

Nephrology Worldwide Nephrology in Indonesia

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Submission date: 05-Jun-2021 08:01AM (UTC+0700)

Submission ID: 1600680417

File name: 20._Nephrology_WorldwideNephrology_in_Indonesia.pdf (741.32K)

Word count: 9137

Character count: 50192



Nephrology in Indonesia

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Area ¹	1,913,578.68 km ²
Population ²	267,663,435 (2018)
Capital	Jakarta
Three most populated cities ³	DKI Jakarta West Java Banten
Official language	Bahasa Indonesia
Gross Domestic product ²	1.042 trillion USD (2018)
GDP per capita ²	3893.596 USD (2018)
Human Development Index (HDI) ⁴	0.694 (2017)
Official currency	Indonesian rupiah (Rp, IDR)
Total number of nephrologists	144
National Society of Nephrology	Indonesian Society of Nephrology (InaSN)/Perhimpunan Nefrologi Indonesia (Pernefri) www.pernefri.org
Incidence of end-stage renal disease	2018 – 251 pmp
Prevalence of end-stage renal disease (on dialysis)	2018 – 499 pmp
Total number of patients on dialysis (all modalities)	2017 – 79,629 2018 – 134,247
Number of patients on hemodialysis	2017 – 77,892 2018 – 132,142
Number of patients on peritoneal dialysis	2017 – 1737 2018 – 2105
Number of renal transplantations per year	2017 – 141 2018 – 142

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18 Introduction

Indonesia is the world's fourth most populous country with an estimated population of 270 million in 2019, 10 million higher than the 2016 estimate of 219 million [1]. Indonesia nowadays is a developing country facing a double burden of infectious and chronic noncommunicable diseases. In the two decades since 1990, chronic noncommunicable diseases have been topping the national chart of the causes of death and disease [2].

Chronic kidney disease (CKD) is currently one of the major health challenges faced by Indonesia. Impaired kidney function was the number ten risk factor contributing to dis-

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J. A. Moura-Neto et al. (eds.), *Nephrology Worldwide*, https://doi.org/10.1007/978-3-030-56890-0_22

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ease burden in 2016 [2]. Meanwhile, end-stage renal disease (ESRD) was the third largest healthcare expense, after heart disease and cancer, in nationwide health insurance scheme conducted by the Indonesian National Health Insurance System (INHIS) [3]. With the current dialysis coverage, more than 1.5 trillion IDR (1 USD = ~13,500 IDR) was spent in 2014.

A nationwide household survey in 2018 on basic health showed that 0.38% of the Indonesians are at risk of developing ESRD [4]. The data shows an increasing number since the 2013 survey, which showed that 0.2% of the population were at risk [5]. The survey is consistent with the ESRD findings from the Indonesian Renal Registry (IRR), an annual report that describes the CKD statistics in Indonesia. The 2018 report shows that the incidence rate of ESRD increased from 108 pmp in 2014 to 251 pmp in 2018. Meanwhile, the prevalence rate increased from 158 pmp in 2014 to 499 pmp in 2018 [6]. The increased prevalence and incidence of ESRD prompted the increased demand for renal replacement therapy (RRT), which consisted of three options commonly available: hemodialysis (HD), peritoneal dialysis (PD), and renal transplantation.

The growing burden of CKD and consequent increased need for RRT in Indonesia provides challenges for the nation's healthcare professionals in nephrology.

A Short History of Indonesian Society of Nephrology (InaSN)

The development of the medical fields on nephrology and hypertension in Indonesia is inseparable from the historical development of internal medicine at the Faculty of Medicine of Universitas Indonesia. After the end of the Dutch colonization, the Department of Internal Medicine at the Dr. Cipto Mangunkusumo General Hospital, Faculty of Medicine Universitas Indonesia, was led by Dr. Aulia, an internist who had received his education during the Dutch colonization at the School tot Opleiding van Inlandsche Artsen (STOVIA), which means "School for Native Physician," in 1949–1955.

In order to keep up with the ever-growing global development of internal medicine, some experts felt that it was necessary to pay greater concern on the medical fields of specific body organs. Therefore, branches of internal medicine subspecialties were developed, such as pulmonology, cardiology, nephrology, hepatology, etc.

For nephrology and hypertension, Dr. Aulia appointed Dr. Oei Eng Tie to give special attention for renal diseases and hypertension cases. The efforts were then continued by Dr. Busjra Zahir. Medical service and outpatient care for kidney

diseases and hypertension were performed at the outpatient clinic of Dr. Cipto Mangunkusumo General Hospital twice a week. Later on, Dr. Zahir was elected to be the rector at the University of Andalas in Padang, West Sumatera; therefore, the clinic was then led by Dr. R. P. Sidabutar. Afterward, the Division of Nephrology and Hypertension was established and operated under the supervision of the Department of Internal Medicine in 1966.

The main concern in nephrology at the time was kidney failure. In order to manage the problem, the development of PD care was initiated in 1969. Only after the arrival of the first dialysis machine from abroad in 1970, the first HD was performed. Starting in 1971, the chronic HD program officially started.

The development of nephrology care in Jakarta was then followed by other big cities in Java and Sumatera. Experts in internal medicine from Jakarta branch moved out to other cities and became pioneers and founders of local universities and faculty of medicines such as in Yogyakarta, Surabaya (East Java), Semarang (Central Java), Bandung (West Java), and Medan (North Sumatera). A further increase in the number of internists led to the development of nephrology and hypertension care in Makassar (South Sulawesi), Manado (North Sulawesi), Malang (East Java), Solo (Central Java), Padang (West Sumatera), and Denpasar (Bali).

The Faculty of Medicine of Universitas Indonesia, located in the capital city of Jakarta, had become a role model in nephrology for other areas alongside Universitas Airlangga in Surabaya. Furthermore, the cities maintained good relationships with experts from the Netherlands and the United States of America (USA) to support the growing nephrology and hypertension care of both universities. This was followed by networking with Australia and other neighboring countries. The event of the First Asian Colloquium in Nephrology, which was held in Singapore in 1974, was attended by many Indonesian physicians who had their main interest in nephrology and hypertension.

After receiving an invitation from the First Asian Colloquium in Nephrology in Singapore 1974, Dr. R. P. Sidabutar, through the Indonesian Society of Internal Medicine (InaSIM), urged the local InaSIM branches throughout Indonesia to send their delegations to attend the event. Senior experts in internal medicine of some big cities in Java and Sumatera sent off their assistants to participate in the event. After witnessing that most participants were sent by a scientific organization in nephrology from their countries, Dr. R. P. Sidabutar encouraged experts and doctors with interests in nephrology to form a scientific organization, with the hope of shaping a better nephrology care in Indonesia.

