N	%	N	%	n	%
Chronic glomerulonephritis (no biopsy)	2	22.0	2	14.3	10	17.0	1	11.0	19	27.5
IgA nephropathy	2	22.0	2	14.3	1	1.7	-	-	4	5.8
SLE	-	-	-	-	-	-	-	-	2	2.9
Focal sclerosing GN	-	-	1	7.1	-	-	-	-	1	1.4
Drug induced GN	-	-	-	-	1	1.7	-	-	-	-
Membranous GN	-	-	-	-	1	1.7	-	-	-	-
Diabetic nephropathy	2	22.0	6	42.9	34	57.6	7	78.0	33	47.8
PCKD	3	34.0	-	-	1	1.7	-	-	3	4.3
Renal calculi	-	-	1	7.1	-	-	-	-	-	-
Renovascular disease	-	-	-	-	2	3.4	-	-	-	-
TB Kidney	-	-	-	-	-	-	-	-	-	-
Others									5	7.2
Unknown	-	-	2	14.3	9	15.2	1	11.0	2	2.9
<b>Total</b>	<b>9</b>	<b>100.0</b>	<b>14</b>	<b>100.0</b>	<b>59</b>	<b>100.0</b>	<b>9</b>	<b>100.0</b>	<b>69</b>	<b>100</b>

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

Etiology	2003		2004		2005		2006		2007	
	N	%	n	%	n	%	n	%	n	%
Chronic glomerulonephritis (no biopsy)	2	22.0	4	17.4	14	18.7	14	21.2	30	25.6
IgA nephropathy	2	22.0	4	17.4	5	6.7	5	7.5	9	7.7
SLE							1	1.5	2	1.7
Focal sclerosing GN	-	-	1	4.3	1	1.3	-	-	2	1.7
Drug induced GN	-	-	-	-	1	1.3	1	1.5	1	0.9
Membranous GN	-	-	-	-	-	-	-	-	-	-
Diabetic nephropathy	2	22.0	8	34.8	37	49.4	37	56.3	53	45.3
PCKD	3	34.0	3	13.0	4	5.3	3	4.5	5	4.3
Renal calculi	-	-	1	4.3	1	1.3	1	1.5	1	0.9
Renovascular disease	-	-	-	-	2	2.7	2	3.0	-	-
TB Kidney							1	1.5	-	-
Others									5	4.3
Unknown	-	-	2	8.8	10	13.3	1	1.5	9	7.7
<b>Total</b>	<b>9</b>	<b>100.0</b>	<b>23</b>	<b>100.0</b>	<b>75</b>	<b>100.0</b>	<b>66</b>	<b>100.0</b>	<b>117</b>	<b>100.0</b>

### COMORBIDITY

There were 65 (55.6%) patients with diabetes in the prevalent population in 2007.

