

INTRODUCTION

The year 2001 saw a slight decline in the new dialysis acceptance rate despite an improved center coverage where 91% of Haemodialysis (HD) centers report to the Registry. The contraction in acceptance rate was seen in the private and the NGO centers. It may reflect the lingering effects of the recent economic slowdowns. The full beneficial impact of the Government subsidy for NGO centers implemented in 2001 is yet to be realized. Under the subsidy scheme non-profit centers get a subsidy of RM50 for each dialysis performed for deserving patients. In return patients should not be charged more than RM60. In addition the government will subsidise 50% of the capital cost for machines for new centers to be developed by non-profit organisations. Renal transplant rate remained unchanged in 2001.

There continues to be a disparity in the level of provision of dialysis services between states in the country. The state with the highest acceptance rate (Johor) accepted 3.4 times as many patients as Sabah which has the lowest rate. Private dialysis centers and Non-profit organizations play important roles in this respect. The high prevalence of low income population and the geography of the state do not encourage private sectors or Non profit organizations to set up HD centers in Sabah. The government through the MOH will have to play a bigger role to redress the imbalance in the states with poor acceptance rates. Acceptance rate by age groups did not change significantly with those in the 55-64 years having the highest acceptance rate. Home Hemodialysis and office HD will soon be phased out as more and more HD centers are opened particularly in Peninsular Malaysia.

Major outcome measures have remained stable. It is imperative that we now pay greater attention to improving the quality care for our HD patients. There are still areas in patient management that can be improved. These include management of anaemia, cardiovascular diseases, calcium and phosphate and nutrition of HD patients. More training programs in specific areas of care have to be developed.

Once again the National Renal Registry thank all contributors for their unrelenting support. We hope to improve the report on Renal transplantation to include more data that will prove useful to clinicians.

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REPORT SUMMARY

1 ALL RENAL REPLACEMENT THERAPIES

- 1.1 At 31st December 2001, 8633 patients were on renal replacement therapy, comprising 7330 on dialysis and 1303 with functioning transplants. 1691 new dialysis patients were accepted in 2001.
- 1.2 The new renal transplant rate was 6 per million population. The overall dialysis acceptance rate decreased to 71 per million population. This reduction was contributed by the decrease in intake of new dialysis patients into NGO and private dialysis centers. Dialysis prevalence rate however increased to 308 per million population.

2 DIALYSIS IN MALAYSIA

- 2.1 Dialysis acceptance rate by state varied between 120 per million state population for Johor Darul Takzim to 35 per million per state population in Sabah.

By age group, dialysis acceptance rate varied between a stable rate of 4 per million child population to a high of 401 per million population for age group 55 to 64 years. Dialysis provision rate for patients older than 65 years was 336 per million population for age, a marginal increase from 331 in 2000..

- 2.2 Males made up 54% of all new dialysis patients
- 2.3 Centre Haemodialysis (HD) accounted for 82% of new dialysis acceptance in 2001 and only 1% each in office and home HD. A larger proportion (16%) were accepted into the CAPD programme.
- 2.4 The proportion of patients with unknown primary disease was 32% in 2001. Diabetic nephropathy remained the commonest cause of ESRD surging to 46% in 2001, chronic glomerulonephritis 8% and obstructive uropathy 2 %.
- 2.5 Overall death rate on dialysis remained at 10%; HD death rate was 9%, and CAPD death rate was at 18%. 34% of deaths were attributed to cardiovascular causes and 15% to sepsis unrelated to peritonitis. 26% died at home.
- 2.6 **Centre survey 2001:** A centre survey was carried in December 2001 to provide up-to-date information on patient and centre census in Malaysia.

There were a total of 8179 dialysis patients in Malaysia giving a dialysis treatment rate of 352 per million population (pmp). Dialysis treatment rate from individual patient reporting had given a rate of 308 pmp.

There were a total of 219 centres, an increase of 23 centres from the previous year with a total of 2244 dialysis machines.

