Dialysis delivery in India: demand, challenges and policy insights

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Foreword

This report is a product of a detailed study by EY in collaboration with the Healthcare Federation of India (NATHEALTH) based on insights provided by key stakeholders in the Dialysis Ecosystem of India. We are grateful for our collaboration with NATHEALTH and its stakeholders, who provided us with timely support and guidance in the form of primary data, sectoral and medical knowledge and industry reports. These insights have been critical in formulating the analysis presented in the whitepaper, along with drafting the recommendations and vision for the future of the Dialysis Industry in India.

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Name	Organisation
Government Stakeholders	
Dr. Atul Mohan Kochhar (Chief Executive Officer)	National Accreditation Board for Hospitals and Healthcare Providers (NABH)
Dr. Ranjan Kumar Choudhury (Advisor)	National Health Systems Resource Centre (NHSRC)
NATHEALTH Leadership Team	
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NATHEATH Secretariat	
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Dr. Mr. Bhaskar Guha, Managing Director & Country Manager; Mr. Parveen Jain, RAC (Devices)	Fresenius Medical Care India
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Executive summary

Dialysis: *The popular treatment of ESRD disease requires policy focus to build access and capacity, thereby helping reduce mortality rates*

Dialysis Overview

- Renal failure is an important public health problem. However, it remains a mostly undocumented cause of premature death in developing countries, like India.
- As per government estimates, nearly **220,000 patients develop end-stage renal disease (ESRD) annually in India, leading to an additional annual dialysis demand of 34 million treatment sessions.**
- **With nearly 5,000 existing dialysis centres and 3,340 nephrologists (estimated by the industry), this may be inadequate to meet the upcoming demand for dialysis** as this disease gains traction due to various sociological and environmental factors.
- There are two major types of complementary treatments offered to ESRD Patients in India: Hemodialysis (HD) Treatment and Peritoneal Dialysis (PD).
- **94% of dialysis patients in India are on HD treatment**

Key Challenges

- **Lack of access to dialysis centres and machines across districts,** lead to low frequency of treatment, impacting the health of patients
- **Erratic** and **low rate of reimbursements for dialysis sessions** affects operation of dialysis centres
- **Lack of skilled workforce** including dialysis technicians and renal nurses.
- **Low uptake of PD** in India due to high cost and low clinical adoption.

Need for Clinical Outcome Monitoring

- An essential component of quality delivery of dialysis services is recording and monitoring clinical outcomes of ESRD patients for improving their safety and clinical care.
- There are several important clinical outcomes which are considered critical for dialysis patients; however, **the four key indicators are mortality, anemia, seroconversions and dialysis access.**
- Monitoring and tracking these outcomes helps improve the understanding of the effect of dialysis treatment on patients and thereby helps the service providers in turn **to improve their services in order to increase the lifespan of patients and enhance their quality of life.**

Human resource requirement In dialysis

India needs to address several gaps in terms of training healthcare professionals and building a skilled workforce to deliver quality dialysis services. Few of the gaps identified by the industry in the dialysis ecosystem are the following:

1. Addressing **shortage of Dialysis Technicians (DTs)** and **ensuring employability** of DTs in the country
2. **Need for short-duration courses** to accelerate upskilling of the existing pool of nurses, doctors and allied professionals.
3. **Addressing the requirement of training centres** available in the country

Need for standalone dialysis centres	Short-term recommendations	Medium-term recommendations
Higher safety: Patients in standalone centres have lesser chances of developing hospital-acquired infections **Convenient and patient-friendly solution:** A convenient and patient-friendly solution for patients accessing services in multiple locations rather than hospitals for service billing, dialysis service, laboratory tests, cafeteria, etc. **Proximity to Patient:** These centres will reduce travel cost and hassle for patients who live far away from the district hospitals; especially as dialysis sessions are required three times a week.	▸ **Improving access to standalone dialysis** centres through both PPP and non-PPP channels ▸ Optimal use of Human Resource, maintaining standards and mitigating other costs ▸ **Resolving Empanelment Delays** through provision of default "deemed approved status" ▸ **Reimbursement rates to be increased** considering the overall cost of treatment to providers	▸ **On the job trainings and internship opportunities** for DTs ▸ **Short-term trainings** for nurses on both HD and PD ▸ **Short-duration training courses** for Ayush, BAMS, BHMS, MBBS doctors may be formulated. ▸ To address infrastructure challenges, PPP model may be used to conduct training ▸ Specific trainings required for surgeons, nurses and patients for PD.

