

KIDNEY DIALYSIS FOUNDATION

MEDICAL ANNUAL REPORT HAEMODIALYSIS PROGRAMME 2011

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1. EXECUTIVE SUMMARY

The Kidney Dialysis Foundation runs 3 dialysis centres at Bishan from 1997, Kreta Ayer Road – San Wang Wu Ti centre from Sep 2003 and Ghim Moh 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 2011, there were 29 new entrants.

Thirty-five (35) patients exited the programme (1 transplant, 20 deaths, 3 transfers to PD programme, 7 to non-PD programmes, 3 withdrew from dialysis, 1 terminated). In the prevalent population, average age was 57.7 ± 10.8 years, the number of patients with chronic glomerulonephritis as the etiology of renal failure was 43.8%, diabetic nephropathy 28.4%. Overall first year survival of patients was 95.6% and five year survival 83.8%. 5 year survival in diabetics was similar in the first year (non-DM vs DM 96.4% vs 94%), 5 years 86.3% vs 77.8% and 10 years 72.9% vs 41.8%.

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

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

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

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

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

Less patients were registered on the National Transplant waiting list (14%), likely due to more patients having comorbidities in an aging population.

2. INTRODUCTION

The Kidney Dialysis Foundation started operations in 1996 with only one centre at Alexandra Hospital. This was a centre originally managed jointly by the Renal Department at the SGH providing medical cover and nursing staff from Alexandra Hospital under the Ministry of Health (MOH). On 17 April 96 when the center was taken over from MOH, the care of 28 patients was transferred to the KDF. Bishan Dialysis Centre commenced operation on November/December 1997 with 43 patients from the former Tan Tock Seng Dialysis Centre.

Originally Renalcare Holdings Pte Ltd provided the dialysis service by contract. They also won the first tender to supply haemodialysis services in 1997 for a period of three years. In 2000, the tender was opened with an option to quote for three and 5 years. After much deliberation, the tender for Alexandra Hospital Centre was awarded to Fresenius Medicare and Bishan Centre to Asia Renal Care (the company which had absorbed Renalcare Holdings). Asia Renal Care was absorbed by Fresenius Medical Care on 1st July 2010. Thus all three centres came under one management. In 2011, the tender was opened with an option to quote for 5 years for Bishan Centre. It was awarded to DaVita Renal in June 2011.

KDF started operations in its third centre called the San Wang Wu Ti - KDF Centre on 1 Sept 03. It was built from funds donated from San Wang Wu Ti Religious Society. The idea was first mooted in 2000. Numerous site visits were made to assess suitability as the location was an old HDB block with many physical constraints. Tenders were called in the second half of 2001. Fresenius Medical Care was awarded the tender for supply of dialysis machines and Baxter Healthcare the dialysis chairs. A local company, Memiontec Pte Ltd, was awarded the tender for the RO water treatment system. Renovation works were started in October 2002 after all the necessary approvals were obtained. Fresenius Nephrocare was awarded the tender as dialysis provider. Eight patients were subsequently transferred from Alexandra Hospital Centre.

KDF's first Peritoneal Dialysis Centre is also located at the Kreta Ayer Centre and was renovated with generous donations from the Khoo Foundation and Singapore Pools Pte Ltd. The Khoo Foundation also continues to contribute to the deficit funding of the Centre. The PD Centre obtained its license on 7 May 2003 but because of the SARS outbreak, it only became operational on 1 July 2003. The dialysis service is contracted out to a dialysis provider, Baxter Healthcare Pte Ltd and the contract ended 31 December 2009.

In January 2005, KDF was informed of the decision by Alexandra Hospital that the lease for the premises on which the dialysis centre was situated will not be renewed. The last day of operation was on 25 April 2005.

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

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

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

This report covers medical data collated at the end of 2011.

3. THE DIALYSIS CENTRES

The location and prevalent number of patients as of 31 Dec 2011 are listed below:

| | Centre | Location | Patient No |
|---|-----------------------------|--|------------|
| 1 | KDF-Bishan Centre | Block 197, Bishan Street 13 #01-575/583 | 88 |
| 2 | San Wang Wu Ti – KDF Centre | Block 333, Kreta Ayer Road #03-33 | 69 |
| 3 | KDF – Ghim Moh Centre | Blk 6 Ghim Moh Road #01-188 | 44 |
| | TOTAL | Haemodialysis patients | 201 |

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

The other haemodialysis centres operate 3 shifts a day.

Dialysis Station

| | Centre | No. of Regular + Isolation Stations | Total |
|---|-----------------------------|--|-------|
| 1 | KDF-Bishan Centre | 19 + 1 | 20 |
| 2 | San Wang Wu Ti – KDF Centre | 14 + 1 | 15 |
| 3 | KDF – Ghim Moh Centre | 16 +1 (2 machines transferred back to KA Aug 11) | 17 |
| | TOTAL | | 52 |

I. HAEMODIALYSIS PROGRAMME

In addition to routine dialysis, additional schemes were introduced.

- A) an interim haemodialysis scheme was 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) KDF patients turning high dependency considered unsuitable for low dependency dialysis was started in Dec 2009 to enable to continue dialysis in a private sector where physician care/advice could be rendered more quickly.

4 STAFFING

MEDICAL

The medical staff comprised a pool of 14 nephrologists from both the restructured hospitals as well as the private sector. They are rostered to do rounds in the centre as well as screen new patients for medical suitability for entry into the dialysis programme if there has been no assessment performed at the restructured hospitals. Routinely, dialysis patients are seen once every month.

The nephrologists include:

1. Dr Stephen Chew
2. A/Prof Lina Choong
3. Dr Marjorie Foo
4. Dr Ho Chee Khun
5. Dr Titus Lau
6. Dr Grace Lee
7. Dr Pwee Hock Swee
8. Dr Tan Han Khim
9. Dr Tan Seng Hoe
10. Dr Yeoh Lee Ying
11. Dr Ng Tsun Gun
12. Dr Adrian Liew
13. Dr Yang Wen Shin (until Jan 2011)
14. Dr Jason Choo
15. Dr Roger Tan

Urgent medical cover was arranged as follows:

Bishan Centre:

1. Dr Goh Ming Kiong – Lifeline Medical Group
2. Dr Woo Kim Fatt – Agape Clinic

Kreta Ayer Centre:

1. Dr Chua Thiam Eng – Cambridge Clinic
2. Dr Lai Li Cheng – Chinatown Clinic
3. Dr Chong Foong Chong – Grace Clinic

Ghim Moh Centre:

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

NURSING

The overall standard of nursing is overseen by Ms Theresa Soh as Patient Services Coordinator and Ms Lay Kwee Chin (Senior Nurse Clinician,) Ms Tay See Inn (Nurse Clinician). Ms Tay resigned in May 2011.

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

- Fresenius Medicare at San Wang Wu Ti (Kreta Ayer) Centre (contract is renewed in Sep 2008, to end in Aug 2013)
- Asia Renalcare Pte Ltd at Bishan Centre (contract ended in Feb 2011, extended to May 2011), new service provider, DaVita Renal (contract from Jun 2011 for a period of 5 years)
- Asia Renalcare Pte Ltd at Ghim Moh Centre (contract to end in May 2012)

The Dialysis Provider is responsible for rostering of the nursing services. Staff numbers inclusive of the charge nurse as at 31 Dec 2011 is listed as follows:

| Centre | Renal trained SN | SN | AN | DT | Total |
|-------------|------------------|----|----|----|-------|
| Bishan | 2 | 7 | 5 | 1 | *15 |
| SWWT | 2 | 7 | 5 | 0 | 14 |
| Ghim Moh | 1 | 7 | 3 | 1 | 12 |
| Grand total | | | | | 41 |

*exclude 2 staff who were on maternity leave at year end

Training & Education

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

5 EQUIPMENT

DIALYSIS MACHINES

There are in total 54 dialysis machines.

These were located as follows:

| | Fresenius 4008S | Gambro AK96 |
|------------|-----------------|-------------|
| Bishan | 0 | 21 |
| Kreta Ayer | 15 | 0 |
| Ghim Moh | 17 | 0 |

The stations in SWWT centre were increased from 12+1 (normal + isolation) to 14+1 as two Fresenius 4008S were transferred from Ghim Moh centre, making a total of 16+1 (normal + isolation) machines in Ghim Moh centre. Five Fresenius 4008S machines in Bishan centre were traded-in and replaced by Gambro AK 96.

WATER TREATMENT SYSTEMS

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

water treatment system in Bishan Centre was replaced by Gambro WRO system in October 2009.

All centres use the Reverse Osmosis System. Pretreatment comprises of backwashable multimedia, activated carbon filter, regenerable water softener and pre cartridge filter before entering the RO membranes via high pressure pumps to allow reverse osmosis to take place. This removes most of the dissolved solids from the feed water. The product water then passes through 0.2 micron filter to be distributed to the dialysis stations. The distribution piping is a closed loop system.

The systems 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 performs 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. Chemical disinfection is done 6 monthly by the vendors for Ghim Moh and SWWT centres. In Bishan centre membrane disinfection is performed every 2 months.

The chemical disinfectant used for RO disinfection as follows:

Bishan centre – Dialox

SWWT centre – Hydrogen Peroxide 13%

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

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

REUSE EQUIPMENT

Reuse is practiced using the Renatron Reprocessing machines. Dialysers from hepatitis positive patients are not mixed with those from serologically negative patients during washing.

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

The Renalog RM dialyzer reprocessing management software is a Windows-based system that provides capabilities to analyze and manage automatic and manual dialyzer reuse operations. Renalog RM is able to provide different standard or specific reports that can be printed, viewed and exported to editable file formats.

Renalin 100 Cold Sterilant (containing Hydrogen Peroxide 20%) was classified as an explosive precursor since 1 Dec 07. In order to comply with the requirements of the Arms and Explosives Act, each of the centres has applied for a licence from the Singapore Police Force (SPF) for storage of the Renalin. The licence is renewed every 2 years.