October 5, 1976, was a historical day, and, though there were only ten doctors who had interest in nephrology and hypertension from Jakarta, Bandung, Semarang, Surabaya, and Medan, the Indonesian Society of Nephrology (InaSN) was founded at Sari Pan Pacific Hotel in Jakarta, which was then acknowledged by the Indonesian Medical Association (IMA) as a society of doctors with common interest on nephrology and hypertension.

Members of the society included 53 members from Jakarta, who were Dr. R. P. Sidabutar, Dr. Pudji Rahardjo, Dr. H. M. S. Markum, Dr. Roemiati Oesman, Dr. Jose Roesma, and Dr. Enday Sukandar from Bandung, West Java; Dr. Imam Parsoedi from Semarang, Central Java; Dr. I Made Sukahatya and Dr. Soewanto from Surabaya, East Java; and Dr. Harun Rasyid Lubis from Medan, North Sumatra, the only member from outside of Java. On the first InaSN Congress, October 5, 1976, the Committee of InaSN was officially introduced as well as a plan of drafting bylaws.

The early development of InaSN cannot be separated from the role of InaSIM and Dr. R. P. Sidabutar, who was at that time the medical education chief in InaSIM. Dr. R. P. Sidabutar tried to establish interests on nephrology and hypertension, particularly with internists who lived outside Jakarta, by giving lectures in nephrology and hypertension. Every time they visited other areas, Dr. R. P. Sidabutar and his assistants, such as Dr. Pudji Rahardjo, Dr. H. M. S. Markum, and Dr. Jose Roesma, were always on the search for doctors who had interest in pursuing further education in nephrology and hypertension. They subsequently sent those doctors to the InaSN 43 headquarters that were located in the 2nd Pavilion of Dr. Cipto Mangunkusumo General Hospital, Jakarta.

Thanks to the efforts made by Dr. R. P. Sidabutar, InaSN has progressed and soared to international level with his persistent efforts since 1965, by building correspondences with experts in nephrology worldwide, including from the Netherlands, England, Germany, and Japan, and establishing networking by sending his assistants to have further education abroad. His persistence and diplomatic skills in establishing networks with foreign countries had propelled InaSN into the international realm with ease. On the event of the Second Asian Colloquium in Nephrology in 1976 in Bangkok, InaSN participated as an organization of nephrology and hypertension representing Indonesia. It was then officially accepted as a member of International Society of Nephrology (ISN) in Montreal, Canada, in June 1978 as stipulated in the congress.

Meanwhile, InaSN had its homeward progress to other big cities such as in Bali, Sulawesi (Makassar and Manado)

and Sumatera (Medan, Padang, and Palembang), and Java (Jogjakarta and Solo). The second InaSN Congress was held on September 27, 1981, and the Indonesian Kidney Foundation was proclaimed and a founding board established, consisting of five doctors from various expertise: Dr. R. P. Sidabutar, Dr. Hermanses (pediatrics), Dr. Djoko Rahardjo (urology), Dr. Soetisna Himawan (pathology anatomy), and Dr. Nico Lumenta (representing private hospital). On this second congress, Prof. Dr. Busjra Zahir signed and legalized 14 members of InaSN with a nephrologist title, and other 14 members were legalized as nephrology consultants.

InaSN also pioneered the development of the Asian Transplantation Society, with the first congress being carried out in Bali 1989, in which Dr. R. P. Sidabutar was the Executive Committee President, whereas the best achievement of InaSN was to successfully manage the event of the 13th Asian Colloquium in Nephrology (ACN) in Bali on November 23-25, 2000. The event was a collaborative work with Australian and New Zealand Society of Nephrology (ANZSN). The event, which was initiated by Dr. Wiguno Prodjosudjadi, successfully united 3000 experts in nephrology and hypertension across Asia Pacific region and provided the best speakers from various countries. During the ACN, a Manifest of Understanding was also signed to allow Indonesian nephrologists to have an opportunity for further studies in Australia or Japan for 3–6 months. After the ACN event in Bali, InaSN has become widely known overseas. InaSN also fully supported the implementation of the first kidney transplantation in Indonesia at Dr. Cipto Mangunkusumo General Hospital in Jakarta in 1977. Prof. Kazuo Ota from Japan who led the procedure was a special member of InaSN. The donors were brother and sister and the first transplantation was done successfully.

Dr. R. P. Sidabutar passed away in 1995. His leadership in InaSN was continued by Dr. Pudji Rahardjo, continuing all programs initiated by the former leader until 1998. Afterward, the InaSN leadership was continued by Dr. Wiguno Prodjosudjadi between 1999 and 2005. During that time, InaSN achieved a lot of progress in various fields. Various programs have been developed such as the Sister Renal Center Program, encouraging young nephrologists to participate in the ISN fellowship program, improving the education program for nephrologists and the InaSN organization system. The leadership of InaSN continued successively by Dr. Suhardjono and Dr. Dharmeizar Bahar, and now InaSN is led by Dr. Aida Lydia. Hopefully InaSN will further contribute to the improvement of kidney health in Indonesia.

Renal Diseases in Indonesia

Indonesia is a tropical country with warm and humid atmosphere. Its tropical ecology provides a large plant and animal reservoir that ensures the development, persistence, and evolution of a dense microbiological environment. This causes widespread distribution of diseases transmitted from plants, animals, and microbial toxins, as well as common viruses and bacteria. This is further complicated by genetic variation and traditional beliefs and practices with regard to medical treatment. These tropical infections and administration of certain herbal or other traditional medicine, which may be nephrotoxic, can predispose to acute kidney injury (AKI) [7]. As reported by Sitprija in 1996, infections are the most common cause of AKI in the rural area where the majority of the population resides. Falciparum malaria, leptospirosis, typhoid fever, and diarrheal diseases are typical etiological factors [8].

The InaSN has established a registry compiling data of dialysis, renal transplantation, as well as epidemiological data of kidney disease and hypertension from all over Indonesia. This so-called Indonesian Renal Registry (IRR) has been published annually for the past 10 years and includes data from 651 among 797 renal units in Indonesia [6].

