

An Up to Dated Cost of Renal Replacement Therapy in Turkey

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Introduction

In recent years, costs of medical expenditures are increasing rapidly and the climbing costs for renal replacement therapy (RRT) make it very difficult for countries such as Turkey to afford. Turkey is one of the five European countries (including Germany, Italy, France,

and England) to have the highest number of patients on regular hemodialysis (1). According to the latest Turkish Society of Nephrology national registry report the total number of patients undergoing RRT in Turkey is 32 036 (Table 1) (2).

Table 1. Renal replacement therapy follow up in Turkey, February 2005

Hemodialysis	25 321
Transplantation	3395
CAPD	3320
Total	32 036

CAPD, continuous ambulatory peritoneal dialysis

We previously reported the cost of RRT in Turkey (3). Health expenses, with respect to national budget, made up 3.5% in 2001. Total cost of RRT was US\$488 958 709 per year, this corresponds to 5.5% of health expenses. This rate

fluctuates between 1.5-3.5% in France, Germany and other European countries. Approximately 99.8% of the RRT expenses are paid by insurance, which are heavily supported by the government (Table 2).

Table 2. Percentage of total centre hemodialysis patients covered by various health security and assurance organizations and schemes

Organization	Percentage of HD patients
Health Ministry Hospitals	26.6
University Hospitals	10.6
Social Security Agency for Labourers Hospitals	8.4
Private Dialysis Centers	54.2

Source: Health Ministry of Turkey (2004). HD, hemodialysis

The main factors that increase the cost of RRT in Turkey are inappropriate use of expensive drugs, the reluctance for dialyser reuse, and the small number of transplantations (4).

In 2004, measures taken by government greatly reduced drug costs. In this report, we recalculated the current cost of RRT.

Materials and methods

Cost-related data had been accumulated in 2001, for 54 patients (mean age, 45.5 years; 31 M/23F) on peritoneal dialysis, 50 patients (mean age, 44.2; 36 M/14F) on hemodialysis (HD) and 135 renal transplant recipients

(mean age, 32; 85 M/50F). Up to date costs were recalculated using the current expenses and all cost data are expressed in US\$ (December 2004 parity; 1 US\$=1 400 000 Turkish liras). The data were obtained from the nephrology, dialysis and transplantation departments of the Cerrahpasa Medical Faculty, Istanbul Medical Faculty, Marmara Medical Faculty, and a private dialysis center (Ren Med); all in Istanbul, Turkey.

The HD costs included staff salaries (physicians, nurses, technicians, and auxiliaries), dialysis equipment, arteriovenous fistulas, specific dialysis-related expenses (dialysers, lines, etc.) drugs, outpatient follow up and hospitalization costs (Table 3).

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Table 3. Annual hemodialysis costs in HD center per patient

Hemodialysis costs	US\$
Dialyser, arterial venous line and stick, rising and priming of dialyser, dialysate, heparin, electricity, depreciation, rent for dialysis center, transportation	8 661
Staff	1 032
AV fistula, hospitalization, hemodialysis catheter and prosthesis	1 217
Erythropoietin	3 769
Other drugs (antihypertensive, antibiotics, vitamin D, phosphor binding therapy, etc.)	4 008
X-ray, ECG, laboratory	1 530
Total	20 217

The cost of continuous ambulatory peritoneal dialysis (CAPD) also included staff salaries, procedural expenses (patient education, preparation and operation for catheter insertion, dialysis fluid, etc.), laboratory expenses

(peritoneal equilibrium test, biochemical analysis, etc.) and expenses for drugs, outpatient follow up and hospitalization (Table 4).

Table 4. Annual cost for a CAPD patient

CAPD cost	US\$
Dialysate (for APD, this cost is 24.5% more)	13 641
Staff	1 194
Catheter (including cuff) and implantation	710
Transportation, outpatient clinic control	475
Erythropoietin	1 412
X-ray, ECG, laboratory	1 195
Other drugs (antihypertensives, vitamin D, etc.)	814
Hospitalization (for some medical problems such as peritonitis, drainage problems, cardiovascular problems for over hydration) and outpatient control	587
Total	20 028

APD, automated peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; ECG, electrocardiogram.

In Turkey, 62.8% of HD patients and 56.7% of CAPD patients are using erythropoietin (EPO) (2). The average weekly EPO dose used in our study group was 6000 IU for HD patients and 2000 IU for CAPD patients. Four types of dialysis membranes in HD patients (54% synthetic, 35.8% semi-synthetic, 8.9% high-flux, and 1.3% cuprophane) were used (2). The average cost for a dialyser was US\$15. The calculations for the overall cost of EPO and dialyser in Turkey were based on these values.

In Turkey, 72.1% of renal transplantations are from living-related donors and 27.9% are cadaveric in 2004 (2). Transplantation costs included the preparation of patients and donors, the surgical operation itself, the staff salaries, and laboratory, drugs, outpatient clinic and hospitalization expenses. The total costs for transplantation was calculated separately for the first and second years (Table 5,6).

Table 5. Annual kidney transplantation cost per patient in the first year

Kidney transplantation cost	US\$
Preparation	2 750
Operation	1 150
Staff	1 143
Routine immunosuppressive drugs (CsA, AZA, FK-506, Mycophenolate mofetil, prednisolone)	10 348
Outpatient clinic (Biochemistry lab, USG, scintigraphy)	1 644
Other drugs	856
Hospitalization, induction and rejection therapy (Steroid, monoclonal antibodies: antilymphocyte globulin, antithymocyte globulin, polyclonal antibodies, OKT3 and plasmapheresis)	2 915
Total	20 806

OKT3, muromonab-CD3; USG,ultrasonography.