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

6 PATIENT CARE

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

DIETETICS

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

PATIENT WELFARE

Ms Sandy Lim is the Welfare Officer for both HD and PD patients. Ms Rena Lee rejoined the force in July 2011 and is in charge of Bishan and Ghim Moh centres' patients.

Consistent with its mission, KDF patients are heavily subsidised. In 2011, 81 patients (40.3%) received Medifund subsidies from the restructured hospitals compared with 45.9% the previous year.

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

Six (6) patients received civil service benefits.

DIALYSIS REVIEWS

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

REPORTING OF INCIDENTS AND ADVERSE OUTCOMES

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

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

7 THE PATIENT POPULATION

As at 31 December 2011, we had 202 patients dialysing in 3 centres – 89 patients at Bishan Centre (BS), 69 at Kreta Ayer (SWWT) and 44 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 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| New Cases | 27 | 16 | 10 | 5 | 18 | 5 | 10 | 13 | 18 | 26 | 28 | 12 |
| New Cases (interim) | | | | | 1 | 6 | 3 | 3 | 3 | 7 | 7 | 15 |
| Transfers in from SDDU | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Re-enter KDF | 2 | 1 | 0 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 2 |
| Total Entries | 29 | 17 | 10 | 8 | 19 | 11 | 13 | 17 | 22 | 33 | 38 | 29 |
| EXIT | | | | | | | | | | | | |
| Transfer Out to non-KDF Programs | 3 | 5 | 2 | 2 | 2 | 3 | 0 | 1 | 0 | 5 | 1 | 7 |
| Transfer Out to KDF PD | | | | | | 5 | 3 | 2 | 2 | 1 | 2 | 3 |
| Transplant | 7 | 2 | 2 | 2 | 4 | 6 | 10 | 6 | 4* | 4* | 2* | 1* |
| Withdraw from Dialysis/Default | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 4 | 4 |
| Deaths | 9 | 4 | 5 | 4 | 6 | 5 | 11 | 2 | 9 | 8 | 8 | 20 |
| Total Exits | 19 | 11 | 10 | 8 | 12 | 20 | 24 | 13 | 15 | 19 | 17 | 35 |
| Total No of Pt | 169 | 174 | 174 | 174 | 181 | 172 | 161 | 165 | 172 | 186 | 207 | 201 |

* Cadaveric/Deceased Donor

Table 7A-2 –Mode of Dialysis

| | | |
|---|----|-----------|
| Interim HD | | 16 |
| - Newly initiated subsequently permanent HD | 10 | |
| - Newly initiated awaiting PD | 0 | |
| - Newly initiated Bridge to Transplant | 2 | |
| - PD complications for temp HD | 2 | |
| - PD complications subs permanent HD | 2 | |
| | | |
| Permanent HD [not via interim route] | | 13 |
| - newly initiated | 12 | |
| - failed transplant, re-enter program | 1 | |
| | | |
| TOTAL | | 29 |

Table 7A-3 – Source of Referral

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|----------------------|-----------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| SDDU | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SGH | 25 | 15 | 6 | 5 | 19 | 8 | 10 | 14 | 18 | 16 | 25 | 22 |
| NUH | 4 | 2 | 3 | 3 | 0 | 0 | 2 | 1 | 2 | 11 | 8 | 3 |
| TTSH | | | | | | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| AH / KPTH | | | | | | | | 1 | 0 | 4 | 3 | 3 |
| Private | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Total Entries | 29 | 17 | 10 | 8 | 19 | 11 | 13 | 17 | 22 | 33 | 38 | 29 |

We supported patients on interim haemodialysis while awaiting living related transplant as well as patients waiting to enter the KDF Peritoneal Dialysis program as long as they were suitable for satellite dialysis

B. DEMOGRAPHIC & PATIENT CHARACTERISTICS

Etiology of Renal Failure

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

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

| Etiology | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|----------------------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Chronic glomerulonephritis | 4 | 30.8 | 4 | 23.5 | 4 | 18.2 | 6 | 18.1 | 14 | 36.8 | 6 | 20.7 |
| Diabetic nephropathy | 6 | 46.2 | 9 | 52.9 | 13 | 59.1 | 20 | 60.6 | 14 | 36.8 | 14 | 48.3 |
| Lupus nephritis | 0 | 0 | 0 | 0 | 1 | 4.5 | 1 | 3.1 | 0 | 0 | 0 | 0 |
| Obstructive uropathy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2.6 | 2 | 6.9 |
| PCKD | 0 | 0 | 0 | 0 | 1 | 4.5 | 1 | 3.1 | 2 | 5.3 | 1 | 3.4 |
| TB kidney | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hypertension | 2 | 15.4 | 1 | 5.9 | 1 | 4.5 | 0 | 0 | 1 | 2.6 | 1 | 3.4 |
| Others | 1 | 7.7 | 3 | 17.6 | 0 | 0 | 0 | 0 | 4 | 10.6 | 4 | 13.8 |
| Unknown Etiology | 0 | 0 | 0 | 0 | 2 | 9.1 | 5 | 15.1 | 2 | 5.3 | 1 | 3.4 |
| Total | 13 | 100 | 17 | 100 | 22 | 100 | 33 | 100 | 38 | 100 | 29 | 100 |

The majority of new cases were patients with diabetes mellitus (48.3%) and chronic GN (20.7%).

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

| Etiology | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Chr glomerulonephritis | 96 | 59.6 | 93 | 56.4 | 90 | 52.3 | 86 | 46.2 | 93 | 44.9 | 88 | 43.8 |
| Diabetic nephropathy | 28 | 17.4 | 33 | 20.0 | 40 | 23.3 | 53 | 28.5 | 62 | 30.0 | 57 | 28.4 |
| Lupus nephritis | 9 | 5.6 | 8 | 4.8 | 9 | 5.2 | 10 | 5.4 | 10 | 4.8 | 10 | 5.0 |
| Obstructive uropathy | 0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1.0 | 2 | 1.0 |
| PCKD | 2 | 1.2 | 2 | 1.2 | 2 | 1.2 | 3 | 1.6 | 5 | 2.4 | 6 | 3.0 |
| TB kidney | 1 | 0.6 | 1 | 0.6 | 1 | 0.6 | 1 | 0.5 | 0 | 0 | 1 | 0.5 |
| HT | | | 3 | 1.3 | 4 | 2.3 | 4 | 2.2 | 4 | 1.9 | 5 | 2.5 |
| VUR | 2 | 1.2 | 2 | 1.2 | 2 | 1.2 | 2 | 1.1 | 2 | 1.0 | 2 | 1.0 |
| Others | 9 | 5.6 | 9 | 5.5 | 8 | 4.6 | 9 | 4.8 | 10 | 4.8 | 13 | 6.5 |
| Unknown Etiology | 14 | 8.7 | 14 | 8.5 | 16 | 9.3 | 18 | 9.7 | 19 | 9.2 | 17 | 8.5 |
| Total | 161 | 100 | 165 | 100 | 172 | 100 | 186 | 100 | 207 | 100 | 201 | 100 |

Majority of patients (43.8%) have chronic glomerulonephritis as the primary etiology of renal failure and 28.4% of the patients with diabetic nephropathy.

Gender

Table 7B-3 – Gender of New Patients

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

Table 7B-4 – Gender of Prevalent Patients

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

At the end of 2011, the ratio of male to female patients was 96:105.

Ethnic Distribution

Table 7B-5 – Ethnic Distribution of New Patients

| Race | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|----------------|------|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| Chinese | 10 | 90.9 | 10 | 76.9 | 13 | 76.5 | 16 | 72.7 | 18 | 54.6 | 27 | 71.0 | 20 | 67.0 |
| Malay | 1 | 9.1 | 1 | 7.7 | 4 | 23.5 | 5 | 22.7 | 11 | 33.3 | 6 | 15.8 | 8 | 27.6 |
| Indian | 0 | 0 | 2 | 15.4 | 0 | 0 | 1 | 4.5 | 4 | 12.1 | 5 | 13.2 | 1 | 3.4 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 11 | 100.0 | 13 | 100 | 17 | 100 | 22 | 100 | 33 | 100 | 38 | 100 | 29 | 100 |

Table 7B-6 – Ethnic Distribution of Prevalent Patients

| Race | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|----------------|------|-------|------|-------|------|------|------|------|------|------|------|------|------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| Chinese | 133 | 77.5 | 126 | 78.30 | 126 | 76.4 | 138 | 77.3 | 138 | 74.2 | 153 | 73.9 | 145 | 72.1 |
| Malay | 28 | 16.2 | 23 | 14.3 | 27 | 16.4 | 36 | 17.4 | 36 | 19.4 | 38 | 18.4 | 42 | 20.9 |
| Indian | 11 | 6.4 | 12 | 7.4 | 12 | 7.3 | 12 | 5.2 | 12 | 6.4 | 16 | 7.7 | 14 | 7.0 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 172 | 100.0 | 161 | 100 | 165 | 100 | 172 | 100 | 186 | 100 | 207 | 100 | 201 | 100 |

The ethnic distribution of our prevalent patients was 72.3% Chinese, 20.8% Malays and 6.9% Indians.