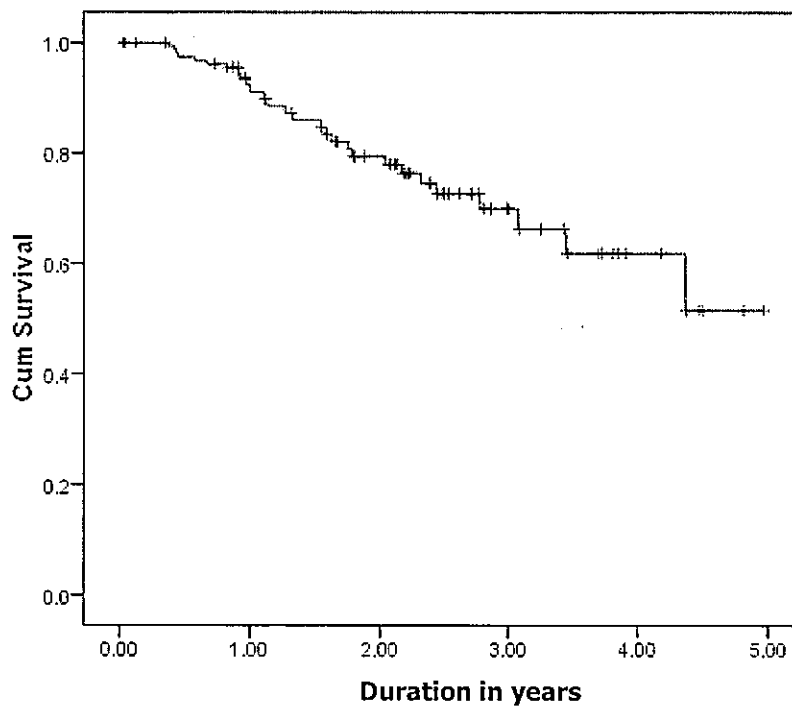


## DEATHS / TRANSFERS AND SURVIVAL ANALYSIS

There were 13 deaths and 5 transfers to hemodialysis in 2007. The causes of death are as follows: Septicemia (4), Cardiac causes (1), Bleeding GIT (1), Died at home (2) and 5 died of unknown causes. Five patients were withdrawn from the programme because of peritonitis and were transferred to hemodialysis.

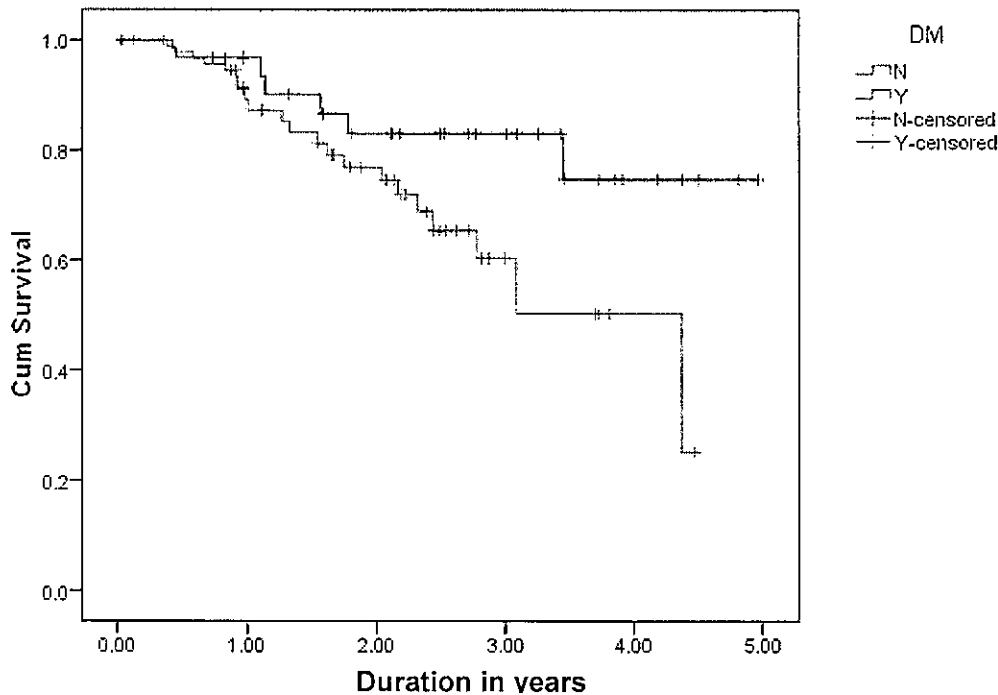
The death rate was 9.6% based on total number of patients in the year as compared to 14.3% in 2006.

**Fig 2. Kaplan-Meier Survival Curve for PD Patients (2003-2007)**



The 1 year survival was 92.3% and the 3 year survival was 69.9%.

**Fig 3. Kaplan-Meier Survival Curves for PD patients with and without Diabetes (2003-2007)**



The 1 year and 3 year survivals in non-diabetic patients was better than those who were diabetic (1 year survival: Diabetes 89.3% versus Non-Diabetes 96.9%, 3 year survival: Diabetes 60.4% versus Non-Diabetes 83.1%).

### HOSPITALISATIONS

The data for hospitalisations excludes the patients from SCS as data of past hospitalizations for this group is not available.

