Global dialysis perspective: Brazil
Dialysis management and funding in Brazil

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Brazil, the largest Latin American country, ranks fifth in the world by both geographic area and population (209.469 million inhabitants in 2018). The annual rate of population growth is 0.82% (1). The population has a mixed ethnicity with 44% of them self-declared as of white skin color; 10.5% of the inhabitants are over 65 years and life expectancy at birth is 75.5 years (1). Although the country has experienced great social and economic development over the last decades, notable inequalities are still present. The southern and southeastern regions concentrate most of the economic resources, and industrial, technological and health care capabilities. The gross national income per capita was US$ 9,140 in 2018. The total expenditure on health per capita in 2016 was US$ 796, corresponding to 9% of the gross national income (2).

In 1974, the Brazilian Public Health System recognized chronic dialysis as a treatment for end-stage kidney disease (ESKD) initiating the reimbursement of the procedure. The implementation of a unified public health system in 1993 was a cornerstone in the assertion of the creation of a countrywide permanent program to integrally financing the chronic maintenance dialysis treatment to all ESKD patients (3). From then on, the program size, and the number of patients and clinics have progressively increased. Over the years, Brazil has been ranked third in the world in the number of patients undergoing dialysis.

The Brazilian Society of Nephrology has been annually monitoring the epidemiologic data from these patients since 1999 through a national dialysis registry (4,5,6). In the last surveys the response rate of the clinics has been around 40%, so caution should be exercised regarding data interpretation. Although there is universal chronic dialysis coverage in Brazil, access to care is not uniform. Some renal failure patients particularly the oldest ones (7), those of lower social class, or living far from health care centers with dialysis facilities, particularly in the north and northeast regions of the country, may not receive timely treatment. There is still considerable room for improvement regarding the integration of primary care facilities with more advanced health care centers.

In July 2018, there were 133,464 patients on maintenance dialysis, corresponding to an average annual increase of 6.6% in the last 5 years (5,6) (Fig. 1). As for the therapy modality, 92.3% were on hemodialysis (HD) and 7.7% on peritoneal dialysis (PD). Overall, 89.9% were on conventional in-center
dialysis (4h, 3 times/wk.), 2.4% on in-center more frequent dialysis (≥4 times/wk.), and 0.1% on home HD (Table 1). Home dialysis is restricted to automated PD (APD) since the home HD activity is incipient in the country. Most patients (64.5%) were in the 20-64 years age group, 1.2% were <20 years old and 34.3% were ≥ 65 years old. Fifty-eight percent of the patients were male. The major reported primary renal diseases were hypertension 33.9%, diabetic nephropathy 30.8%, glomerulonephritis 9.1% and polycystic kidney disease 4%. The proportion of HD patients using arteriovenous fistula was 73.8%, central venous catheter 23.6%, and graft 2.6%. At the start of the dialysis program, up to 65% of patients used a central venous catheter as the vascular access (8).

The overall estimated prevalence rate of dialysis treatment was 640 patients per million population (pmp), ranging from 448 pmp in the north to 738 pmp in the southeast region (Fig. 1,2). The prevalence rate tended to increase in all regions over the years, from 499 pmp in 2013 to 640 pmp in 2018 (28.3%), an average annual increase of 28.2 pmp. Most patients were on dialysis in the states of São Paulo, Minas Gerais and Rio de Janeiro (southeastern region) (Figure 2). The overall prevalence of renal replacement therapy including subjects on dialysis or with a functioning renal graft was 876 pmp in 2018, an estimate near to that of several western European countries (9).

The number of patients starting dialysis in 2018 was estimated at 40,307, yielding an incidence rate of 194 pmp (ranging from 142 in the north to 221 in the southeast). The incidence rate has increased in the past years. Forty percent of the incident patients had diabetic nephropathy. As for the prevalent patients, the last result of hemoglobin level was <10 g/dL in 29%, serum parathormone was >600 pg/mL in 18% (5) and cardiovascular disease was reported by 7.3% of them (registry data) (8), the percentages of positive serology for hepatitis C, hepatitis B, and HIV were 3.2%, 0.7%, and 0.9%, respectively. The majority of susceptible patients receive hepatitis B vaccination at the beginning of the dialysis program. Notably, the serum positivity for the hepatitis C virus has consistently dropped in the past years (4-6).