Age

The mean age at entry in 2011 was 56.9 ± 12.5 years (median, 55.8). Nine (9) patients were above the age of 65 years

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

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------------|------|------|------|------|------|------|------|------|------|------|------|
| Mean Age (years) | 43.1 | 43.4 | 41.5 | 46.6 | 52.7 | 62.6 | 56.6 | 58.8 | 56.6 | 56.7 | 56.9 |
| SD | 10.6 | 12.1 | 7.3 | 8.8 | 15.1 | 11.8 | 12.9 | 12.4 | 12.5 | 10.4 | 12.5 |
| Min | | | | | | | 26.9 | 33 | 26 | 34.5 | 32.7 |
| Max | | | | | | | 73.0 | 78 | 76 | 81.9 | 78.9 |

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

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

| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------------|------|------|------|------|------|------|------|------|------|------|------|
| Mean Age (years) | 46.7 | 47.3 | 48.1 | 48.7 | 50.1 | 52.3 | 53.8 | 55.5 | 56.2 | 57.4 | 57.7 |
| SD | 9.3 | 9.4 | 9.3 | 9.3 | 9.3 | 10.0 | 9.9 | 9.7 | 10.3 | 10.3 | 10.8 |
| Min | | | | | | | | | | | 28.0 |
| Max | | | | | | | | | | | 86.0 |

Age of the prevalent dialysis population at the end of 2011 was 57.7 ± 10.8 years (median 57.7). 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 | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|-----------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Diabetic | 6 | 46.2 | 11 | 64.7 | 10 | 45.5 | 22 | 71 | 20 | 52.6 | 19 | 65.5 |
| IHD n oth cardiac dis | 3 | 23.1 | 2 | 11.8 | 5 | 22.7 | 15 | 48.4 | 22 | 57.9 | 6 | 20.7 |
| CVA | 0 | 0 | 0 | 0 | 4 | 18 | 7 | 22.6 | 4 | 10.5 | 1 | 3.4 |
| PVD | 0 | 0 | 1 | 5.9 | 1 | 4.5 | 5 | 16.1 | 4 | 10.5 | 1 | 3.4 |

Table 7B-10 -- Common Comorbidities in Prevalent patients

| Year | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Diabetics | 36 | 21.8 | 44 | 26.7 | 45 | 26.2 | 65 | 34.9 | 69 | 33.3 | 67 | 33.3 |
| IHD n other cardiac dis | 33 | 20.0 | 42 | 25.5 | 37 | 25.1 | 59 | 31.7 | 57 | 27.5 | 45 | 23.4 |
| CVA | 7 | 4.2 | 7 | 4.2 | 9 | 5.2 | 15 | 8.1 | 14 | 6.8 | 11 | 5.5 |
| PVD | 5 | 3.0 | 5 | 5 | 6 | 3.5 | 7 | 3.8 | 11 | 5.3 | 7 | 3.5 |

The proportion of diabetics in the prevalent dialysis population remains at 33.3%

The proportion of patients with cardiac problems has decreased 23.4%.

HOSPITALIZATIONS

Hospitalizations during the period 1 January 2011 to 31 December 2011 were analyzed and expressed as episodes and days hospitalized per patient year of dialysis programme. There were 499 hospitalization episodes in 158 patients. Thus, 67.2% of the patients were ever admitted that year.

Table 7B-11 Admission Rates

| | 2008 | | 2009 | | 2010 | | 2011 | |
|-------------------------------------|------|-------|------|-------|---------|-------|---------|-------|
| | No | % | No | % | No | % | No | % |
| No of Patients admitted in ref year | 108 | 57.4% | 134 | 63.4% | 141/224 | 62.9% | 160/235 | 69.9% |
| - Diab pt adm / all diab | | | 51 | 70.8% | 69/85 | 81.2% | 75/97 | 77.3% |
| - Non-diab pt adm / all | | | 83 | 59.4% | 72/139 | 51.8% | 89/138 | 64.5% |

| RATES/YR | 2007 | <i>Per yr</i> | 2008 | <i>Per yr</i> | 2009 | <i>Per yr</i> | 2010 | <i>Per yr</i> | 2011 | <i>Per yr</i> |
|--------------------|------|---------------|------|---------------|------|---------------|------|---------------|------|---------------|
| Admission episodes | 234 | 1.5 | 248 | 1.3 | 272 | 1.5 | 466 | 2.4 | 499 | 2.5 |
| • diabetic | 93 | 2.7 | 111 | 2.1 | 165 | 2.84 | 266 | 3.6 | 233 | 3.1 |
| • non-diabetic | 141 | 1.1 | 137 | 1.0 | 107 | 0.87 | 200 | 1.6 | 266 | 2.1 |
| Admission days | 1628 | 10.2 | 1833 | 9.75 | 2207 | 13.9 | 2581 | 13.4 | 3574 | 17.6 |
| • diabetic | 909 | 25.9 | 870 | 16.7 | 1148 | 20.5 | 1394 | 18.8 | 1897 | 25.5 |
| • non-diabetic | 719 | 5.7 | 963 | 7.1 | 1059 | 10.9 | 1187 | 9.6 | 1677 | 13.0 |

The admission rate was 2.5 episodes per patient year. Days admitted per dialysis year increased to 17.6. Not unexpectedly, diabetics had about double the number of days (25.5) admitted compared with non-diabetics (13.0).

Access problems accounted for 33.8% of admission days (51.8% in diabetics, 26.3% in non-diabetics).

Table 7B-12: Hospitalization Days

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

* including infections of the access

+ excluding access related infections

DEATHS AND WITHDRAWALS

A total of 35 patients left the programme. Reasons were as follows:

3 patients was on interim haemodialysis and transferred to PD programme.

1 patient received a deceased donor transplant and

4 patients withdrew from dialysis treatment.

7 patients transferred to other centres where

- four to high dependency units,
- 2 to private centres and
- 1 to another VWO centre

There were 20 deaths – 4 from heart failure, 2 from cardiac causes, 5 from septicaemia/ infection, 3 from pneumonia, 2 from carcinoma, 1 from multi organ failure, 1 from brain stem haemorrhage, and 2 died at home.

Table 7B-14: Deaths and Withdrawals

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

C. SURVIVAL

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

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

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

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

Fig 7C-1: Overall Patient Survival

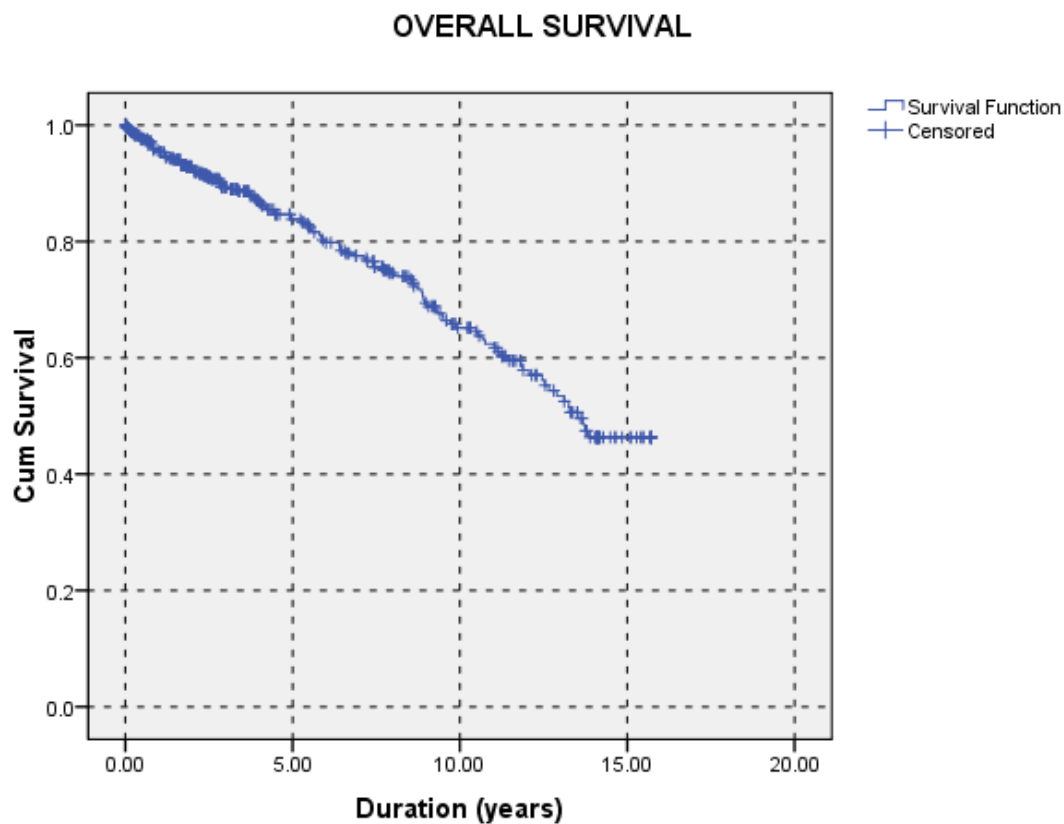


Table 7C-2 - Survival Difference between Diabetics and Non diabetics 1996- 2011

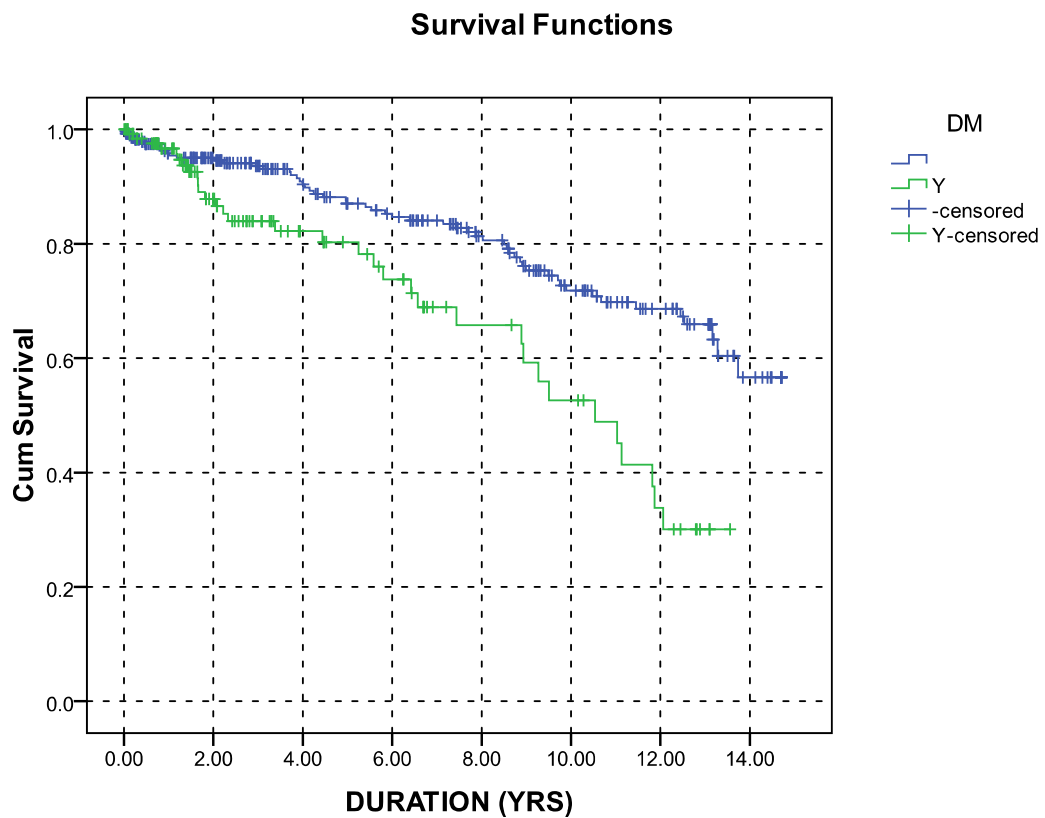
| | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------------|-------|-------|-------|-------|-------|
| Non-DM | | | | | |
| 1 yr | 96.2% | 95.4% | 95.6% | 96.8% | 96.4% |
| 5 yr | 86.8% | 86.2% | 86.0% | 87.0% | 86.3% |
| 10 yr | 74.4% | 73.8% | 74.6% | 71.8% | 72.9% |
| DM | | | | | |
| 1 yr | 95.4% | 96.1%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