Key recommendations for peritoneal dialysis

- **PPP mode for PD treatment** delivery with private service providers providing consumables and public sector providing care
- **Building awareness** amongst patients through information and education campaigns
- **Establishing supply side channels** by enabling a reduction in the cost of consumables
- Clinical support infrastructure through establishing and monitoring **clinical outcomes**
- Promoting PD treatment through **community healthcare**

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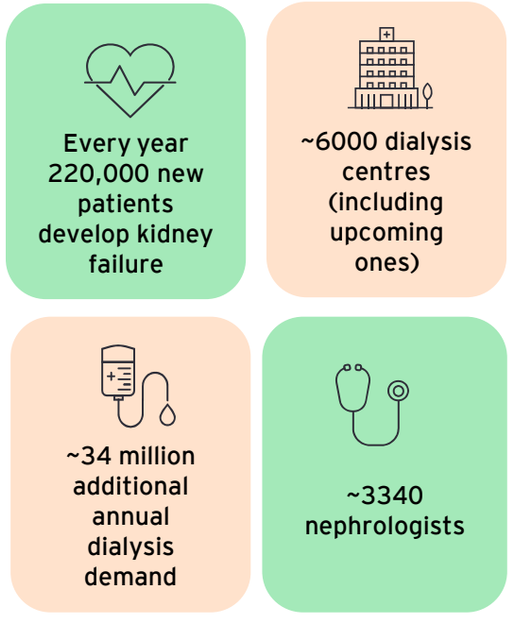
Dialysis landscape of India

Introduction:
Understanding the need for dialysis in India

Renal failure is an important public health problem, however, it remains a mostly undocumented cause of premature death in developing countries, like India. Scientifically known as Chronic Kidney Disease (CKD), it is characterized by a gradual loss of kidney function over time. The final stage of this disease, known as the end-stage renal disease (ESRD) requires kidney or renal replacement therapy (RRT) such as dialysis or kidney transplant.

As per the Million Deaths study, from 2001 to 2003, 2.1% of total deaths among 15 to 69-year-olds were from renal failure, which increased to 2.9% by 2010–13. On an aggregate level, there were 136,000 renal failure deaths in 2015. Another study published in the Statesman estimates that more than 3% of the total deaths in India between the age group 15-69 occur every year due to renal failure or kidney diseases.

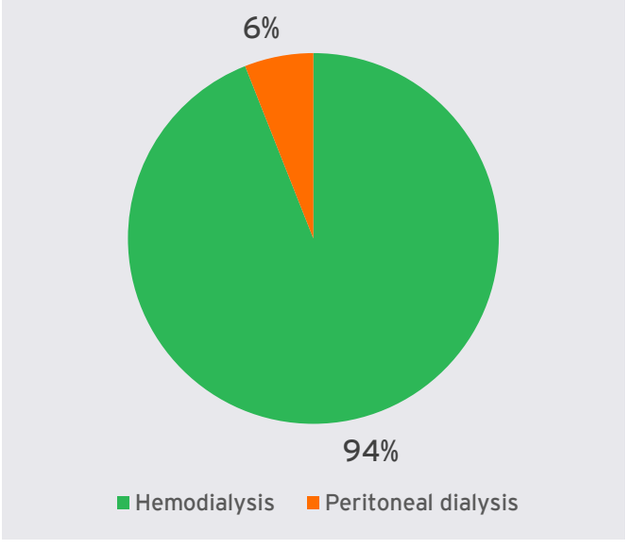
As per government estimates, nearly 220,000 patients develop ESRD in India, leading to an additional annual additional dialysis demand of 34 million treatment sessions. India presently has nearly 5,000 existing dialysis centres (including 1,353 centres under PMNDP) and 3,340 nephrologists. This capacity will not be sufficient to meet the upcoming demand as this disease gains traction due to various sociological and environmental factors.