There were 62 admissions in 39 patients and 57.4% of the patients were admitted in the year. There were 6 patients with recurrent admissions of 3 or more admissions in the year and they accounted for 402 admission days (43.6% of total admission days). The admission rate was 1.06 episodes per patient year or 15.8 days per patient year. The diabetic patients had a higher rate of days per patient year (22.9 vs 5.42 in non-diabetic patients), more admissions for infections (peritonitis: 30% vs 16% admissions in non-diabetic patients; other infections: 18% vs 5.6%) and longer hospitalizations for infections (peritonitis: 5.89 vs 4.15 days per patient year; other infections: 3.11 vs 0.16). PD related admissions accounted for 31% of all admissions.

When compared to the previous year (2006), the rates of hospitalization and the percentage of patients admitted were not different.

**Table 10: Hospitalisations**

HOSPITALISATION	ALL		DM		NON-DM	
	2006	2007	2006	2007	2006	2007
Number of patients ever in prog	84	68	52	41	32	27
Total patient years	72.8	58.3	44.8	34.7	28	23.6
Number of patients ever admitted	49	39	31	27	18	12
Admission episodes	100	62	63	46	37	16
Admission days	1031	922	610	794	421	128
<b>Days hospitalized</b>						
PD related – technical	18	24	-	9	18	15
- infection	137	322	67	271	70	51
Other Infections	187	145	79	143	108	2
Others	689	431	464	371	225	60
<b>% patients ever admitted</b>						
% patients ever admitted	58.3	57.4	59.6	65.9	56.3	44.4
Episodes per patient year	1.20	1.06	1.24	1.32	1.16	0.68
Days per patient year	14.16	15.81	13.61	22.9	15.04	5.42
<b>Days per patient year</b>						
PD related – technical	0.25	0.41	0.0	0.25	0.64	0.64
- infection	1.88	5.52	1.49	7.81	2.50	2.16
Other Infections	2.57	2.49	1.76	4.12	3.86	0.08
Others	9.46	7.39	10.36	10.69	8.04	2.54
<b>% of admissions</b>						
PD related - technical	2.0	4.4	0.0	4.0	5.4	5.6
- infections	14.0	26.6	12.7	30.0	16.2	16.6
Other Infections	16.0	14.6	15.9	18.0	16.2	5.6
Others	68.0	54.4	71.4	48.0	62.2	72.2

Hospitalisations during the period Jan-Dec 2007 were analysed and expressed as days hospitalized per patient year of dialysis programme.

## DIALYSIS PARAMETERS

The dialysis parameters reported do NOT include the 68 patients transferred from the Singapore General Hospital in Dec 2007. This is because data was not available in a large proportion of these patients.

### 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  $2.20 \pm 0.43$ . Although the mean KT/V was above the minimum requirement, 7 patients (17.5 %) did not meet the required minimum of 1.7. The 7 patients had virtually no residual renal function compared to the group with  $KT/V > 1.7$  ( $0.07 \pm 0.08$  vs  $0.19 \pm 0.27$ ,  $p < 0.05$ ) and had a larger body surface area (BSA) ( $1.77 \pm 0.20$  vs  $1.58 \pm 0.15$ ,  $p < 0.05$ ).

**Table 11: KT/V**

	2003	2004	2005	2006	2007
N	9	23	69 (6 not done)	60 (6 not done)	40 (11 not done)
Total KT/V	$2.55 \pm 0.5$	$2.53 \pm 0.5$	$2.37 \pm 0.7$	$2.27 \pm 0.5$	$2.20 \pm 0.43$
Dialysate KT/V	$2.10 \pm 0.3$	$2.07 \pm 0.3$	$1.96 \pm 0.4$	$2.00 \pm 0.4$	$1.84 \pm 0.34$
Residual KT/V	$0.45 \pm 0.4$	$0.46 \pm 0.3$	$0.33 \pm 0.5$	$0.26 \pm 0.3$	$0.17 \pm 0.25$
% patients with $KT/V \geq 1.7$	100.0	100.0	88.4 (8 out of 69 $< 1.7$ )	90.0 (6 out of 60 $< 1.7$ )	82.5 (7 out of 40 $< 1.7$ )