As expected, diabetics have worse survival than non diabetics.

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

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

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



D. DIALYSIS PARAMETERS

All patients are on high flux dialyzers, majority using Fresenius Polysulfone membrane unless a larger dialyzer size is required. Maximum reuse is 15 times. There are separate reuse facilities for Hepatitis B and HCV positive dialyzers in Bishan while in SWWT and Ghim Moh, dialyzers for HepB positive patients are not reused.

Table 7D-1 : Types of Dialyzers used

| | 2005 | | 2006 | | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | |
|------------|------|------|------|------|------|------|------|------|------|-----|------|------|------|-----|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % |
| F6 | 2 | 1.20 | 1 | 0.6 | 1 | 0.6 | 3 | 1.7 | 2 | 1 | 1 | 0.5 | 2 | 1 |
| F7 | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HF50 | 10 | 5.8 | 13 | 7.9 | 13 | 7.9 | 13 | 7.6 | 17 | 9 | 19 | 9.2 | 21 | 10 |
| HF60 | 44 | 25.4 | 42 | 25.5 | 38 | 23.0 | 41 | 23.8 | 40 | 22 | 37 | 17.9 | 49 | 24 |
| HF80 | 18 | 10.4 | 14 | 8.5 | 10 | 6.1 | 10 | 5.8 | 9 | 5 | 15 | 7.2 | 32 | 16 |
| HF100 | 7 | 4.0 | 7 | 4.2 | 8 | 4.8 | 8 | 4.7 | 9 | 5 | 8 | 3.9 | 12 | 6 |
| PolyFlux6L | | | | | 1 | 0.6 | 1 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 |
| PolyFlux11 | | | 1 | 0.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PolyFlux14 | 48 | 27.7 | 47 | 28.5 | 54 | 32.7 | 55 | 32 | 65 | 35 | 77 | 37.2 | 45 | 22 |
| PolyFlux17 | 26 | 15.0 | 24 | 14.5 | 25 | 15.2 | 25 | 14.5 | 30 | 16 | 34 | 16.4 | 30 | 15 |
| PolyFlux21 | 17 | 9.8 | 15 | 9.1 | 14 | 8.5 | 15 | 8.7 | 14 | 8 | 16 | 7.7 | 10 | 5 |
| FB210U | 1 | 0.6 | 1 | 0.6 | 1 | 0.6 | 1 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 173 | 100 | 165 | 100 | 165 | 100 | 172 | 100 | 186 | 100 | 207 | 100 | 201 | 100 |

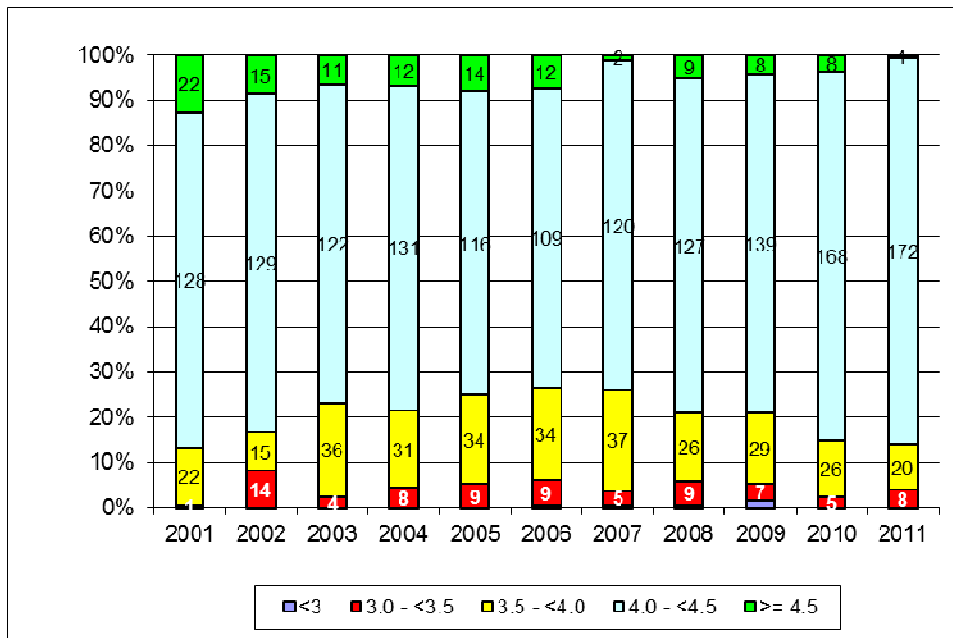
Only 2 patients (1 %) were using low flux dialyzers.

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

| ml/min | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------|------|------|------|------|------|------|------|
| Mean | 276 | 274 | 272 | 273 | 270 | 267 | 267 |
| Std Dev | 36 | 34 | 36 | 34 | 35 | 31 | 34 |
| Min | 180 | 180 | 180 | 150 | 150 | 150 | 180 |
| Max | 400 | 400 | 360 | 360 | 360 | 360 | 360 |

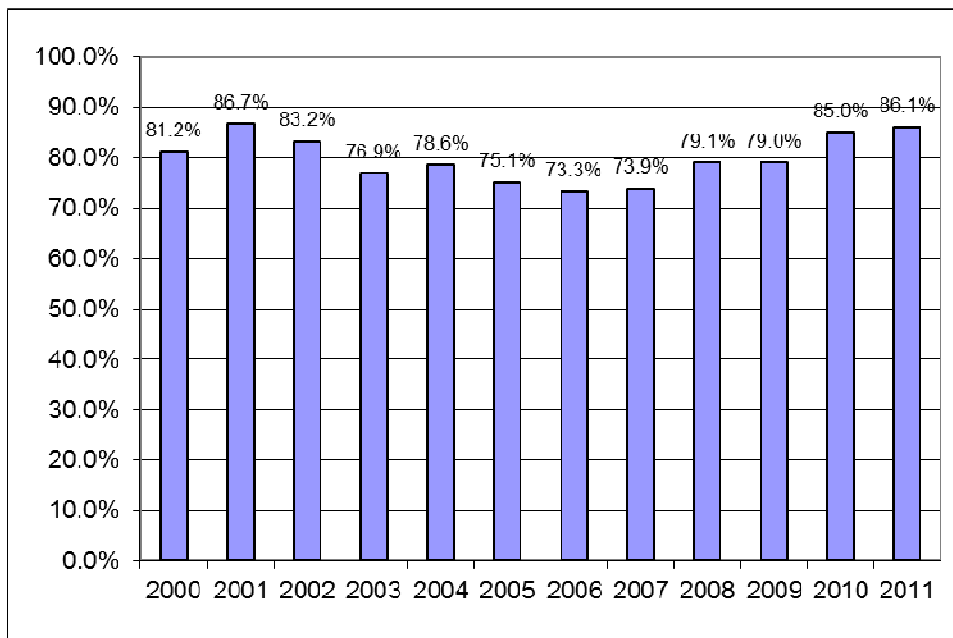
Blood flow is set at a minimum of 200 ml/min and averaged 267 ± 34 ml/min (range 180 -360).

Fig 7D-1: Dialysis Time Per Session



Most patients (86.1%) dialyze for 4 hours or more as compared to the previous year (85%).

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



DIALYZER REUSE

Maximum reuse is 15 times. All centres use the Renatron System. There are separate reuse facilities for washing of dialyzers used by HCV positive patients in Bishan. SWWT centre started accepting hepatitis positive patients when AH centre closed down but without reuse of dialyzers for Hepatitis B positive patients. Ghim Moh centre also started accepting Hepatitis B positive with single use of dialyzers.