By state, dialysis treatment rate ranged from 106 per million state population in Sabah to 624 pmp in Pulau Pinang. HD capacity to patient ratio ranged from 1.26 in Sabah to 2.39 in Kelantan.

There were 74 private dialysis centers, 61 NGO centers and 70 Ministry of Health(MOH) centers giving HD capacity of 3750, 4150 and 2895 respectively. There were a total of 2223 patients dialyzing in private centers, 2620 in NGO centers and 3102 in MOH centers. Centre HD capacity to patient ration ranged from 1.69 in private to 1.37 in MOH centers to 3.9 in university centers.

3 HAEMODIALYSIS

3.1 Haemodialysis in Government Centres

- 3.1.1 At 31st December 2001, 467 new patients - the highest number noted, were accepted into government HD centers. There were 2324 prevalent patients dialysing in government centres.
- 3.1.2 93% of new patients were accepted into centre HD, 3% into home HD and 4% into so called officer HD. 97% of new patients were financed by the government.
- 3.1.3 Death rate was 9% per year. Cardiovascular disorders, infections and deaths at home were the 3 commonest causes of death at 41%, 19% and 14% respectively
- 3.1.4 In 2001, there were a total of 68 government HD centres, 9 run by Ministry of Defence, 3 university hospital centres and the rest under the Ministry of Health.
- 3.1.5 New HD patients in 2001: Modal age-group 45 – 64 years; 57% males, 37% were diabetics, 5% had HBsAg, and 3% had anti-HCV antibodies.
- 3.1.6 HD patient and technique survival in government centres at 6 months for 2001 were 90% and 87% respectively.
- 3.1.7 Overall, 41% of HD patients were able to work part or full time. 69% had normal quality of life index.
- 3.1.8 **Haemodialysis Practices:** In 2001, 76% were dialysed via wrist AVF, 20% via brachiocephalic fistula. 92% reported no difficulties with their vascular access; only 15% had vascular access complications. Proportion of patients with higher blood flow rates of 300-349 increased from 17% in 1998 to 39% in 2001. Almost all were on thrice-weekly dialysis, 97% on 4 hours per session. Use of cellulosic membrane dialysers decreased further to 22% and synthetic membrane dialyser usage increased to 68%; 84% reused their dialysers six times or more, 17% reused 12 times and 7% more than 12 times. Usage of bicarbonate buffer increased to 93%. Median prescribed KT/V remained at 1.5; and a lower proportion of patients (72%) achieved a KT/V of more than 1.3 compared to 79% in year 2000.
- 3.1.9 **Dyslipidaemia in haemodialysis patients:** This has remained mostly unchanged over the years. In 2001, 67% of HD patients had serum cholesterol concentration < 5.3 mmol/l with median at 4.9 mmol/l. 87% had serum triglyceride concentration <3.5 mmol/l with median at 1.7 mmol/l; 95% had serum LDL concentration <5 mmol/l with median at 2.9 mmol/l; and 94% had serum HDL concentration of < 2 mmol/l with median at 1.1 mmol/l.
- 3.1.10 **Renal bone disease:** In 2001, 93% of HD patients were on oral calcium carbonate, only 4% remained on aluminium hydroxide. Use of vitamin D reduced to 22%. 36% achieved serum phosphate concentration <1.6 mmol/l;

57% had serum calcium concentration between 2.2 and 2.6 mmol/l, and 23% with iPTH between 100 – 250 ng/l. Median PTH concentration was 94 ng/L.