According to the IRR, HD patients in Indonesia come from three types of diseases, namely CKI, chronic kidney disease (CKD) stage 5, and acute-on-chronic kidney disease. Incidence of CKD stage 5 is the most common cause of HD (27,637 people, 90%), followed by AKI (2375 people, 8%) and acute-on-chronic kidney disease (593 people, 2%) in 2009 [9]. The 2018 annual report showed a CKD stage 5 incidence increase to 60,852 people (92%), followed by AKI (3822 people, 6%) and acute-on-chronic kidney disease (125 people, 2%) [6].

According to the Basic Health Research (RISKESDAS) 2018, the prevalence of CKD in Indonesia was 3800 pmp. This is an increase when compared to RISKESDAS 2013, which reported a prevalence of 3000 pmp [4]. IRR reported that until 2017, there were 77,892 people with ESRD undergoing HD, while the number of new cases of ESRD was 30,831 in 2017. IRR reported that until 2018, there were 132,142 people with ESRD undergoing HD, while the number of new cases of ESRD was 60,852. According to Sitprija V, Indonesia had the largest number of people undergoing HD compared to other countries in Southeast Asia in 2003 [7].

The most common CKD etiology is hypertensive nephrosclerosis (36%), followed by diabetic nephropathy (29%) and primary glomerulopathy (12%), among many others [3]. A community screening of CKD in Indonesia that was conducted in four major cities in Indonesia (Jakarta, Yogyakarta, Surabaya, and Bali) reported a high prevalence of CKD among patients with hypertension and diabetes. Of 9412

subjects, CKD was found in 12.5% of the patients with hypertension, proteinuria, and/or diabetes [9].

AKI is most commonly reported to be found in people with malignancy (21%), followed by cardiovascular disease (15%), other urinary tract diseases (10%), gastrointestinal disease (8%), cerebrovascular disease (4%), tuberculosis (3%), hepatitis B (2%), hepatitis C (2%), and others [6].

Acute-on-chronic kidney disease is mostly found in hypertensive kidney disease (30%), followed by diabetic nephropathy (18%), obstructive nephropathy (16%), and primary glomerulopathy and others (11%). Regarding comorbidity, IRR reports that cardiovascular disease is the most prevalent (23%), followed by malignancy (19%), other urinary tract diseases (14%), cerebrovascular disease (8%), gastrointestinal disease (5%), tuberculosis (4%), and others. The most common cause of death was cardiovascular complications (37%), followed by sepsis (10%), cerebrovascular disease (9%), and gastrointestinal bleeding (2%). The most common reasons for cessation of HD were death (70%) and dropped out due to unknown causes. There is a possibility that these unknown dropouts are due to difficulties in finding and reaching HD units. Some medical centers are situated so far that it may take hours for patients to reach via multiple modes of transportation (ferry boat, chartered cars, etc.); besides, many factors such as weather or geographical challenges might hinder patients from getting proper treatment [6].

Renal Replacement Therapy in Indonesia

All RRT modalities are available in Indonesia, namely, HD, CAPD, and kidney transplantation. In Indonesia, HD therapy was initiated in the late 1970s and PD program started at the late 1980s. Most of the patients with ESRD are on HD treatment (98%), while the rest are on PD or kidney transplantation [46].

Since 2014, Indonesian government has launched a comprehensive universal health coverage program called the Indonesian National Health Insurance System (INHS). There are specific grouping codes for each modality of RRT in Indonesian Case-Based Grouping stated by the Ministry of Health [10].

Resource for Nephrology Care

In Indonesia, there are only 154 nephrologists for the 268 million population, which translates to 0.57 nephrologist pmp [6]. Due to the lack of nephrologists, both by number and by distribution, Indonesian nephrologists need to delegate some of their competencies to other dialysis-trained medical professionals, such as general internists and general

practitioners. For this reason, the InaSN has carried out a dialysis training program for internists and general practitioners to be certified for dialysis (HD and PD) treatment. Currently, there are 665 certified dialysis internists, 995 certified general practitioners, and 7249 certified dialysis nurses in 905 dialysis centers, treating 132,142 patients with HD and 2105 patients with PD. Certified dialysis internists are trained to have the competency as standing doctors responsible for the care of dialysis patients in both out- and inpatient setting. Certified general practitioners are general physicians who are trained for dialysis and have the competency as doctors on duty, capable of managing certain medical problems during their dialysis shift that need immediate attention. Likewise, there is an insufficient number of medical staff and dialysis centers to provide adequate treatment for all patients [6].

Dialysis Unit

The Ministry of Health's (MoH) regulation on dialysis service in Indonesia was first launched in 1998. For a dialysis unit to be established, it must meet some requirements that include medical staff, building facilities, machines, and standard operational procedures, among others. The MoH has published a guideline book entitled *Pedoman Pelayanan Dialisis di Indonesia* which translates to *Indonesian Dialysis Service Guidelines* for the hospitals and other healthcare

facilities that provide dialysis services. This book consists of national standards for medical staff, dialysis room, water treatment, water loop, storage, sink, infectious room, medical record, as well as the monitoring and evaluation of the dialysis service [11].

The minimum requirements of medical staff are nephrologist or certified dialysis internist as a standing physician, certified dialysis general practitioner, and certified dialysis nurse as staff who delivers the treatment. In case a dialysis unit has no nephrologists, the InaSN will assign a nephrologist from the nearby area to supervise the unit [11]. According to the 11th annual IRR report (2018), the dialysis service data showed as follows (Table 22.1) [6].

Reimbursement Policy

As mentioned earlier, RRT is covered by the INHIS with specific grouping code for each modality of RRT: HD, PD (CAPD), and kidney transplantation. The reimbursement systems are as follows:

- Primary healthcare: paid by capitation.
- Secondary or tertiary healthcare (hospital): paid by Indonesian Case-Based Groups (Ina CBGs). Ina CBGs regulation is stated by the MoH. The scheme of Ina CBGs is based on:
 1. Hospital classes A, B, C, and D

Table 22.1 The annual report of Indonesian Renal Registry (IRR) 2018: dialysis staff [6]