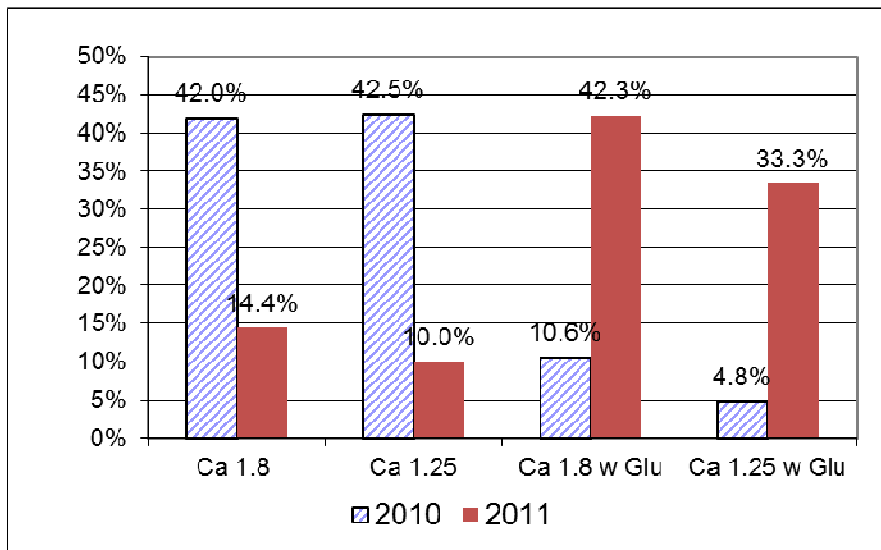
DIALYSATE

Dialysate available contains

- potassium value of 2.0 mmol/L
- calcium of 1.5 mmol/L and 1.2 mmol/L
- glucose of 10 mmol/L

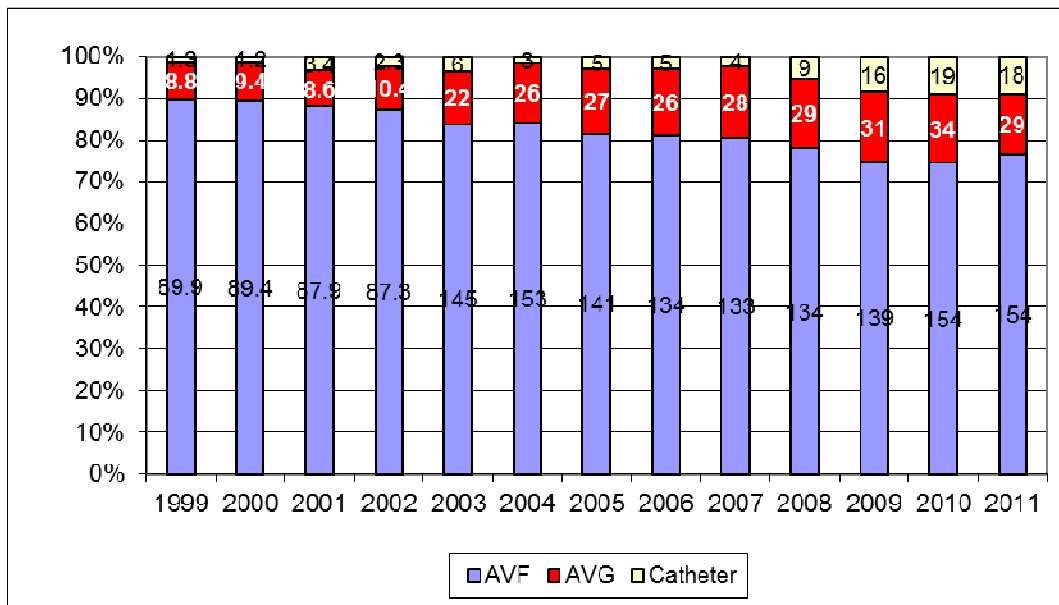
Dialysate containing 1.5 mmol/L calcium and 10 mmol/L glucose was first introduced in SWWT centre on 2nd December 2008 for diabetic and elderly patients. All patients in Bishan centre were provided with dialysate with glucose 10mmol/L with either calcium 1.5 or 1.2 mmol/L from July 2011.

Fig 7D-3 Dialysate Calcium and Glucose



E. VASCULAR ACCESS

Fig 7E-1: Vascular Access



Thirty four patients or 14.4% (29/201) were using grafts for vascular access, approximately the same proportion as last year. This is compared to 8.8% in 1999. Eighteen (18) patients were on temporary catheters (9%). The rest were using AV fistulae (76.6%), slightly higher than last year (74.4%).

We continue to use the Transonic machine for monitoring the access flows and recirculation in the vascular access. This performed every 6 months unless the flows are below 600 ml/min. The average flow for AVF's was 1171 ± 682 ml/min (median 990 ml/min). The average flow for AVG's was 1026 ± 507 ml/min (median 910 ml/min). There were no patients with recirculation. One patient who was previously noted to have 20% recirculation, went for fistulogram, The reading was 0% when repeated after the procedure.

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

F. DIALYSIS ADEQUACY

This assessment is performed every 2 months using a pre and post blood urea performed on a midweek dialysis session to calculate the single pool KT/V as follows:

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

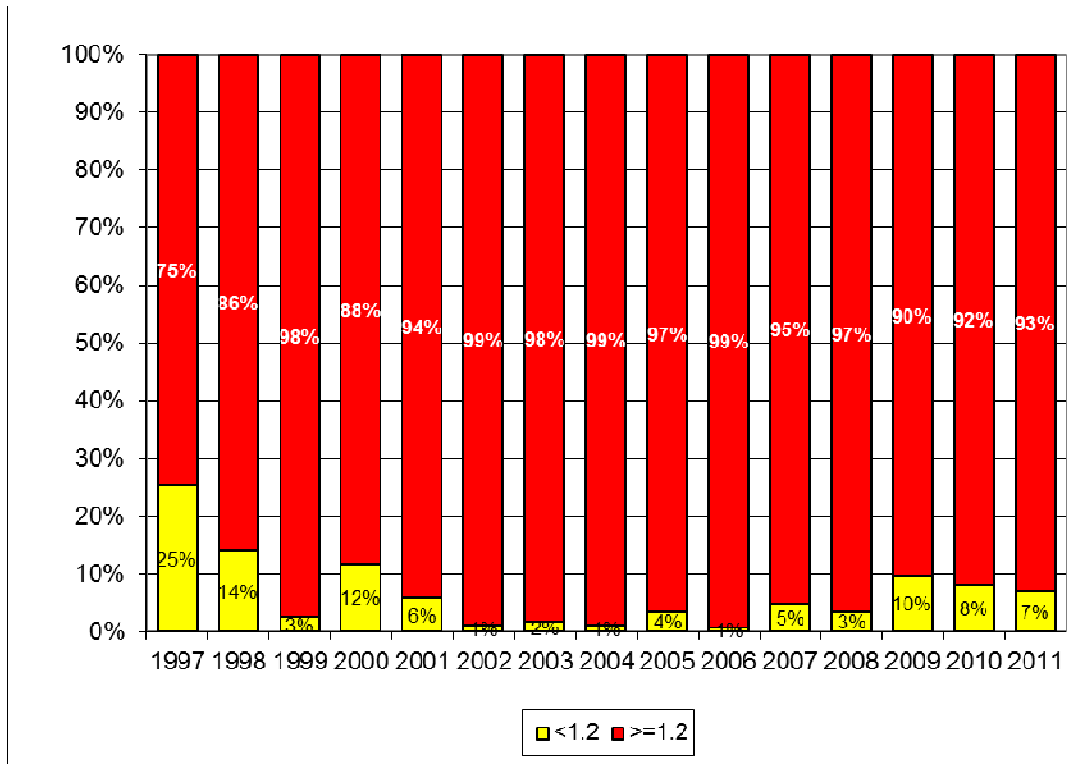
where R = post/pre urea
 UF = ultrafiltration in litres
 W = post dialysis weight

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

Our patients weighed 58.0 ± 13.7 kg (median 56.6 kg, range 32.6 – 113.5 kg).

The proportion of patients with KT/V of 1.2 or greater in November / December 2011 was 97%.

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



G. ANAEMIA

The mean Hb was calculated to be 11.01 ± 1.43 g/dl (range 7.6 – 16.1). 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% higher than last year (20%).