- 3.1.11 **Blood pressure control:** In 2001, 67% required anti-hypertensive therapy. Of these, 62% achieved systolic blood pressure(BP) < 160 mmHg, and 62% a diastolic BP < 90 mmHg. Of the 33% not on anti-hypertensive therapy, 85% had systolic BP < 160 mmHg and 80% diastolic BP < 90 mmHg.
- 3.1.12 **Management of anaemia:** In 2001, 92% of patients were on oral iron supplements. Intravenous iron usage has increased further to 8%. 60% of HD patients were on recombinant erythropoietin with 59% on 2000-4000 units weekly. 76% of those without erythropoietin and 71% on erythropoietin injections had serum iron > 10 umol/l. 85% of patients without erythropoietin and 88% of those on erythropoietin supplements had serum ferritin > 100 ng/l. Only 10% of patients on erythropoietin injections had haemoglobin concentration >12 g/dl, 35% with haemoglobin concentration between 10 and 12g/dl.
- 3.1.13 **Nutritional status:** 58% of HD patients had serum albumin > 40 g/l with 59% with body mass index of between 18.5 and 25kg/m².
- 3.1.14 **Anti-HCV and HBsAg status:** In 2001, patients with anti-HCV antibodies plateaued at 28%. Proportion with HbsAg remained at 6%.

3.2 Haemodialysis in Non-Governmental Organisation (NGO) Centres

- 3.2.1 At 31st December 2001, 2554 patients were on HD in centres managed by NGOs. 587 new patients were accepted into the programme in 2001 compared to 587 in year2000.
- 3.2.3 Death rate in NGO HD centres was 9% in 2001. Deaths at home, cardiovascular disorders and infections were the 3 commonest causes of death at 33%, 26% and 17% respectively.
- 3.2.4 In 2001, there were a total of 62 NGO dialysis centres.
- 3.2.5 New HD patients in 2001: Modal age-group 55-64 years; 53% were males, 48% were diabetics, 5% had HBsAg and 3% had anti-HCV antibodies.
- 3.2.6 HD patient and technique survival in NGO centres at 6 months for 2001 were similar at 96%
- 3.2.7 Overall, 28% of HD patients were able to work part or full time, 25% were homemakers and 7% pensioners. 48% had normal quality of life index.
- 3.2.8 **Haemodialysis Practices:** In 2001, 83% were dialysed via wrist AVF. 92% reported no difficulties with their vascular access; only 12% had vascular access complications. 52% had blood flow rates between 250 and 299 ml/min, 96% were on thrice-weekly and 3% on twice weekly HD. 99% had HD for 4 hours per session. Synthetic membrane usage increased to 52% in 2001. 79% reused their dialysers at least six times, 27% reused eight time

and 10% more than 12 times. Usage of bicarbonate buffer was almost universal at 99%. Median prescribed Kt/V was 1.5; 74% had Kt/V more than 1.3.

- 3.2.9 **Dyslipidaemia in haemodialysis patients:** In 2001, 63% of HD patients had serum cholesterol concentration < 5.3 mmol/l with median at 5 mmol/l. 86% had serum triglyceride concentration <3.5 mmol/l with median at 1.7 mmol/l.
- 3.2.10 **Renal bone disease:** In 2001, 95% of HD patients were on oral calcium carbonate, only 1% were on aluminium hydroxide. Proportion on active vitamin D supplements dropped to 20%. A larger proportion - 36% achieved serum phosphate concentration <1.6 mmol/l; 61% had serum calcium concentration between 2.2 and 2.6 mmol/l and only 13% with iPTH between 100 – 250 ng/l. Median PTH concentration was 29.8 ng/L.
- 3.2.11 **Blood pressure control:** In 2001, 66% required anti-hypertensive therapy. Of these, 56% achieved systolic BP < 160 mmHg, and 96% diastolic BP < 90 mmHg. Of the 31% not on any anti-hypertensive therapy, 78% had systolic BP <160 mmHg and 80% diastolic BP < 90 mmHg.
- 3.2.12 **Management of anaemia:** In 2001, 62% were on recombinant erythropoietin with 54% on 2000 units weekly and 39% on 2000 – 4000 units weekly. 77% without erythropoietin and 71% on erythropoietin injections had serum iron > 10 umol/l. 91% of those on erythropoietin had serum ferritin of > 100 ug/l. 33% of patients on erythropoietin had haemoglobin concentration >10 g/dl with only 6% > 12 g/dl.
- 3.2.13 **Nutritional status:** The proportion of patients with serum albumin concentration of >40 g/l was 33% in 2000. 60% had body mass index of between 18.5 and 25 kg/m² with 17% with BMI <18.5 kg/m².
- 3.2.14 **Anti-HCV and HBsAg status:** In 2001, 18% of patients had anti-HCV antibodies, 6% were positive for HBsAg.