Region	Province	Dialysis unit	Nephrologist	Dialysis-certified internist	Dialysis-certified GP	Dialysis-certified nurse
West	Aceh	15	4	16	9	170
West	North Sumatra	52	7	33	41	513
West	Riau	20	1	19	15	136
West	West Sumatra	16	4	8	13	115
West	Riau Islands	14	1	15	12	123
West	Jambi	6	1	6	7	50
West	Bengkulu	7	Supervised by West Sumatra	8	10	77
West	South Sumatra	27	4	20	21	208
West	Bangka Belitung Islands	4	1	3	2	49
West	Lampung	25	2	15	29	218
Central	Banten	36	4	26	50	283
Central	Jakarta	135	39	58	138	997
Central	West Java	168	14	130	202	1096
Central	Central Java	116	14	101	128	1163
Central	Yogyakarta	46	9	34	42	346
Central	East Java	102	15	79	64	893
East	30	37	7	24	36	342
East	West Nusa Tenggara	6	1	6	6	45
East	East Nusa Tenggara	7	1	7	6	41
East	West Kalimantan	3	Supervised by Jakarta	3	3	21
East	East Kalimantan	17	1	17	13	133
East	Central Kalimantan	4	Supervised by East Java	4	6	33
East	South Kalimantan	10	1	9	11	106

2. Class of service: 1, 2, or 3 (class 1 can be upgraded to VIP with co-sharing by the patient)
3. Outpatient or inpatient service

Hemodialysis

In Indonesia, a majority (98%) of ESRD patients are on HD, IRR 2018 (Fig. 22.1) [6].

Incidence and prevalence of HD patient have increased consistently in Indonesia, IRR 2018 (Fig. 22.2) [6].

Indonesian Statistic Bureau has reported that the Indonesian population was 258.7 million in 2016 and increased to 265 million in 2018 and predicted to be 296 million by 2030. This situation poses big challenges for nephrology health service [12]. RISKESDAS 2018 report found that the prevalence of CKD was 0.38%, and 19.33% of them were on dialysis treatment [13]. Survival rate at 60 months is 53.7% [13]; it is higher than the United States (37%) and

almost the same as Malaysia (50%) and Europe (52%). IRR 2018 annual report showed an increase in new cases, from 15,128 in 2013 to 66,433 in 2018, and current active patients from 15,128 in 2013 to 134,247 in 2018 yielding a prevalence of 499 pmp and an incidence rate of 251 pmp by 2018. By the end of 2019, the current active number of HD patients in Indonesia was predicted to be about 147,340, with 90% of them being covered by INHIS [6].

In Indonesia, in addition to HD, there are other RRT techniques used for ESRD patients such as hemodiafiltration (HDF) and hemoperfusion reinfusion (HFR), although they are only a small number. The development of continuous renal replacement therapy (CRRT) may allow the hemodynamically unstable patients undergoing critical care to get RRT. Initiation of CRRT should be done by a team consisting of intensivist, nephrologist, nutritionist, critical care nurse, and pharmacist. Currently, the CRRT devices in Indonesia are scarce and are limited to the tertiary hospitals in Jakarta, thus inhibiting the nationwide intensivist or nephrologist to gain experience in utilizing CRRT devices. The limitation is related to tremendous cost of CRRT, which may further burden the insurance scheme.

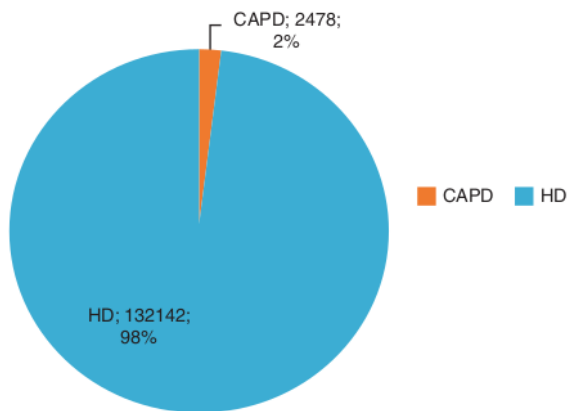
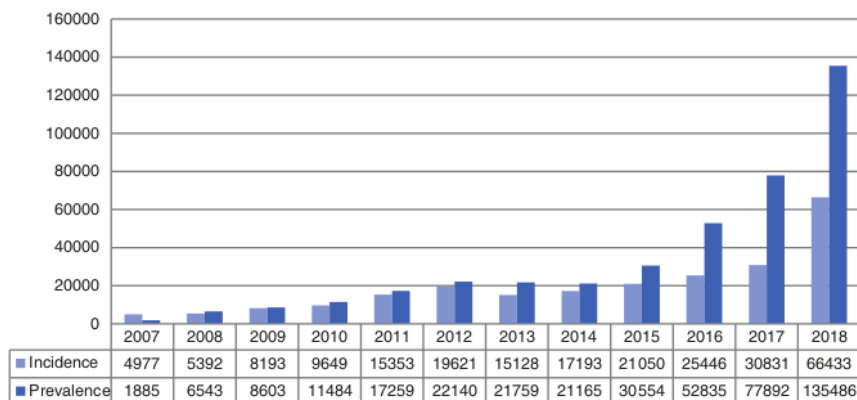


Fig. 22.1 Renal replacement therapy in Indonesia [6]

Peritoneal Dialysis

PD is not very popular as a treatment choice for ESRD patients in Indonesia; the prevalence was only 2% in 2018. CAPD is the only type of PD system available in Indonesia [6]. Some factors were identified that are related to the small uptake of PD patient in Indonesia: reimbursement value, Indonesian geography, number of available trained medical staff, and logistic issues. The current reimbursement of CAPD only covers for PD solution bags and minicaps for 1 month; laboratory examination, oral medication, and erythropoiesis-stimulating agents are not covered. The study conducted in 2016 showed that PD-first policy, in which

Fig. 22.2 Incidence and prevalence of ESRD requiring dialysis [6]



ESRD patients are offered PD as initial care followed by HD if complications occur, was found to be more cost-effective compared to the HD-first policy in INHIS setting [14]. IRR 2018 report showed the mapping of CAPD patients in Indonesia (Fig. 22.3) [6].

The MoH Research Department made a health economics study entitled “Economic Evaluation of Policy Options for Dialysis in End-Stage Renal Disease Patients Under the Universal Health Coverage in Indonesia.” It was found that the budget impact analysis indicated that the required budget for the PD-first policy is 43 trillion IDR for 53% coverage and 75 trillion IDR for 100% coverage in 5 years, which is less than the HD-first policy, i.e., 88 trillion IDR and 166 trillion IDR. The PD-first policy was found to be more cost-effective compared to the HD-first policy [14]. Budget impact analysis provided evidence on the enormous financial burden for the country if the current practice, where HD dominates PD, continues for the next 5 years. Based on this study, MoH made a breakthrough program to increase uptake of CAPD patient; the first step is the Increasing Uptake of CAPD Pilot Project in West Java on May 2018. This pilot project ended on June 2019 and is still being evaluated [14]. The results have not yet been published as of December 2019; however, the MoH has already made a statement that they would prepare a budget for increasing the uptake for the CAPD program in 2020. West Java province has already this program with an advanced

training of CAPD for internists and nurses (40 medical professionals from ten hospitals).