Fig 7G-1: Average Hemoglobin

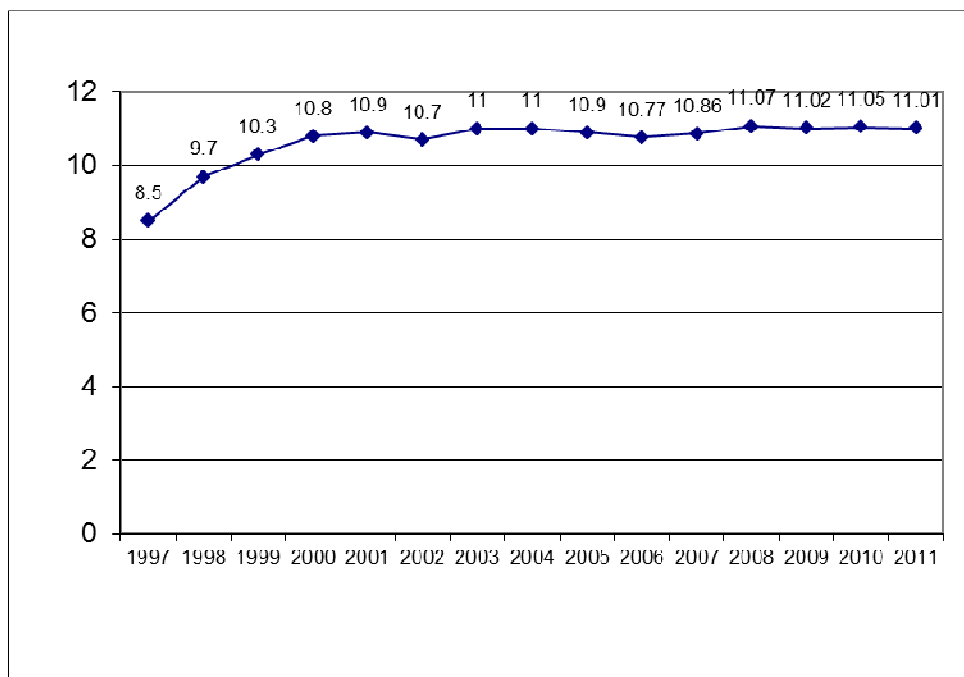


Fig 7G-2: Hb Frequency

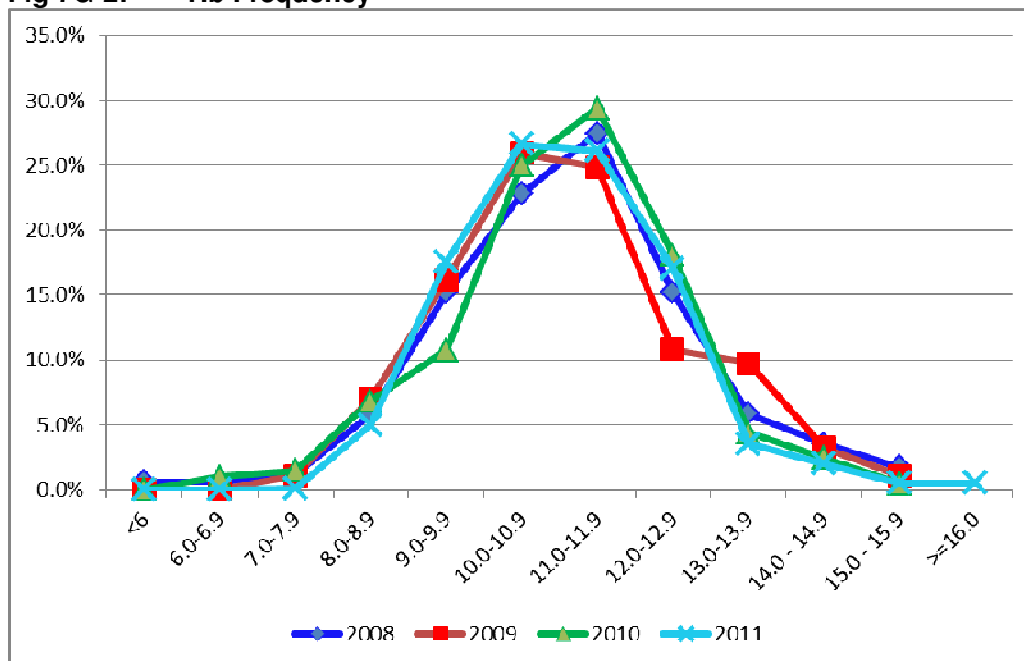
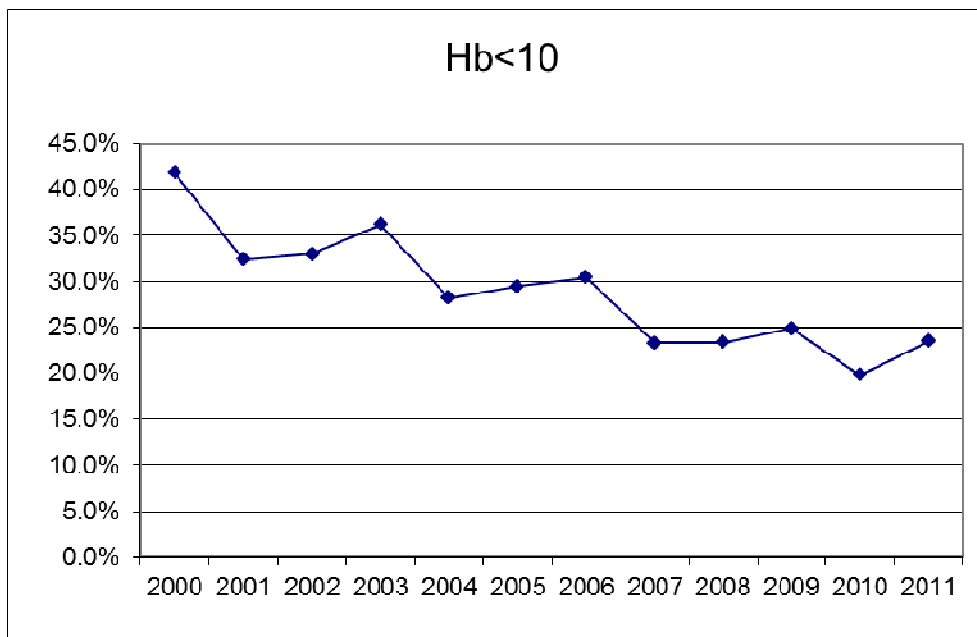


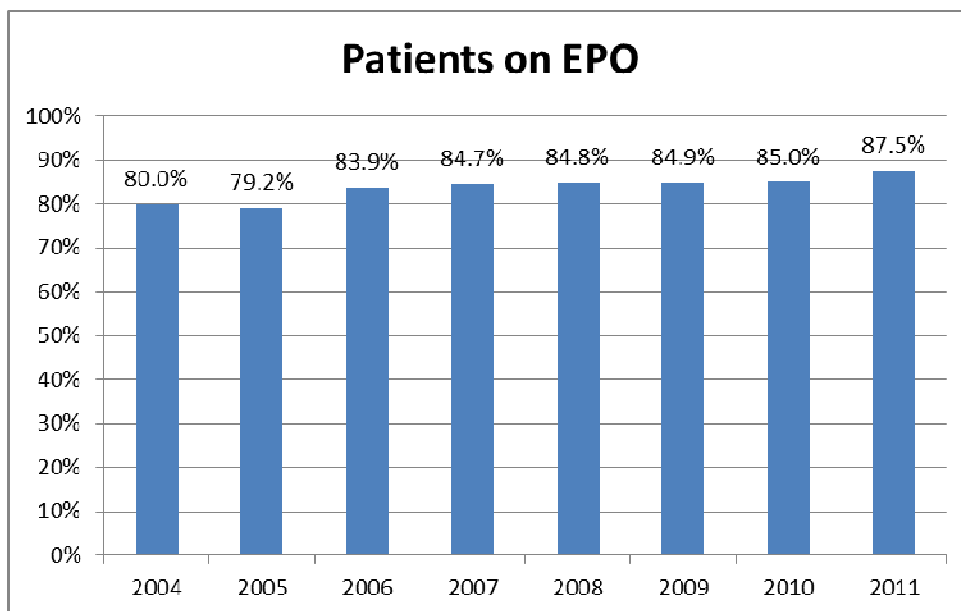
Fig 7G-3: Hb <10



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 continues to fall now 23.5% with 87% (174/201) of patients on erythropoietin

Fig 7G-4: Proportion of Patients on ESA



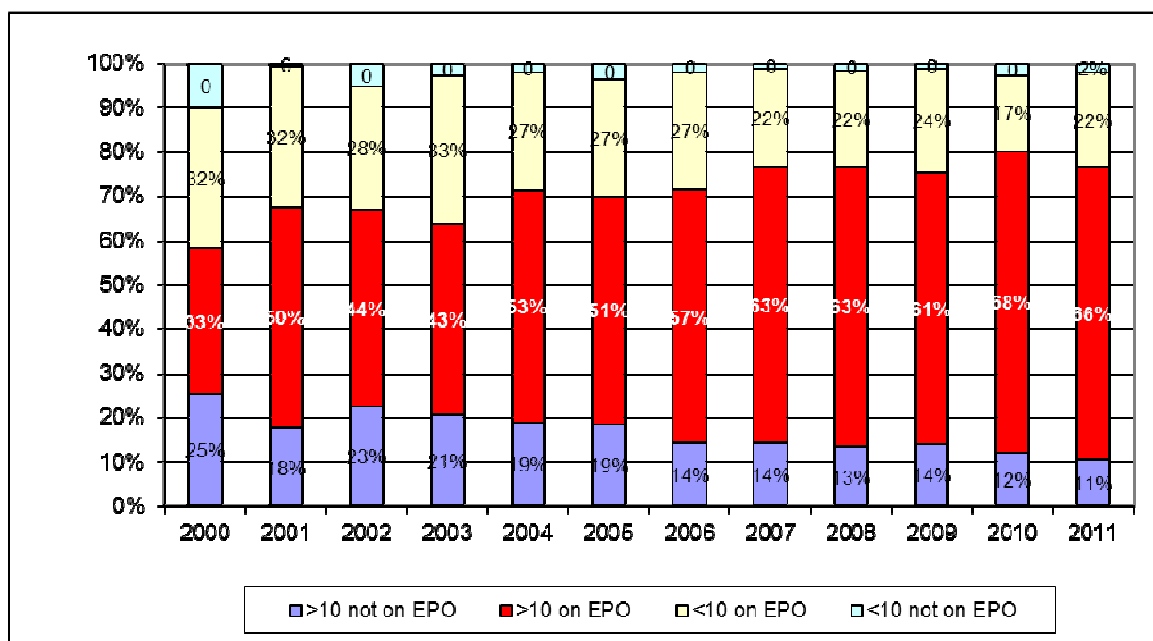
The cost of erythropoietin is Medishield claimable if the patient is eligible. In addition, patients are also eligible to apply for the Foundation's subsidy programme. There is no cap on the erythropoietin subsidy

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

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

Twenty-five (25) patients (12.4%) were not on EPO. They had a mean Hb of 11.9 g/dl (range 8.7 – 15.3). Only 4 patients (2.0%) with Hb below 10 g/dl were not on EPO.

Fig 7G-5: Use of Erythropoietin



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

IRON STATUS

Table 7G-1 : Transferrin Saturation

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

As at the end of 2011, mean transferrin saturation was $34.6 \pm 15\%$ (range 6.1 – 92.3). The proportion of patients with transferrin saturation of less than 20% was 10.4%, lower than the previous year. 28.6% (6/21) in this iron deficient group had a Hb of less than 10 g/dl. The average Hb of patients with transferrin saturation greater or equal to 20% was 11 g/dl compared with 10.8 g/dl for those whose TF Sat was <20%

82 patients used intravenous iron (Venofer) in 2011. Forty-eight (48) used Venofer to replenish iron stores (as compared to 53 in 2010) while 62 patients used it for maintenance. A subsidy scheme for Venofer has been available since April 2005.

Table 7G-2: Ferritin

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

Using S Ferritin, 15.4% are iron deficient

BLOOD TRANSFUSION

A total of 26 patients received 46 units of blood during admissions to hospital.

H. NUTRITION

Mean S Albumin was 35 ± 3.2 g/l. The number of patients with Serum albumin less than 40 g/dl was 95%.