3.3 Haemodialysis In Private Centres

- 3.3.1 At 31st December 2001, 1706 patients were dialysing in private dialysis centres. 455 new patients were accepted for HD in private centers compared to 519 in the year 2000.
- 3.3.3 Death rate in private centres was 11% in 2001. Cardiovascular disorders, deaths at home and sepsis were the 3 commonest causes of death at 41%, 35% and 7% each respectively.
- 3.3.5 New HD patients in 2001: Modal age-group 55-64 years; 56% were males, 52% were diabetics, 4% had HBsAg, 3% had anti-HCV antibody
- 3.3.6 HD patient survival and technique survival in private centres at 6 months for 2001 were similar at 95%.
- 3.3.7 In 2001, 25% were able to work full or part time, 22% were homemakers. 14%

were retirees and 19% were older than 65 years. 52% had a normal quality of life.

- 3.3.8 **Haemodialysis Practices:** In 2001, 77% were dialysed via wrist AVF, 17% via brachiocephalic fistula. 89% reported no difficulties with their vascular access; only 14% had vascular access complications. 80% had blood flow rates between 200 and 299 ml/min. Only 68% were on thrice-weekly dialysis, 27% only had twice weekly dialysis. 88% had 4 hours for session, 10% 4.5-5 hours. The majority – 64% used cellulosic membrane dialysers; only 26% used synthetic membrane dialysers. 7% did not reuse dialysers, 88% reused their dialysers at least three times. Usage of bicarbonate buffer was 94%. Median prescribed KT/V was 1.4; 65% had KT/V more than 1.3.
- 3.3.9 **Dyslipidaemia in haemodialysis patients:** In 2001, 65% of HD patients had serum cholesterol concentration < 5.3 mmol/l with median at 5 mmol/l. 89% had serum triglyceride concentration <3.5 mmol/l with median at 1.6mmol/l.
- 3.3.10 **Renal bone disease:** In 2001, 89% of HD patients were on oral calcium carbonate, only 2% were on aluminium hydroxide and 27% on active vitamin D supplements. 33% achieved serum phosphate concentration <1.6 mmol/l; 60% had serum calcium concentration between 2.2 and 2.6 mmol/l and 23% with iPTH between 100 – 250 ng/l.
- 3.3.11 **Blood pressure control:** In 2001, 68% required anti-hypertensive therapy. Of these, 53% achieved systolic BP < 160 mmHg, and 60% diastolic BP < 90 mmHg.
- 3.3.12 **Management of anaemia:** In 2001, 65% were on recombinant erythropoietin with 30% on 2000 units weekly and 53% on 2000 – 4000 units weekly. 39% of patients on erythropoietin had haemoglobin concentration >.10 g/dl with only 8% with haemoglobin concentration \geq 12 g/dl. About one-fifth still received blood transfusion.
- 3.3.13 **Nutritional status:** Proportion of patients with serum albumin concentration of >40 g/l was 23% in 2001. 57% had body mass index of between 18.5 and 25 kg/m².
- 3.3.14 **Anti-HCV and HBsAg status:** In 2001, 22% of patients had anti-HCV antibodies, 4% were positive for HbsAg.