Renal Transplantation in Indonesia

The first renal transplantation was performed on November 11, 1977, in Dr. Cipto Mangunkusumo General Hospital and was supervised by Professor Ota, a Japanese urologist from Tokyo Women’s Medical College. During 1977–1985, the number of transplantation procedures was still less than five per year in two hospitals, Dr. Cipto Mangunkusumo General Hospital and PGI Cikini Hospital. There were less than ten surgeons who were able to perform the procedure. Back then, Indonesia was yet to have any judicial and religious consensus regarding renal transplantation. The experts continued to share their knowledge in renal transplantation procedure with other experts outside of Jakarta. After this point, Kariadi Hospital and Telogorejo Hospital in Semarang successfully handled some transplantations. However, the rate of renal transplantation was still less than 20 in a year [15, 16].

The first law regulating surgical procedure in deceased body and transplantations of human tissues was issued by the government, as in Government Regulation (Peraturan Pemerintah) No. 18/1981. It provided the first guideline for the use of organs from deceased and living-unrelated donors,



Fig. 22.3 Mapping of CAPD patients in 2018 [6]

supported by an international consensus from the Society of Transplantation.

In the early 1990s, centers for renal transplantation opened in numerous big cities, such as Bandung, Semarang, Yogyakarta, and Medan. Although the growth of renal transplantation in Indonesia was relatively slow, it had doubled compared to the previous decades. According to Markum [15], numerous factors that affected the rate of organ transplant donor in Indonesia were donor availability, availability of living donors, the hesitancy of using deceased organ donors, and the cost of transplantation. In this period, several regulations strengthened the economic and health programs, such as the earlier form of health insurance and well-distributed health services through primary healthcare centers. The law about organ transplantation was revived in Law (Undang-Undang) No. 23 in 1992, which explained about humanitarian purposes of organ transplantation and the prohibition of transplant organ commercialization. Later in 1995, religious leaders and medical experts made a consensus named *Kesepakatan Kemayoran* (Kemayoran Agreement), in which it was concluded that renal transplantation was one of the RRT options for ESRD, and the usage of deceased organ donor was permitted from the perspective of all official religious, medical, and cultural point of view. It was then formulated at the 2nd Indonesian Society of Nephrology (*Perhimpunan Nefrologi Indonesia – Pernefri*) and National Kidney Foundation (*Yayasan Ginjal Nasional – YAGINA*) symposium [15–17].

A new transplantation law was issued by the government to further prevent the commercial motivation of renal transplantation, as stated in Undang-Undang No. 36 in 2009.

Improvement also came from the health insurance in 2005. Undang-Undang No. 40 in 2004 about National Social Security System (*Sistem Jaminan Sosial Nasional*) was created to ensure that vulnerable population, such as the impoverished, were guaranteed healthcare services. After that, renal transplantation started to increase especially in Dr. Cipto Mangunkusumo General Hospital, although the rate of transplantation was still relatively low compared with the present times. This happened because transplantation was still considered as a special procedure, requiring expensive resources, and there was no clear standard operating procedure (SOP). Fortunately, the distribution of transplantation skills and knowledge is still going strong, proven by the initiation of kidney transplantation in Malang, Solo, and Padang [16]. Figure 22.4 shows the trend of renal transplantation in Indonesia from 1996 to 2010.

The year of 2011 was a very important milestone for the development of renal transplantation in Indonesia. The rate of renal transplantation in Dr. Cipto Mangunkusumo General Hospital rose dramatically in this period. The first laparoscopic living donor nephrectomy (LLDN) was successfully performed at Dr. Cipto Mangunkusumo General Hospital in November 2011. LLDN was generally considered to cause less postoperative pain, post-operational morbidity, and better recovery and downtime [16].

Another breakthrough of Indonesia's renal transplantation in this period was the first pediatric renal transplantation in March 2013 [18]. Pediatric transplantation was known to be more complicated than adult organ transplantation. The factors that need to be considered before doing a transplanta-

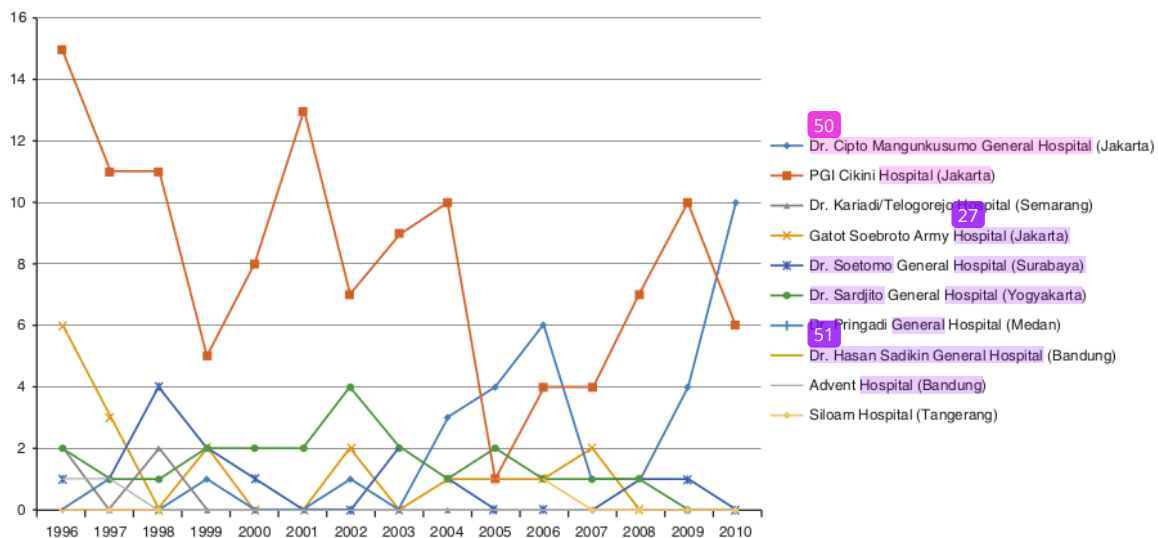


Fig. 22.4 Trend of renal transplantation in Indonesia [16]