Source: Industry Inputs

This whitepaper provides a detailed analysis of the dialysis landscape in India, determining India's readiness to meet the dialysis demand, while also improving the quality of services to maintain international standards. An important component lies in promoting and resolving challenges in standalone dialysis centres, which will prove essential in meeting district-level demand. Meanwhile, future policy is necessary to be centred around building human resource including dialysis technicians and nurses, while also building an ecosystem for peritoneal dialysis in Indian patients.

Available treatment modalities in India: HD vs. PD



Source: Global Dialysis Perspective: India; Joyita Bharati and Vivekanand Jha, 2020

- There are two major types of complementary treatments offered to ESRD Patients in India: Hemodialysis (HD) Treatment and Peritoneal Dialysis (PD). In HD treatment, blood is pumped out of the body to an artificial kidney machine and returned to the body by tubes that are connected to the machine.
- Meanwhile, in PD treatment, a cleansing fluid flows through a tube (catheter) into part of the abdomen while the lining of the abdomen (peritoneum) acts as a filter and removes waste products from the blood.
- It is possible to perform PD at home using CAPD bags, while HD services are offered mainly at centres and also at homes.
- 94% of dialysis patients in India are on HD treatment
- Kidney Transplant is considered the most effective treatment modality. However, due to issues of high cost and delay in procuring the transplant, dialysis treatment is commonly used.

Health profile of Indians: Government support provided in dialysis

Diabetes and Hypertension are leading causes of ESRD in India

- Scientific studies indicate that the leading cause of ESRD disease in India are diabetes (high blood sugar) and hypertension (high blood pressure). The health profile of Indians can be tracked through the National Family Health Surveys (NFHS).
- In India, NFHS 2019-21 data indicates that, on an average, nearly 14.5% to 15% population suffer from high blood sugar levels or are taking medication for controlling blood sugar levels. In addition, on an average, nearly 22% of the Indian population suffers from hypertension or high blood pressure levels. Both these populations may have overlapping patients, which are at risk of developing renal diseases.
- These indicate a significant Indian population is at risk of suffering ESRD condition and may require dialysis treatment. Therefore, there is a need for national-level policy support and guidance for managing the Indian dialysis population.

PMNDP launched in 2016 to solve access and affordability issues for dialysis patients

Hemodialysis:

Free of cost services to BPL beneficiaries at district hospitals

Peritoneal dialysis: Free of cost services to BPL beneficiaries. Catheterization at district hospital followed by home-based care with CAPD bag exchanges (Introduced in 2019)

Dialysis Coverage

17.64 lakh

Number of patients that availed dialysis services under PMNDP since 2016

Government Spending for Dialysis Sessions

INR 2,900 Cr

Estimated at INR 1,500 for 193.3 lakh hemodialysis sessions held under PMNDP since 2016

Pradhan Mantri National Dialysis Program (PMNDP) coverage

PMNDP program covers 36 States and Union Territories, and the program has spread to 642 districts. There are 1,353 centres under the program which have 9,068 HD machines.

Ayushman Bharat- Pradhan Mantri Jan Arogya Yojana (PMJAY)

Other legacy schemes used for dialysis payment reimbursements

Rashtriya Swasthya Bima Yojana (RSBY)

Central Government Health Scheme (CGHS); Ex-Servicemen Contributory Health Scheme (ECHS)

Employees State Insurance Scheme (ESIS)

Source: PMNDP Dashboard, MoHFW (updated to 31 Jan 2023)

Access issues which plague dialysis treatment delivered to rural patients

National-level gaps in dialysis requirements to cater to 220,000 new ESRD patients