4. CONTINUOUS AMBULATORY PERITONEAL DIALYSIS (CAPD)

- 4.1 At 31st December 2001, 746 patients were on CAPD. Intake of new CAPD patients was highest at 315 of which 91% were funded by the government.
- 4.3 In 2001, death rate on CAPD was 18%; transfer to HD 12%. Cardiovascular disorders, death at home and sepsis were the main causes of death accounting for 27%, 23% and 20% respectively. CAPD peritonitis accounted for 15% of deaths. The main cause of transfer was peritonitis at 35%.
- 4.4 There were 16 government CAPD centers, one NGO and one private CAPD center..
- 4.5 New CAPD patients in 2001: Modal age-group 55-64 years; 47% males, 41% were diabetics, 4% had HBsAg, 4% were anti-HCV antibody positive.
- 4.6 CAPD patient survival was 92% and technique survival was 88% at 6 months for year 2001.
- 4.7 Overall, 22% of CAPD patients were able to work part or full time. 35% were homemakers and 15% full time students. Only 69% had normal quality of life index.
- 4.8 **CAPD Practices:** In 2001, 99% were on standard CAPD dialysis regime; 57% used the Baxter disconnect system; 43% on a disconnect system by Braun. 95% had 4 exchanges per day and 94% were on 2-litre exchanges
- 4.9 **Dyslipidaemia in CAPD patients:** In 2001, 44% of CAPD patients had serum cholesterol concentration < 5.3 mmol/l with median at 5.7 mmol/l. 80% had serum triglyceride concentration <3.5 mmol/l with median at 2mmol/l.
- 4.10 **Renal bone disease:** In 2001, 75% of CAPD patients were on oral calcium carbonate, only 1% were on aluminium hydroxide and a lesser proportion - 10% on active vitamin D supplements. 60% achieved serum phosphate concentration < 1.6 mmol/l; 59% had serum calcium concentration between 2.2 and 2.6 mmol/l and 20% with iPTH between 100 – 250 ng/l. Median PTH values was 49.5 ng/L.
- 4.11 **Blood pressure control:** In 2001, 77% of CAPD patients required anti-hypertensive therapy. Of these, 75% achieved systolic BP < 160 mmHg, and 58% diastolic blood pressure < 90 mmHg. Of the 23% not on anti-hypertensive therapy, 92% had systolic BP < 160 mmHg and 78% a diastolic BP < 90 mmHg.
- 4.12 **Management of anaemia:** In 2001, 45% of patients on CAPD were on recombinant erythropoietin with 50% on 2000-4000 units weekly and 33% on 2000 units weekly. 11% still received blood transfusions. 80% of patients without erythropoietin and 77% on erythropoietin injections had serum iron concentration of >10 umol/l. 91% of all CAPD patients had serum ferritin concentration > 100 ng/l. 45% of CAPD patients not on erythropoietin had

haemoglobin concentration >10 g/l and 12% had haemoglobin concentration of >12% compared to 38% and 9% respectively for those on erythropoietin.

- 4.13 **Nutritional status:** Only 15% of CAPD patients had serum albumin > 40 g/l compared to 58% of government HD patients. 50% had body mass index of between 18.5 and 25 kg/m². 27% had body mass index > 25 kg/m².
- 4.14 **Anti-HCV and HBsAg status:** The HbsAg status of CAPD patients were constant over the years at 2-3% but the prevalence of antiHCV antibodies had dropped to 3%.

5. RENAL TRANSPLANTATION

- 5.1 At 31st December 2001, there were 1303 functioning renal transplants
- 5.2 Of 138 new renal transplants in 2001, 30 were from living related donors, 38 from cadaveric donors done locally- the highest ever, 5 from commercial living non-related donors; and 63 from commercial cadaveric donors.
- 5.3 In 2001, 2% of transplant recipients died and 3% lost their grafts. Sepsis and cardiovascular diseases were the commonest causes of death accounting for 57% and 21% respectively. Rejection accounted for 38% of graft loss.
- 5.4 There were 42 centres of follow-up for renal transplant recipients.
- 5.5 Modal age group for new transplant recipients in 2001 was slightly older at 45-54 years; 59% were males, 12% diabetics; 3% were HBsAg positive and 12% had anti-HCV antibodies at the time of transplantation.
- 5.6 Six month patient survival in 2001 was 95% and graft survival was 93%.
- 5.7 Overall, 70% of transplant recipients were able to work part or full time, and 17% were homemakers. 95% had normal quality of life index.