Table 22.2 General hospitals providing renal transplantation services

No	Hospital	Year				
		2015	2016	2017	2018	2019
1	Dr. Zainoel Abidin General Hospital, Aceh	0	1	1	1	1
2	Dr. M. Djamil General Hospital, Padang	1	0	2	3	11
3	H. Adam Malik General Hospital, Medan	0	1	2	0	1
4	Dr. Mohammad Hoesin General Hospital, Palembang	0	1	2	1	0
5	Dr. Cipto Mangunkusumo General Hospital, Jakarta	125	115	114	108	63
6	Dr. Hasan Sadikin General Hospital, Bandung	1	0	0	0	0
7	Dr. Moewardi General Hospital, Surakarta	3	1	1	0	0
8	Dr. Kariadi General Hospital, Semarang	4	3	7	9	21
9	Dr. Sardjito General Hospital, Jakarta	0	0	2	12	14
10	Dr. Soetomo General Hospital, Surabaya	41				
11	Dr. Saiful Anwar General Hospital, Malang	2	2	5	0	20
12	Sanglah General Hospital, Denpasar	0	1	5	8	2
13	Prof. Dr. R. D. Kandou General Hospital, Manado	0				
14	Prof. Dr. Wahidin Sudiro Husodo, Mojokerto	0				
15	PGI Cikini Hospital, Jakarta	342				
16	Gatot Soebroto Army Hospital, Jakarta	51				

tion to children are the prescription of chronic immunosuppression, immune response, dosage changes, risk of posttransplant viral infections, and lymphoproliferative disorders (LPD) [16].

In 2014, the Ministry of Health appointed 16 general hospitals to begin renal transplantation services (Table 22.2). Dr. Cipto Mangunkusumo General Hospital then established a multidisciplinary renal transplantation team to manage the high number of renal transplantation demand and provide comprehensive service to patients with ESRD. The team consisted of nephrologist, urologist, cardiologist, pulmonologist, anesthesiologist, clinical and anatomical pathologist, radiologist, pediatrician, forensics and medicolegal team, and nutritionists. Renal transplantation program in Aceh, Medan, Padang, Palembang, Solo, Malang, and dan Denpasar has been supervised by Dr. Cipto Mangunkusumo General Hospital until now. In the same year, the Indonesia Transplantation Society was established by multidisciplinary physicians involve organ transplantation.

Based on the *Peraturan Menteri Kesehatan Republik Indonesia No. 38 Tahun 2016*, the Ministry of Health established the National Committee on Transplantation as a commit-

tee for hospitals that provide organ transplantation program in 2016. The revision of the reimbursement for renal transplantation in Indonesia was made by the INHIS, due to the high long-term cost of HD. Later on, the INHIS endorsed renal transplantation as the recommended ESRD treatment [16].

As of today, there is still no specific management or organization that helps facilitate for those people who want to be organ donors. The management of organ transplantation is mainly conducted by the related hospital [15, 27].

Most of the kidney transplantations are performed at Dr. Cipto Mangunkusumo General Hospital. Overall, there have been 734 renal transplantation procedures performed at Dr. Cipto Mangunkusumo General Hospital from January 2010 to July 2019 (Fig. 22.5). Thirteen pediatric renal transplantations have been performed until August 2019. All recipients received transplantation from living donors and more than 70% were emotional-related donors [18].

A serial study from 2011 to 2017 by Marbun et al. [19] has shown that from 492 renal transplantation procedures with living-related donors, 335 recipients (70.7%) and 317 donors (66.9%) were male. The mean age of recipient was 47 (13.18 years) and the median age of the donors was 30 years (17–66 years). Most of patients (93.9%) had undergone HD. Family relationship with recipients was found in 119 patients (25.1%), while the rest was emotionally related (Table 22.3).

As seen in Figs. 22.6 and 22.7, patients and graft survival trends are getting better every year. But according to a study by Marbun et al. [19], the survival rates in the first 3 years compared to the first year were 90.6% to 92% for graft survival and from 79.7% to 87% for patient survival. Some factors that were suspected to affect the patient survival rate were serum creatinine levels ($p = 0.0001$), comorbidity (diabetes mellitus $p < 0.01$), and surgical complications (RR = 5.64) [20–22].

The dominant factors for recipient that may affect survival include comorbidity, infectious disease, and unrelated donors. Other factors that should be considered are patients' compliance after transplantation such as the usage of immunosuppressant drugs and healthy lifestyle. In some cases, compliance may be affected by the problem of drug availability and distance between patients' residence and transplant hospital [19]. Table 22.4 shows graft failure rate after kidney transplantation from 2013 to 2018.

Although Indonesia renal transplantation program has much improved, it is still less well-developed than other ESRD modalities. Patients' preferences due to social and religious views, medical conditions, accessibility to treatment, and healthcare insurance definitely play a role. Support from the government is much needed, especially in order to make new laws and continuous national health insurance support. There's still a long way to increase the quantity and quality of the renal transplantation program. We have to develop more advance technology and research, to build

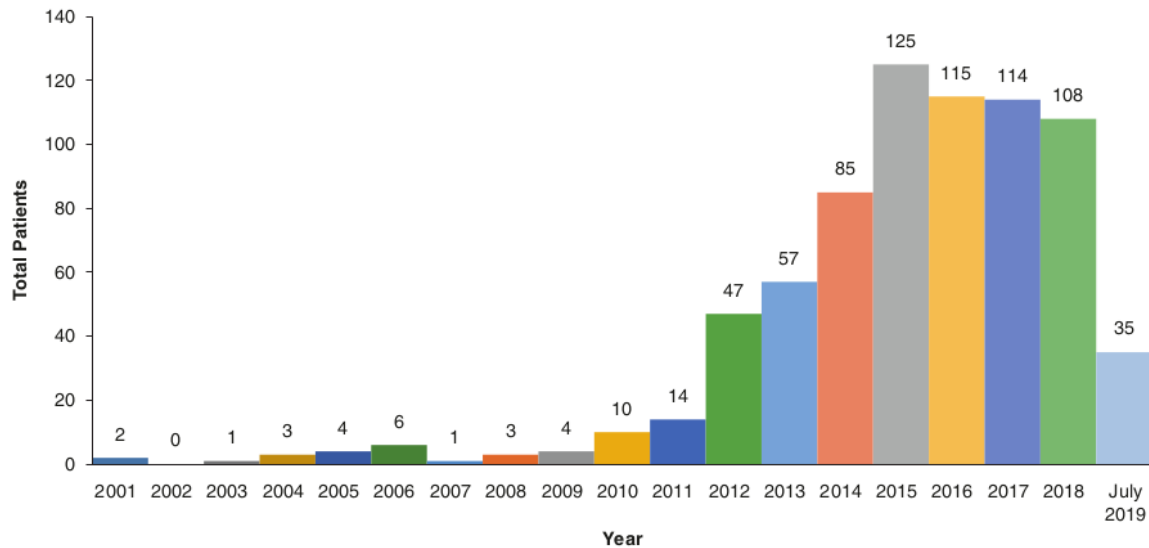


Fig. 22.5 Annual rate of adult renal transplantation in Dr. Cipto Mangunkusumo General Hospital, Jakarta [18]