The percentage of patients using selected medications were: 77% erythropoietin, 50% intravenous iron, 42% sevelamer, 29% calcitriol, 11% cinacalcet, and 6% paricalcitol. An estimate of 31,226 patients (24%) was on
the deceased donors’ waiting list by July 2018. The estimated number of deaths in 2018 was 25,187, yielding a crude death rate of 20% which has remained stable during the past years despite the increasing proportion of elderly and patients with comorbidities.

**Human resources and capabilities**

The number of dialysis centers has progressively increased in the country, reaching 781 in 2018, distributed mainly in the southeast (47%), south (20%) and northeast regions (18%); only 6% were in the north region. Dialysis centers were mainly private (72%). Forty-eight percent of the units were hospital-based. Most units assisted patients reimbursed by either the public system or private health care insurances (70%) whereas 18% and 12% cared only for patients covered by the public system and private health insurance, respectively. Dialyzers were reused in most hemodialysis units, except for subjects with positive serology for hepatitis B, C or HIV. Regarding the dialysis machine vintage, 9% had less than 1 year, 47% between 1-6 years and 44% more than 6 years. All dialyzers’ membranes used were of synthetic material. 81.5% of the HD patients had a Kt/V ≥1.2 in the last month (4).

There were about 4030 nephrologists in the country (19.3 pmp) in 2018. Ninety-five percent of all nephrologists working in dialysis units were national board-certified. The average number of patients in the dialysis unit per nephrologist was 26:1, reaching 33:1 in the north region and 23:1 in the midwest (23:1). Typically, the nephrologist stays in the unit during the whole dialysis procedure and personally assists the patients whenever necessary. Physician office visits are scheduled once a month. The nephrology-licensed nurse to patient ratio per dialysis shift was about 30:1; the corresponding number for patient care technicians was 2-4:1. Each dialysis unit is required to have a dietician, a psychologist and a social worker in the permanent staff.

**Funding for dialysis treatment**

In 2014, the government established more structured guidelines and financial incentives encompassing the assistance of patients with chronic kidney disease at earlier stages. The government spends about 4% (US$ 1.36 billion) of the annual budget of the Ministry of Health in the treatment of patients
undergoing renal replacement therapy. Overall 80% of the patients on maintenance dialysis are financed by the public health system and 20% by private health insurance companies. The relative contribution of the latter has increased in the past years. Table 2 shows the distribution of patients by dialysis therapy according to the financing source.

Public system reimbursement per HD session was US$ 53 (US$ 689/mo.); for APD it was US$ 780/mo. and for continuous ambulatory PD (CAPD) US$ 612/mo. in 2018 (Brazilian reals converted into USD based on the average exchange rates for 2018; US$ 1.00 = R$ 3.68). The government does not fund home HD. Compared to HD, the lower rate of PD use in the country cannot be explained by differences in reimbursement. The corresponding average estimates for private health insurers were US$ 105 (US$ 1365/mo.), US$ 1064, and US$ 1030, respectively. These values of reimbursement are intended to cover medical and nonmedical items. Aside from these values, the dialysis centers receive for the routine laboratory exams. Besides, all patients are eligible to receive directly from the government, without expenses, medications such as erythropoietin, sevelamer, calcitriol, and cinacalcet, if clinically indicated.

Using these estimates the annual costs per patient on maintenance HD would be US$ 8268 and US$ 16380 per year in 2018 in the public and private insurance perspective, respectively. If the costs of the mentioned medications were added, these estimates would increase by at least 40%. In an extensive cost evaluation analysis carried out in 2009, including most direct and indirect costs we estimated that the annual cost was US$ 28570 and US$ 27158 per patient-year for HD and PD, respectively (10). Recently, many dialysis managers have sold their units arguing that the government reimbursement rate for HD sessions is too low and falls short of the needs. Concomitantly, using a more efficient management, large multinational dialysis organizations (e.g. DaVita, Fresenius, and Diaverum) have acquired many dialysis units, increasing their presence in the country (about 15% of the units).