METHODS

1. COVERAGE

There were 219 dialysis centres in Malaysia as of December 2001, of which 200 reported data to the Registry. Thus, centre coverage is now to 91%. We assessed completeness of patient ascertainment by comparing the number of patients registered on the Registry patient database at end of year 2001 and patient census data obtained independently from the annual centre survey in December 2001. Based on the patient prevalence estimates calculated from these 2 independent sources of data (308 versus 352 patients/million population), we estimated the patient ascertainment rate by the Registry to be 87.5%.

2. STATISTICAL ANALYSIS

Kaplan Meier method¹ was used to estimate probability of survival and log rank test used to compare survival function. Technique failure is defined as occurrence of death or transfer to another modality of dialysis. Similarly, graft failure is defined as occurrence of death or returned to dialysis.

Annual death rates were calculated by dividing the number of deaths in a year by the estimated mid-year patient population.

For summarizing continuous laboratory data, we have moved away from calculating summary statistics like mean, standard deviation and instead plot the cumulative frequency distribution graph. We are following the approach used by the UK Renal Registry². Cumulative distribution plot shows a listing of the sample values of a variable on the X axis and the proportion of the observations less than or greater than each value on the Y axis. An accompanying table gives the Median (50% of values are above or below it), upper quartile (UQ, 25% of values above and 75% below it) and lower quartile (LQ, 75% of values above and 25% below it). Other percentiles can be read directly off the cumulative distribution plot. The table also shows percent of observations above or below a target value, or with an interval of values; the target value or interval obviously vary with the type of laboratory data.. For example, target value for prescribed KT/V is ≥ 1.3 and that for haemoglobin is ≥ 10 and ≤ 12 g/l. The choice of target value is guided by published clinical practice guidelines, for example, the DOQI guideline; or otherwise they represent consensus of the local dialysis community.

In contrast to other results reported in this report, Tables 2.12 and 2.13 are based on centre survey data rather than individual patient data reported to the Registry. This is to provide an up to date information on patient and centre census in the country and thus overcome the inevitable time lag between processing individual patient data and subsequent reporting of results. The survey was conducted in the month of December 2001. Centre response rate to the survey was 99.5% (218/219 responded). Standard error estimates are not reported because no sample was taken. Results on distribution by state are also expressed in per million-population since states obviously vary in their population sizes. State population data are based on 2001 census population projection. It is very difficult to estimate the amount of cross boundary patient flow; this source of

error is therefore not accounted for in computing state estimates. However, we minimise the bias by combining states (Selangor and Wilayah Persekutuan, Kedah and Perlis) based on geographical considerations. HD treatment capacity is derived by assuming on average patients underwent 3 HD sessions per week and a centre can maximally operate 2.5 shifts per day. A single HD machine can therefore support 5 patients' treatment. Obviously HD treatment capacity is calculated only for centre HD. The ratio of the number of centre HD capacity to number of centre HD patients is a useful measure of utilisation of available capacity. One centre did not respond to the survey and another 3 responding centres had missing data on number of patients on dialysis at their centres. As the objective of this analysis is to estimate the total amount of dialysis provision in the country, we obviously cannot simply ignore the missing data and confine the analysis to available data. We therefore imputed the missing data based on regression imputation model and guided by the imputation principles described by Little³. The imputation model included sector (public, NGO or private), state, year of operation, number of dialysis machine and personnel. These are well known correlates of level of dialysis provision in a centre. The imputations are then drawn by predictive mean matching³. Each centre with missing data was match with each respondent on its predicted values. We then use the data of the centre with the closest match to impute the missing data.

References:

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2. UKRENALREG 1998 UK Renal Registry, Bristol, UK.
3. Little RJ. Missing data adjustments in large surveys. *J Business Econ statistics* 1988;6:287-301

GLOSSARY

CAPD	Continuous Ambulatory Peritoneal Dialysis
CPD	Continuous Peritoneal Dialysis
ESRD	End Stage Renal Disease
HD	Haemodialysis
LQ	Lower Quartile
MOH	Ministry of Health
NGO	Non-Government Organisation
pmp	per million population
QOL	Quality of Life
rHuEpo	Recombinant Human Erythropoietin
RRT	Renal Replacement Therapy
UQ	Upper Quartile