### Peritonitis Rate

There were a total of 16 episodes of peritonitis during the period of 1 Jan 2007 to 31 Dec 2007 making the peritonitis rate 1 episode in 43.7 patient months. One patient had 2 episodes of peritonitis and transferred to hemodialysis after the second episode. Unfortunately two patients (2/14, 14.3%) died of septicaemia from the peritonitis; one on the first day of presentation (E Coli peritonitis) and the second on the 6<sup>th</sup> day (Kleb pneumoniae peritonitis). Five patients (33.3%) discontinued PD and were transferred to hemodialysis. A significant number of the patients with peritonitis had diabetes (11/15, compared to those without peritonitis (30/54),  $p < 0.01$ ). There was no difference in the peritonitis rate in terms of duration on dialysis or the modality of dialysis. The peritonitis rate has been increasing over the last three years and this is probably the result of a number of factors including the older age of the patients and more co-morbid conditions, including diabetes.

**Table 12: Peritonitis rate**

System	Total Patient Months	No of episodes	Infection Rate (Episodes/ Patient month)
APD (Home choice)			
2005	91.8	2	45.6
2006	133.1	3	44.4
2007	147.2	3	49.1
CAPD (Ultrabag)			
2005	626.0	9	69.6
2006	701.3	12	53.9
2007	552.1	13	42.5
All Systems			
2005	717.8	11	65.2
2006	834.4	15	52.2
2007	699.3	16	43.7

#### Anaemia

The mean haemoglobin was  $9.8 \pm 2.0$  g/dl with 93% of the patients receiving erythropoietin. The mean dose of erythropoietin was  $5426 \pm 2498$  U/week (range 2000 – 12000 U/week). Despite the wide usage of erythropoietin, only 5 (11.6%) of the patients achieved a target haemoglobin of 12 g/dl and this probably reflects inadequate dosing of erythropoietin, in addition to other problems related to iron supplementation.

**Table 13: Haemoglobin and use of Erythropoietin**

Hb (g/dl)	2003		2004		2005		2006		2007	
N	9		23		75		66		43*	
Mean $\pm$ SD	11.9 $\pm$ 2.6		11.1 $\pm$ 1.8		10.7 $\pm$ 1.8		10.4 $\pm$ 1.6		9.8 $\pm$ 2.0	
< 10 not on EPO	1	11.0%	1	4.3%	3	4%	1	1.5%	0	0
< 10 on EPO	2	22.0%	4	17.4%	22	29%	29	43.9%	22	51%
> 10 not on EPO	1	11.0%	6	26.0%	10	13%	5	7.6%	3	7%
> 10 on EPO	5	56.0%	12	52.2%	40	53%	31	47.0%	18	42%

\* 8 patients with no data

#### Serum Albumin

The patients continue to have a low serum albumin level with a mean of  $30.3 \pm 3.9$  g/L. More than half the patients (58.7%) did not achieve a normal albumin level of 37 g/L and 39.1% were below 30 g/L. This occurs as a result of protein loss in the dialysate in

patients on peritoneal dialysis. This is a perennial problem in patients on PD and is best addressed through nutritional supplementation.

**Table 14: Serum albumin**

Albumin (g/L)	2003	2004	2005	2006	2007
N	9	21	71	66	46 *
Mean $\pm$ SD	28.7 $\pm$ 4.6	30.7 $\pm$ 5.9	31.5 $\pm$ 4.7	31.0 $\pm$ 5.2	30.3 $\pm$ 3.9
% < 37 g/L	88.8	95.2	52.1	45.5	58.7
% < 30 g/L	66.7	33.3	39.4	40.9	39.1

\* No results in 5 patients

### Hyperlipidaemia

The mean LDL cholesterol level was 2.8  $\pm$  0.9 mmol/L with 60.9% of the patients achieving the recommended MOH guidelines for LDL cholesterol of < 2.6 mmol/L. The mean HDL cholesterol level (1.1  $\pm$  0.4 mmol/L) is lower than previous years and the reason for this is unclear. A large proportion of the patients (37/51, 72.5%) are on lipid-lowering agents.