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

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| NPCR (g/kgBW) | | | | | | | | | |
| • Mean \pm SD | 1.14 \pm 0.23 | 1.13 \pm 0.23 | 1.12 \pm 0.21 | 1.13 \pm 0.22 | 1.14 \pm 0.24 | 1.07 \pm 0.23 | 1.09 \pm 0.26 | 1.06 \pm 0.26 | 1.05 \pm 0.24 |
| • % < 1.2 | 62.6 | 63.5 | 68.2 | 63.6 | 63.6 | 75 | 71 | 74 | 78 |
| S Albumin (g/l) | | | | | | | | | |
| • Mean \pm SD | 36.9 \pm 3.1 | 36.9 \pm 3.5 | 37.5 \pm 3.4 | 36.8 \pm 3.1 | 34.3 \pm 3.4 | 33.9 \pm 3.8 | 33.9 \pm 3.4 | 34.5 \pm 3.4 | 35 \pm 3.2 |
| • % <40 | 80.6 | 81.8 | 72.3 | 77.6 | 95.7 | 90.0 | 90.3 | 88.4 | 93.5 |
| • % <35 | 22.9 | 21.0 | 16.8 | 24.2 | 59.1 | 50.0 | 51.1 | 48.8 | 49.3 |

Supplemental feeds were provided upon the advice of the centre's dieticians to patients at a highly subsidized price from September 2011.

I. MINERAL METAB

Table 7I-1 : Serum Calcium levels

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

* S Calcium corrected for S Albumin reported from 2007

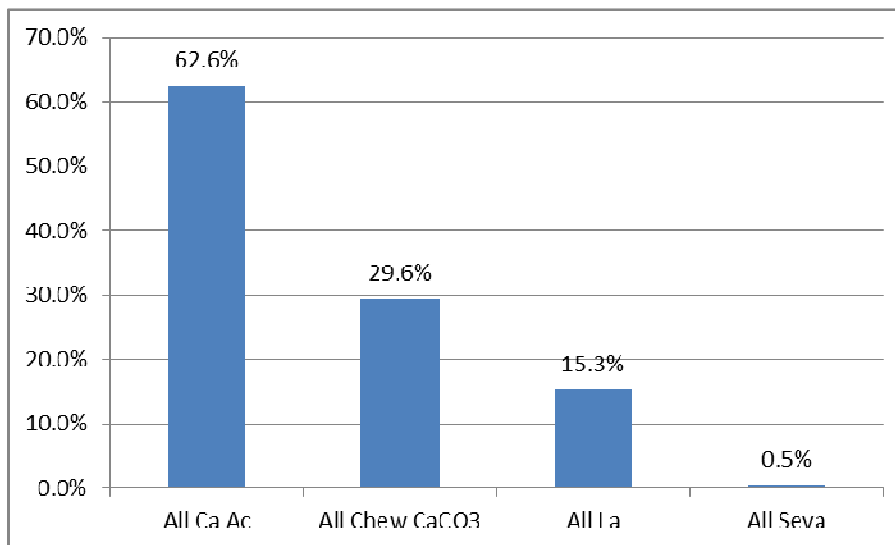
The mean corrected serum calcium value was 2.37 ± 0.18 mmol/l. Low calcium dialysate is currently in use for almost half of the patients (87/201, 43.3%). Its use appears to be dropping.

Table 7I-2 : Serum Phosphate levels

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

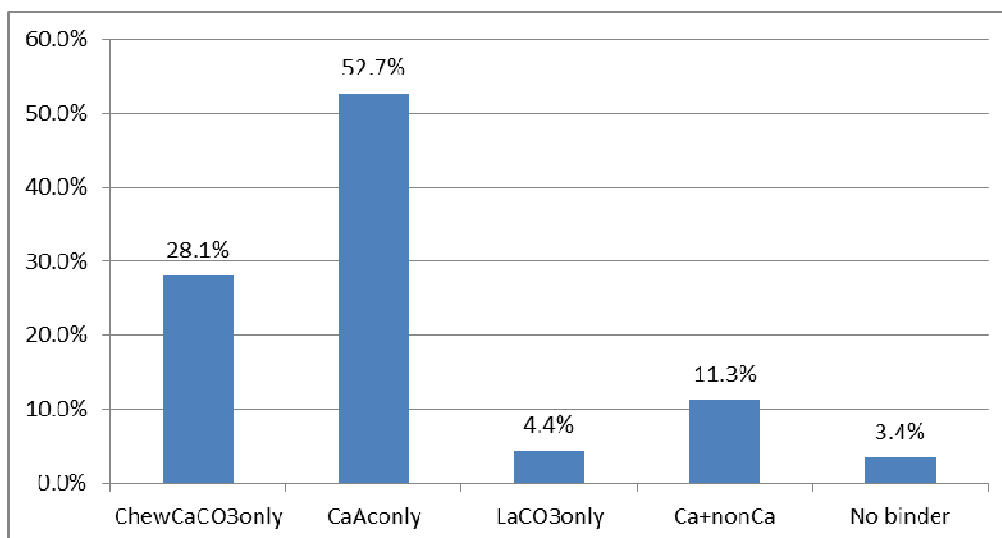
Mean S Phosphate was 1.5 ± 0.42 mmol/l. The patients having values above 2.0 mmol/l was 11% as compared to 18.4% the previous year.

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



Majority of patients are on calcium-based phosphate binders of which 62.6% are on calcium acetate.

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



Non calcium non-aluminum binders (Lanthanum and Sevelemar) use has increased to 15.7%. A small proportion (11.3%) used calcium based binders in combination with non-Ca-non-Aluminium binders. KDF provides a subsidy for these expensive phosphate binders. No patient was on Aluminium.

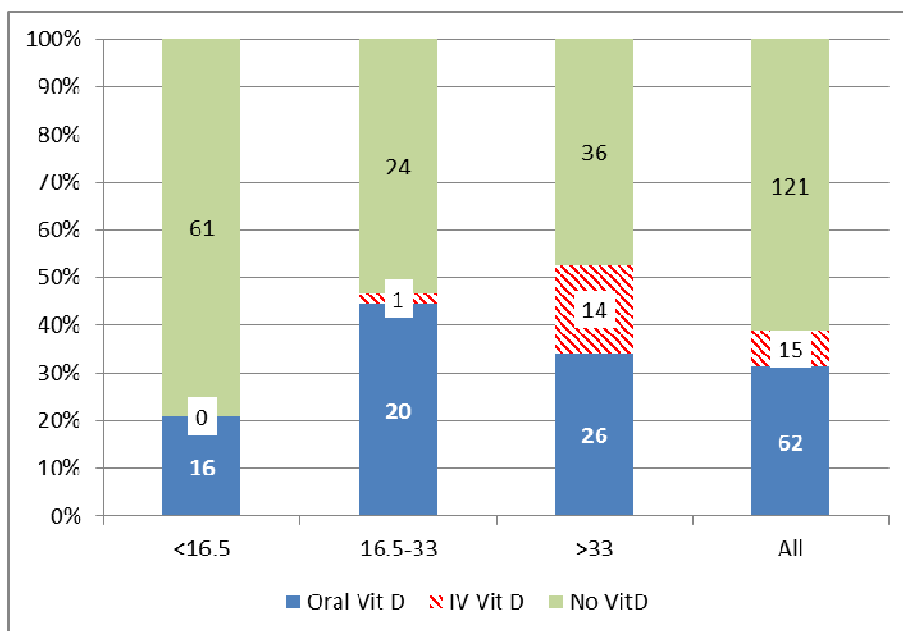
The KDOQI guidelines of 2003 (AJKD Vol 42 October 2003 Suppl 3) recommends treatment for patients on dialysis (CKD Stage 5) when iPTH exceed 33 pmol/l should be treated with Vit D analogs to main the PTH at 16.5-33 pmol/l. Recent KDIGO guidelines recommend keeping iPTH within 2-9 times of the upper limit.

Table 7I-3: PTH levels

| | 2006 | % | 2007 | % | 2008 | % | 2009 | % | 2010 | % | 2011 | % |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| <16.5 | 52 | 32.3 | 54 | 32.9 | 52 | 31.3 | 71 | 38.4 | 80 | 39.2 | 77 | 38.9 |
| 16.5-33 | 31 | 19.3 | 24 | 14.6 | 27 | 16.3 | 31 | 16.8 | 38 | 18.6 | 45 | 22.1 |
| >33.0 | 78 | 48.4 | 86 | 52.4 | 87 | 52.4 | 83 | 44.9 | 86 | 42.2 | 76 | 38.4 |
| Total | 161 | 100 | 164 | 100 | 166 | 100 | 185 | 100 | 204 | 100 | 198 | 100 |

About a third of the patients have intact parathyroid hormone levels elevated beyond 33 pmol/l. Hyperparathyroid bone disease is still a significant problem in the dialysis population.

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



In the group with low PTH (<16.5 pmol/l) which constitutes 39% (77 patients) of all cases, only 7.9% (16) were on oral Vit D and none on iv Vit D.

K/DOQI aims for a PTH level of 16.5 – 33 pmol/l. Only 22.1% of all patients had PTH values in this range. 52.6% (40/76) of patients with PTH>33 pmol/l being treated with Vit D. A subsidy scheme for Calcijex was started in April 2005. Hyperphosphatemia and hypercalcemia often preclude them from treatment. One patient is on Paricalcitol.

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

A total of 48 patients had parathyroidectomy bringing the prevalent rate to 23.8% (48/201).

J. DIABETICS

The prevalent number of diabetic patients was 76 (37.8%) This is not surprising as diabetic nephropathy is the etiology of ESRD in more than half of all new cases.

K. HYPERTENSION

78.1% (157/201) have recorded high blood pressures or have their blood pressures controlled with anti-hypertensive agents.

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

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---------|--------|-------|-------|-------|-------|------|------|
| None | 38.7% | 31.7% | 37.0% | 29.7% | 27.4% | 22% | 22% |
| 1 Drug | 28.3% | 31.9% | 31.5% | 28.5% | 28.5% | 33% | 31% |
| 2 Drugs | 22.0% | 20.7% | 23.0% | 27.3% | 26.3% | 27% | 29% |
| 3 Drugs | 8.7% | 13.4% | 6.1% | 9.9% | 14% | 14% | 14% |
| 4 drugs | 2.3% | 1.2% | 2.4% | 4.7% | 3.8% | 4% | 3% |
| | 100.0% | 100% | 100% | 100% | 100% | 100% | 100% |

About 22% of the patients were not on antihypertensives and another 31% on one drug only.