Table 22.3 Characteristic of renal transplant patients from January 2011 to May 2017 [19]

Characteristic (n = 474)	Value
Recipient age (years), mean (SD)	47 (13.18)
Donor age (years), median (range)	30 (17–66)
Recipient sex, n (%)	
Male	335 (70.7)
Female	139 (29.3)
Dialysis type, n (%)	
Hemodialysis	445 (93.9)
CAPD	16 (3.4)
Preemptive transplantation	13 (2.7)
Cross-matching	
0–10%	4 (0.8)
10–20%	69 (14.6)
20–30%	247 (52.1)
30–40%	57 (12.0)
Data is not available	97 (20.5)
Recipient-donor relationship, n (%)	
Related	119 (25.1)
Unrelated	355 (74.9)

donor and organ procurement programs, and also to share the skills and knowledge among centers.

Nephrology Practice in Indonesia

Nephrologist and Medical Education of Nephrologist in Indonesia

There are currently 133 board-certified nephrologists in Indonesia. The number is scarce when compared to

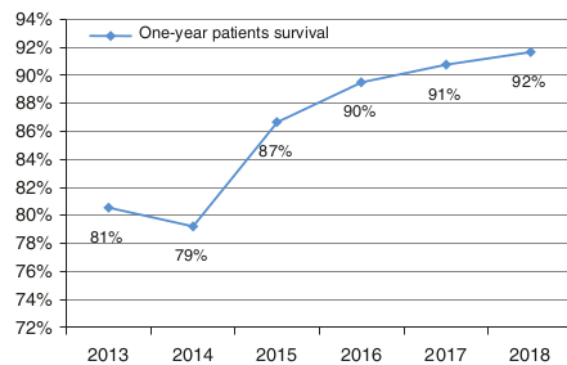


Fig. 22.6 Patient survival rate within 1 year after transplantation in Dr. Cipto Mangunkusumo General Hospital, Jakarta [18]

Indonesian huge population. The nephrologists are full members of Indonesian Society of Nephrology or InaSN (Perhimpunan Nefrologi Indonesia – Pernefri). InaSN is the national professional organization for nephrologist, established on October 5, 1976. IRR was an accomplishment of the InaSN, introduced first time in 2007.

The board-certified nephrologists in Indonesia spend years in medical school to become a nephrologist. The study period of the undergraduate program in medical school is at least 3.5 years of preclinical studies, followed by a 2-year clinical phase [23]. Then, the prospected nephrologist needs to take 5-year postgraduate medical education in internal medicine to be eligible to take the 3-year subspecialties training in nephrology and hypertension. The medical schools that are qualified to provide subspecialties training,

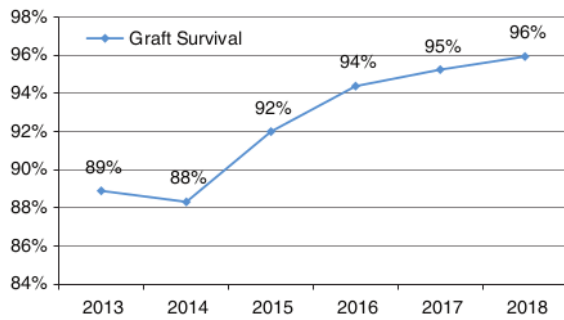


Fig. 22.7 Graft survival rate within 1 year after transplantation in Dr. Cipto Mangunkusumo General Hospital, Jakarta [18]

Table 22.4 Chronic rejection rate after renal transplantation [18]

	2013	2014	2015	2016	2017	2018
Graft failure	4	9	12	15	18	20
Graft function	32	68	138	252	361	472
Total Patients	36	77	150	267	379	492
Failure Rate	11%	12%	8%	6%	5%	4%

especially in nephrology, are limited in Indonesia because the institution must fulfill certain accreditation requirements to be deemed qualified.

Health Professionals Associated with Nephrology Practices in Indonesia

As mentioned earlier, there are other physicians who contribute and are associated with nephrology practices in Indonesia. In 2019, there were 555 general internists who have taken a short dialysis therapy course in order to provide service in a HD unit under supervision of a nephrologist. There are also pediatric nephrologists and urologists who work in surgery for renal transplantation and vascular surgeons who work in surgery for dialysis access in patients undergoing HD. Currently, there are 45 pediatric nephrologists in Indonesia. An aspiring pediatrician who wants to be a pediatric nephrologist needs to take the 2-year subspecialties training in nephrology after completing 4-year residency in pediatrics.

IRR 2018 reported that there were 7660 dialysis nurses nationwide [6]. The report also explained that more than 2000 additional dialysis nurses are needed to overcome the scarcity of the dialysis nurse currently. The need is growing, expecting the increment of dialysis unit worldwide in the period of nationwide health insurance scheme conducted by the Indonesian National Health Insurance.

The undersupply of nephrologist and dialysis nurse in Indonesia nowadays creates a major challenge for nephrology practices in the country. The supply for these profession-

als requires careful calculation for the professional expected income, which is determined by some factors: the local regulation of healthcare facility (determined by initial employment contract and given in remuneration, fee for services, or revenue sharing), professional organization guidance, and the type of healthcare facility.

Working in Indonesia as a Foreign Nephrologist

One of the biggest challenges in globalization was the chance for the importation of foreign nephrologist to work and give medical services in Indonesia. This opportunity shall lead to prospected transfer of medical knowledge, experience, and technology. Health services in international trade is one of the components of services trade, which is currently regulated in bilateral and ASEAN regional agreements. The influx of foreign health professional is regulated according to domestic regulation in Indonesia.

According to *Undang-Undang* 13/2003 about labor, which is explained in the Decree of Ministry of Labour and Transmigration No. 2/2008, MoH has a role as promotor to the application of working license for foreigner. According to the Decree of No. 67/2013, the MoH also has the role to permit foreigner health professionals for knowledge and technology transfer, education and training, research on health services, and/or social services.