Conclusion

There has been a continuous increase in the prevalence and incidence rates of maintenance dialysis treatment in Brazil. The costs with the procedures continue to rise and there is an enormous economic burden for the Government
to maintain the program. There is a permanent challenge to develop a more cost-effective and economically sustainable treatment for those with advanced disease, guarantee access to treatment, and keep providing a high quality of care.

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Table 1. Percentage of patients according to dialysis modality and type of financing, 2018.

| Dialysis modality          | Public System % | Private Insurance % | Total % |
|----------------------------|-----------------|---------------------|--------|
| Conventional HD            | 91.7            | 82.7                | 89.9   |
| Daily HD (≥ 4x/wk.)        | 0.4             | 10.6                | 2.4    |
| Home HD                    | 0.1             | 0.1                 | 0.1    |
| CAPD                       | 2.1             | 1.1                 | 1.9    |
| APD                        | 5.7             | 5.9                 | 5.7    |
| IPD                        | 0.1             | 0                   | 0.1    |
| Total                      | 100             | 100                 | 100    |

HD: hemodialysis, CAPD: continuous ambulatory peritoneal dialysis, APD: automated peritoneal dialysis, IPD: intermittent peritoneal dialysis
Table 2. Characteristics of dialysis treatment in Brazil, 2018.

| Number of dialysis patients (N/1,000 general population) | 133,464 (0.640) |
|----------------------------------------------------------|-----------------|
| Patients on home dialysis, %                             |                 |
| Automated or continuous ambulatory peritoneal hemodialysis| 7.6             |
| Hemodialysis                                             | 0.1             |
| All dialysis sessions covered by insurance                | Yes             |
| Patients have out-of-pocket expenses?                     | No              |
| Unit location, %                                          |                 |
| Hospital-based                                           | 48              |
| Freestanding                                             | 52              |
| Economic purpose of the dialysis unit                     |                 |
| For-profit                                               | Yes             |
| Non-profit                                               | -               |
| Reimbursement per hemodialysis session, US$               |                 |
| Public                                                   | 53              |
| Private insurers                                         | 105             |
| Dialysis staff who deliver dialysis                       |                 |
| Nurses                                                    | yes             |
| Patient care technicians                                  | yes             |
| Patient:registered nurse ratio in the unit                | 35:1            |
| Average length of dialysis session, h                     | 4               |
| Times per month a patient is seen by nephrologist during session | 12             |
| Vascular access to hemodialysis, %                        |                 |
| Arteriovenous fistula                                     | 73.8            |
| Vascular graft                                            | 2.6             |
| Central venous catheter                                  | 23.6            |
Legend to Figures

Figure 1. Number of patients and prevalence rates of dialysis treatment in Brazil, by year, 2000-2018.

Figure 2. Geographic variation in the prevalence rate of dialysis treatment (per million population, pmp), by state in Brazil, 2018.

Abbreviations:
AC: Acre, AL: Alagoas, AP: Amapá, AM: Amazonas, BA: Bahia, CE: Ceará, DF: Distrito Federal, ES: Espírito Santo, GO: Goiás, MA: Maranhão, MG: Minas Gerais, MT: Mato Grosso, MS: Mato Grosso do Sul, PA: Pará, PB: Paraíba, PE: Pernambuco, PI: Piauí, PR: Paraná, RJ: Rio de Janeiro, RN: Rio Grande do Norte, RS: Rio Grande do Sul, RO: Rondônia, RR: Roraima, SC: Santa Catarina, SP: São Paulo, SE: Sergipe, TO: Tocantins.
Figure 1
Prevalence rate (pmp) of dialysis treatment, 2018

Data not available

< 400

400 - 499

500 - 599

600 - 699

700 - 799

≥ 800

Figure 2