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

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

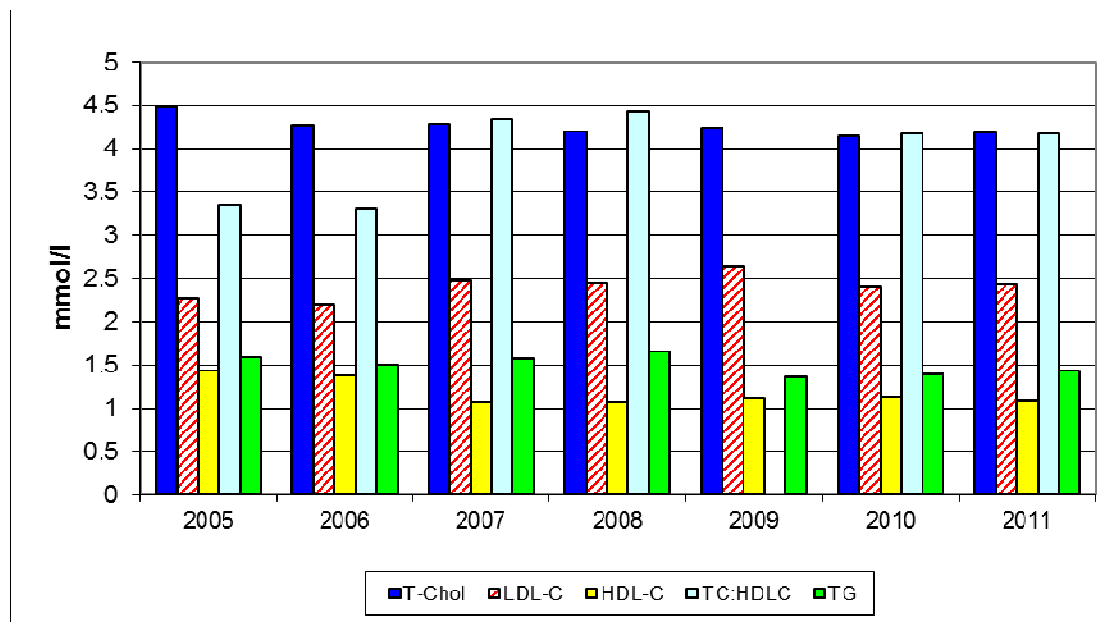
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|
| None | 38.7% | 31.7% | 37.0% | 29.7% | 27.4% | 22.2% | 21.9% |
| Beta blockers | 43.9% | 44.7% | 38.8% | 43.6% | 47.3% | 50.2% | 53.7% |
| Calcium channel Blockers | 31.2% | 36.4% | 33.3% | 43.6% | 43% | 45.9% | 49.8% |
| ACEI / ARB | 26.0% | 30.8% | 26.7% | 33.7% | 37.6% | 36.2% | 32.8% |
| Others | 5.8% | 3.6% | 4.8% | 4.7% | 13.4% | 5.8% | 7% |

These are not mutually exclusive.

L. HYPERLIPIDEMIA

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

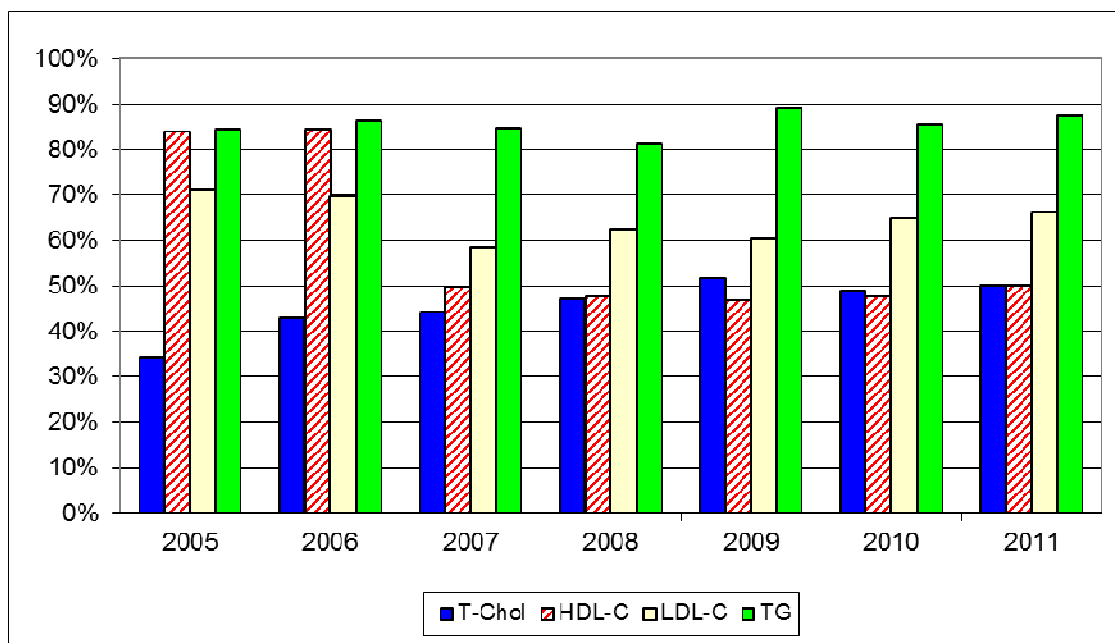
Fig 7L-1: Lipids



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

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

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



The percentage of patients achieving MOH targets for TG (<2.3 mmol/l) remains quite high 86.0%. However, for LDL cholesterol (<2.6 mmol/l) it was 66.2%. Only around 50% of the patients achieved the other targets – total cholesterol (<4.1 mmol/l 50.0% and HDL-cholesterol (>=1.0 mmol/l) 50.0%,

The proportion of patients on drug therapy has increased to 78.1% (157/201). HMG-CoA reductase inhibitors were the most commonly used drug (91.1%),

M. HEPATITIS SEROPOSITIVITY

4.5% are hepatitis B carriers, 4.9% are anti-HCV positive for Hepatitis C antibody. Four patients (1.9%) had received interferon treatment and HCV PCR was tested negative. Two patients (1.0%) are both anti-HCV and HepBsAg positive.

Table 7M-1 : Hepatitis Rates

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------|-------|------|------|-------|-------|------|-------|------|------|------|------|------|
| HepB | 5.8% | 5.7% | 5.7% | 7.5% | 5.5% | 5.2% | 6.2% | 6.7% | 6.4% | 6.5% | 6.3% | 4.5% |
| HCV | 9.4% | 9.7% | 9.2% | 11.5% | 10.9% | 9.8% | 10.6% | 9.1% | 8.7% | 8% | 7.7% | 4.9% |
| HepB & HCV | 1.20% | 1.1% | 1.1% | 1.7% | 1.6% | 1.7% | 1.2% | 1.2% | 1.2% | 1% | 1% | 1% |

VACCINATION

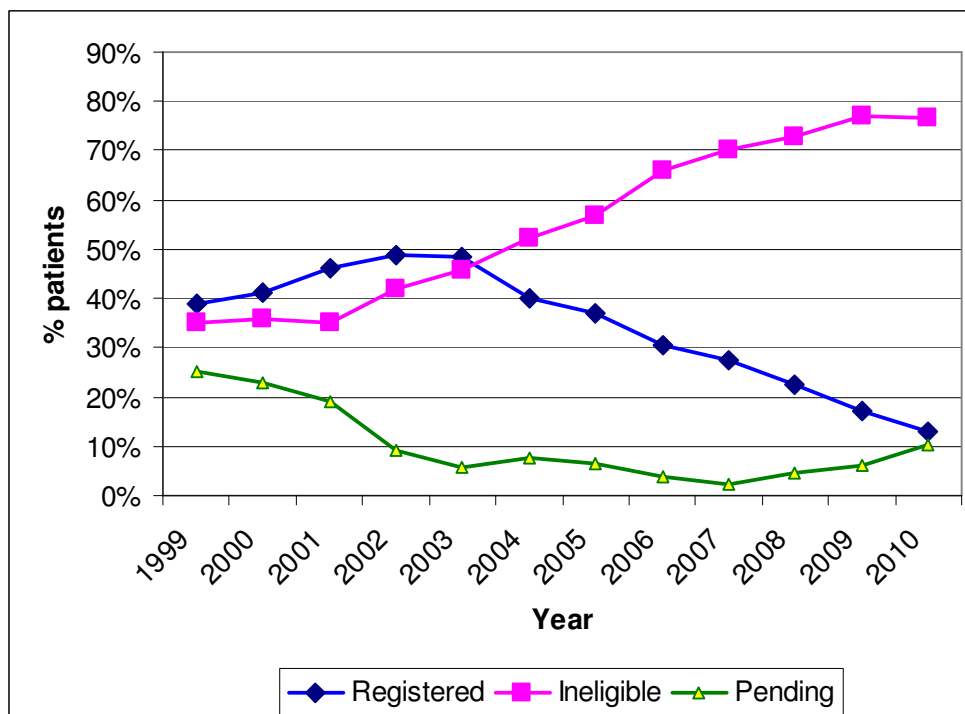
Hepatitis B

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

N. TRANSPLANT WAITING LIST

Only 29 patients (14%) are on the waiting list. More patients (26) have not been assessed with the larger influx of new cases this year. The number of ineligible patients grow as KDF takes in more patients with comorbidities since admission criteria was relaxed.

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



8. CONCLUSION

This year, two thirds of the new patients were diabetic. The remaining patients are also growing older and develop comorbidities as they age.

However, the non-diabetic remains challenged by vascular access issues which accounted for most of their admissions while the diabetic admitted for a larger variety of problems.

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

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

A/PROF CHOONG HUI LIN
MEDICAL DIRECTOR