Besides qualifying in nephrology, foreign nephrologists who want to work in Indonesia are demanded to satisfy the labor-normative and health technical requirement. The requirements consist of certificate of competence, temporary registration certificate of doctor, medical practice license, and certificate of Bahasa Indonesia language proficiency. Certificates of competence are obtained by foreign nephrologists after passing the competency evaluation by the Indonesian Medical Council. The certificate is the prerequisite requirement to obtain temporary registration certificate of doctor, which is 1-year valid and may be extended for another 1 year. Both certificates may be used to procure the medical practice license in the corresponding regional public health office.

Future Perspective of Nephrology in Indonesia

4 2013, the president of the Republic of Indonesia issued a President Decree No. 12/2013, as amended by President Decree No. 111/2013, regarding healthcare insurance managed by the newly established Indonesian National Health Insurance System (INHS). Both the Healthcare and Worker Social Security schemes are compulsory for all workers. The healthcare insurance program is handled by INHS. Employ-

ees are required to participate and contribute to this health-care scheme. Indonesian citizens and all residents of Indonesia, including long-term expatriate employees, are required to join. Registration with INHIS covers the whole family. Only one spouse is required to contribute to gain family coverage. By the end of 2019, all Indonesians would have universal healthcare coverage [24, 25]. This healthcare insurance covers dialysis treatment. During 2014, INHIS reported that kidney failure patients claims were placed at the second place in the list of catastrophic diseases, after heart diseases. It is shown that 2,165,507,578,258 IDR or around 161,606,000 USD were claimed by kidney failure patients during 2014. This claim tends to increase throughout the years [26]. Most of INHIS funding comes from the national budget or regional government budget targeting to support poor populations and from civil servants, public fund as subscription of individuals or private company workers. This fund will mostly go to secondary or tertiary centers where dialysis services are running [25, 26].

HD is a health service with characteristic of high cost, high volume, and high risk; therefore, it needs standardized service through evidence-based national clinical guideline and implemented as hospital standard procedure. It should be supported by well-organized dialysis unit and competent human resources. The basic of HD should be aimed at good outcomes and manifested reduced mortality with low cardiovascular complication, good nutritional status, and optimal quality of life. It may be achieved by targeted Kt/V, maintenance of vascular access, and adapted technology of dialysis machine and dialyzer. Implementation of health technology assessment and anti-fraud regulation on this technology application will lead to a cost-effective service in expensive dialysis treatment [27, 28]. The human resources involved in one dialysis unit in Indonesia, which are regulated by the Indonesian Society, are nephrologist, internist with 3 months of dialysis training, and general practitioner with 3 months of dialysis training [27, 29]. Most of the financial support for HD treatment comes from INHIS (the Indonesian National Health Insurance System). Nowadays, more than 80% of Indonesian population has been covered by this insurance agency. A minority of the population is supported by regional health insurance, other commercial insurance, and fee for service [30].

In order to choose more cost-effective treatment in dialysis service, MoH performed HTA (health technology assessment) in 2015 and evaluated cost-effectiveness between HD and CAPD. The result was that PD is more cost-effective when compared to HD. In order to improve an affordable treatment as well as improve access care for RRT, then PD-preferred policy is encouraged. The MoH has just started a pilot PD program in some region of West Java [550].

Studies in some countries have shown that kidney transplantation is more cost-effective than dialysis treatment [31–

33]. Indonesian MoH in conjunction with 13 major hospitals in Indonesia has launched a development kidney transplantation program. A National Committee of Organ Transplantation was established in 2016 in order to regulate organ transplantation, including the kidney. Although deceased kidney transplantation national program is still in infancy, the government has committed to pursue this program by dispatching a team of doctors to Spain for deceased organ transplantation.

The treatment of kidney disease is a complex problem. In addition to great burden of kidney disease, high technology and human resources are involved in the management of the disease. Indonesian Society of Nephrology has developed short- and long-term programs in conjunction with MoH, including unleashing the PD-preferred program for the endorsement of CAPD, early detection and preventive program for CKD in the community and primary healthcare, and development of kidney transplantation in some tertiary hospitals. Indonesian Society of Nephrology is involved on collaborative studies with ANZSN (Australian and New Zealand Society of Nephrology) and ISN on randomized controlled trials with HD patients. In cooperation with the Taiwan Society of Nephrology, Indonesian Society of Nephrology is developing a preventive kidney disease program in Indonesia. An interventional nephrology society has been established recently, aiming to develop training for doctors who are interested in enrolling in education and training in nephrology. New developed educational curriculum to become nephrology consultant, targeting physicians, has been proposed to the Collegium of Internal Medicine.

Pediatric Nephrology in Indonesia

Pediatric nephrology care in Indonesia varies, ranging from province with comprehensive care that provides all RRT to others offering no possibilities to provide dialysis or transplantation to children with ESRD. Most children are dialyzed in adult centers; there is only one center in the capital city Jakarta that has a pediatric dialysis unit separated from the adult unit. In 2017, there were 14 pediatric nephrology centers in major cities [34].

Nephrotic syndrome is the most common pediatric kidney disease in Indonesia, although the precise incidence is unknown. Steroid-resistant nephrotic syndrome is still a problem, since a small number of cases become end-stage renal disease within 10 years. AKI also remains an important problem, whose etiology includes post-streptococcal acute glomerulonephritis, severe hypovolemia from acute gastroenteritis, sepsis, and post-cardiac operation cases.

An impressive improvement has been made in the care of pediatric renal diseases during the past few decades. A total of 220 children underwent RRT in a pediatric nephrology center in 2017 [34]. Pediatric living donor kidney

transplantation program was initiated in 2013 [35], and until 2019 there have been 17 children transplanted (unpublished data from Pediatric Nephrology Working Group of Indonesian Pediatric Society). The leading causes of ESRD in pediatric patients are glomerulonephritis (49.5%) and congenital anomalies of kidney and urinary tract (CAKUT) (26.56%) [35].

RRT in children remains inaccessible in most of our country especially in the area with no pediatric nephrology center. High cost of renal healthcare makes management of either acute or chronic RRT in children in Indonesia faced with diverse challenges, which contribute to the overall poor outcome of renal disease as well as the high general mortality and morbidity in the region. Future development is to formulate policies to improve pediatric nephrology services, including to alleviate the inaccessibility and unsustainability of RRT in children in such resource-limited setting.

Conflicts of Interest The authors declare that they have no conflict of interest.

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