**Table 15: Serum Cholesterol and Triglycerides**

	2003	2004	2005	2006	2007
Total Cholesterol (mmol/L)	5.7 $\pm$ 2.2 (n = 2)	5.7 $\pm$ 1.2 (n = 18)	5.3 $\pm$ 1.5 (n = 59)	4.9 $\pm$ 1.4 (n = 62)	5.2 $\pm$ 1.8 (n = 43)
% < 4.1 mmol/L	50.0	11.0	10.2	32.3	30.0
LDL Cholesterol (mmol/L)	3.3 $\pm$ 1.2 (n = 2)	3.1 $\pm$ 1.0 (n = 15)	2.9 $\pm$ 1.1 (n = 52)	2.3 $\pm$ 1.1 (n = 54)	2.8 $\pm$ 0.9 (n = 23)
% < 2.6 mmol/L	100.0	26.7	25.0	70.3	60.9
HDL Cholesterol (mmol/L)	1.9 $\pm$ 0.6 (n = 2)	1.5 $\pm$ 0.4 (n = 18)	1.5 $\pm$ 0.4 (n = 60)	1.6 $\pm$ 0.7 (n = 62)	1.1 $\pm$ 0.4 (n = 43)
% $\geq$ 1.0 mmol/L	100.0	94.0	88.3	93.5	55.8
Triglycerides (mmol/L)	1.3 $\pm$ 0.8 (n = 2)	2.3 $\pm$ 1.8 (n = 16)	2.5 $\pm$ 1.8 (n = 59)	2.5 $\pm$ 2.2 (n = 62)	2.7 $\pm$ 2.3 (n = 43)
% < 2.3 mmol/L	100.0	56.3	59.3	61.3	65.1

### TRANSPLANT WAITING LIST

Twenty-eight (23.9%) patients were registered on the transplant register and 35 (29.9%) were pending registration. A large number of patients (52 patients, 44.4%) were not eligible for transplant as a result of exceeding the age limit of 60 years (45 patients,

38.5%); another four had ischemic heart disease and three were seropositive for Hepatitis B or C.

**Table 16: Transplant status**

	2003		2004		2005		2006		2007	
N	9		23		75		66		117	
Registered	1	11.0%	6	26.0%	8	10.6%	13	19.7%	28	23.9%
Not eligible	1	11.0%	4	17.4%	31	41.3%	21	31.8%	52	44.4%
Opted out	0	0	4	17.4%	13	17.3%	11	16.7%	2	1.7%
Pending	7	78.0%	9	39.0%	23	30.6%	21	31.8%	35	29.9%

### **INTERIM HEMODIALYSIS**

Three patients required interim hemodialysis (due to peritonitis) and all were subsequently converted to permanent hemodialysis (one was admitted to the KDF HD Programme and two went to private centres).

## **ACTIVITIES OF THE PD CENTRE**

### **Patient Activities**

The PD patients participated in the following activities:

1. a Patient Education Seminar on “Cooking with Chef Devagi” on 29 April 2007,
2. a patient outing to a farm on 27 June 2007, and
3. a Patient Education Seminar on “Managing Fatigue – How to Conserve Energy” and a social outing to the Singapore Night Safari on 2 September 2007.

### **Provider Contract Expiry**

The provider’s existing contract revised in June 2006 was extended to 31 March 2008.

### **Patient Fee Review**

Patient fees are reviewed once every two years. The Welfare Executive, together with the Patient Services Manager and General Manager, met up with patients and their family members in November 2006. Summaries of the fee review were then submitted to the Executive Committee for their approval.

## **CONCLUSION**

The PD programme continues to remain a challenge in providing affordable, high quality dialysis and meeting dialysis targets in patients with multiple co-morbidities. The rate of hospitalisation also remains high.

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)