Table 6. Annual kidney transplantation cost per patient in the second year

Kidney transplantation cost	US\$
Hospitalization	750
Staff	644
Routine immunosuppressive drugs	4 170
Other drugs	914
Outpatient clinic	1 142
Laboratory, X-ray, USG, scintigraphy	1 067
Total	8 687

USG, ultrasonography.

The costs values are expressed as mean \pm SD. The student's t-test and ANOVA were used when appropriate. $p < 0.05$ was accepted as being statistically significant.

Results

The annual cost of hemodialysis per patient is US\$20 217 \pm 1602 (Table 3). The largest part of this cost (dialyser, dialysate, electricity, equipment wear costs, staff salaries and rents for the dialysis center) is directly paid to the dialysis centers. The majority of the hemodialysis expenses are for EPO and dialysers.

The annual cost of CAPD per patient is US\$20 028 \pm 865 (Table 4), and the majority of the CAPD expenses are spent on dialysate and staff costs.

The majority of the kidney transplantation costs are spent to immunosuppressive therapy. Because of the cost of induction therapy, the cost of cadaveric transplantation nearly matched those of living donor transplantation. The annual cost of transplantation per patient is US\$20 806 \pm 1770 for the first year and US\$8 687 \pm 415 for the second year (Table 5, 6).

Total annual expenses for HD, CAPD and transplantation are listed in Table 7.

Table 7. Total annual expenses of HD, CAPD and transplantation

Treatment modality	Calculation	Cost (US\$)
HD	25 321 X 20 217	511 914 657
CAPD	3 320 X 20 028	66 492 960
Tx (first year)	665 X 20 806	13 835 990
Tx (second year)	2 730 X 8 687	23 715 510
Total	615 959 117	

HD, hemodialysis; CAPD, continuous ambulatory peritoneal dialysis; Tx, transplantation.

Moreover, the comparisons of cost values in 204 with that in 2001 are seen in table 8.

Table 8. Comparative costs of three RRT modalities

Treatment modality	2001(US\$)	2004(US\$)	p
HD	22 759±1804	20 217±1602	<0.0001
CAPD	22 350±966	20 028±865	<0.0001
Tx (first year)	23 393±1991	20 806±1770	<0.0001
Tx (second year)	10 028±480	8 687±415	<0.0001

HD, hemodialysis; CAPD, continuous ambulatory peritoneal dialysis; Tx, transplantation.

Discussion

An estimated incidence of end stage renal disease (ESRD) in Turkey is 120 per million patients each year (5). Hemodialysis is main treatment modality of ESRD patients. Government-supported insurance companies pay health expenses in the majority of HD patients and in all CAPD and Transplantation patients. Among the three RRT modalities, renal transplantation is the preferred one because it is the most cost-effective and provides a better quality of life. Moreover, the mortality rate is lower than dialysis. According to 2001 National Registry, gross mortality rate was 9.4% on HD and 1.3% in renal transplantation (6).

In the second year of transplantation, the costs are even lower because there are no expenses for preparation and less rejection prevention therapy is required.

The costs for HD were not different than those for CAPD. HD costs are an economic burden for developing countries. Dialyser reuse in Turkey is not conducted although in USA dialyser reuse is conducted in 82% of the HD patients and in Singapore and Thailand the reuse frequency is 97 an 100%, respectively (7). Furthermore, use of recombinant EPO and other expensive drugs, together with AV fistula problems raise the costs of HD. EPO is caused 48.4% of medication costs. EPO cost for one vial of 4000 IU is US\$42 in 2004; this cost was US\$70 in 2003. Total expenses of EPO are decreased in last year because of this cost reduction.

In CAPD, the use of expensive dialysate and peritonitis frequency influences the costs of CAPD. EPO use in CAPD is less frequent compared with HD, 62.8% versus

56.7% respectively (2) but EPO still remains a main factor to the increasing costs.

In Turkey, the most frequent causes of ESRD are diabetes, hypertension and glomerulonephritis with their frequency being 23.1, 19.8 and 16.3% respectively (2). Early detection of these diseases is as important as their optimal treatment. Early referral to a nephrologist can decrease costs of RRT.

Furthermore, there are other factors that reduced costs of dialysis treatment. In developed countries, such as England, number of dialysis patients is limited because of limited hospital budget (8,9,10). Additionally, in patients with poor prognosis (i.e. patients with metastatic malignancy, patients with multiple co-morbidity) a decision to not start dialysis should be considered.

EPO and other expensive drugs must be used according to national guidelines and their use must be strictly controlled. The prescription of these drugs should be made under the supervision of a nephrologists or a competent professional. Membrane reuse should be adapted in Turkey in order to reduce RRT costs. Although cheaper than HD treatment in a private center (11), home HD treatment has not been initiated yet in Turkey. Moreover, the number of transplantation should be increased and pre-emptive transplantation would also help to reduce costs.

Patient based yearly costs for RRT in 2004 are lower than that of 2001. This reduction is mainly due to decreased drug costs. In Turkey during 2004, EPO and other expensive drug prices were reduced about 20%. Due to new regulations, upper price limit of these drugs in Turkey cannot be higher than those of a European Union member

country with the lowest drug prices. Moreover tax reduction was also reduced the cost of drugs. In summary, the total cost of RRT in Turkey is calculated as being US\$615 959 117 in 2004. This corresponds to nearly 3.5% of Turkey's total health expenditure. Patient based cost of RRT is decreased. However total cost of RRT is raised progressively because of increased number of ESRD patients.

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