HD Machines required:
103,507

Existing machines:
~40,000

Gap:
~65,000 machines

HD centres required:
10,000
(Assumption: 10 machines each centre)

Existing centres:
~5,000

Gap:
~5,000 centres

Healthcare Practitioners Required (HCP)
[Nurse + Dialysis Technician]:
40,000
(1 Nurse +3 DTs each centre)

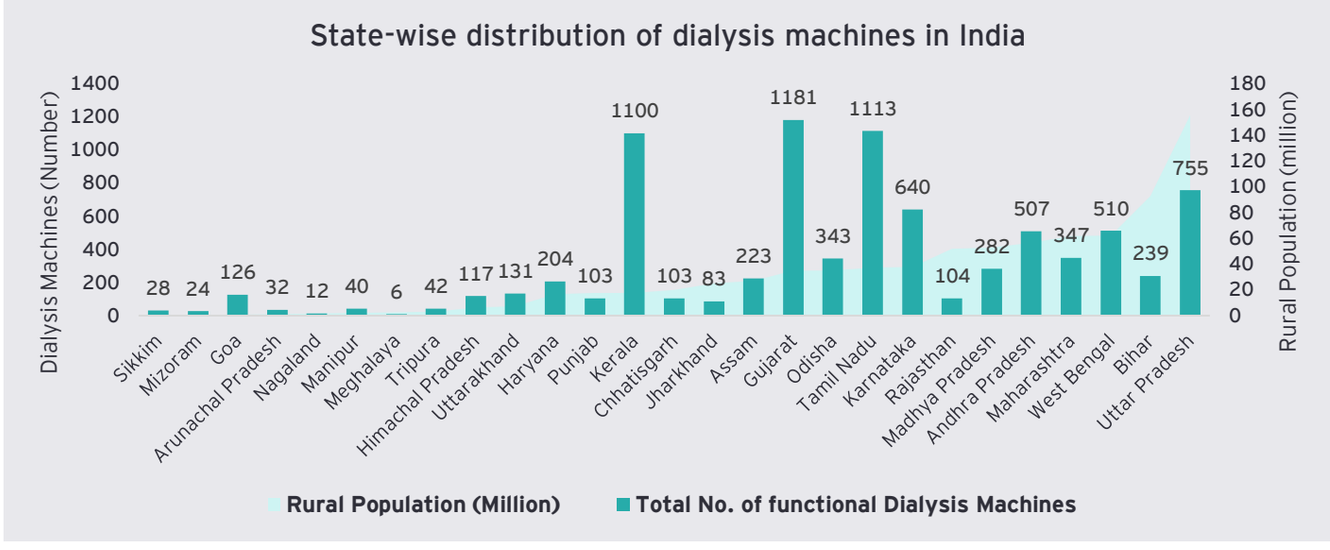
Existing HCPs:
~20,000

Gap:
~20,000 HCPs

Source: Industry estimates

Various research studies reiterate that large inequalities exist in accessing dialysis services in India, with the rural areas being a disadvantage. As per industry experts, around 90% of the dialysis facilities in India are in urban India (i.e., metro cities and tier I and tier II cities). Thus, more than 60% of patients on dialysis travel about 50 km to access HD treatment while nearly 25% lived more than 100 kms away from the facility .

Access issues can also be understood by mapping the availability of dialysis machines under the PMNDP program, against the rural population across various states. The following figure shows the state-wise variations and disparities in accessibility of dialysis services. For instance, states like Kerala and Tamil Nadu have a much higher number of dialysis machines, even though they have a lower rural population. In contrast, Bihar and Uttar Pradesh have a greater rural population suffers from inadequate dialysis access. Thus, access to dialysis machines remains a key concern in several states of India.



Source: PMNDP – updated to Jan 2023, RBI Statistics
Note: Rural data for Delhi and Telangana unavailable on RBI Statistics

State-wise Dialysis demand: Large variations

As 220,000 new ESRD patients are added every year, state-wise distribution of new patients requiring dialysis can be estimated.

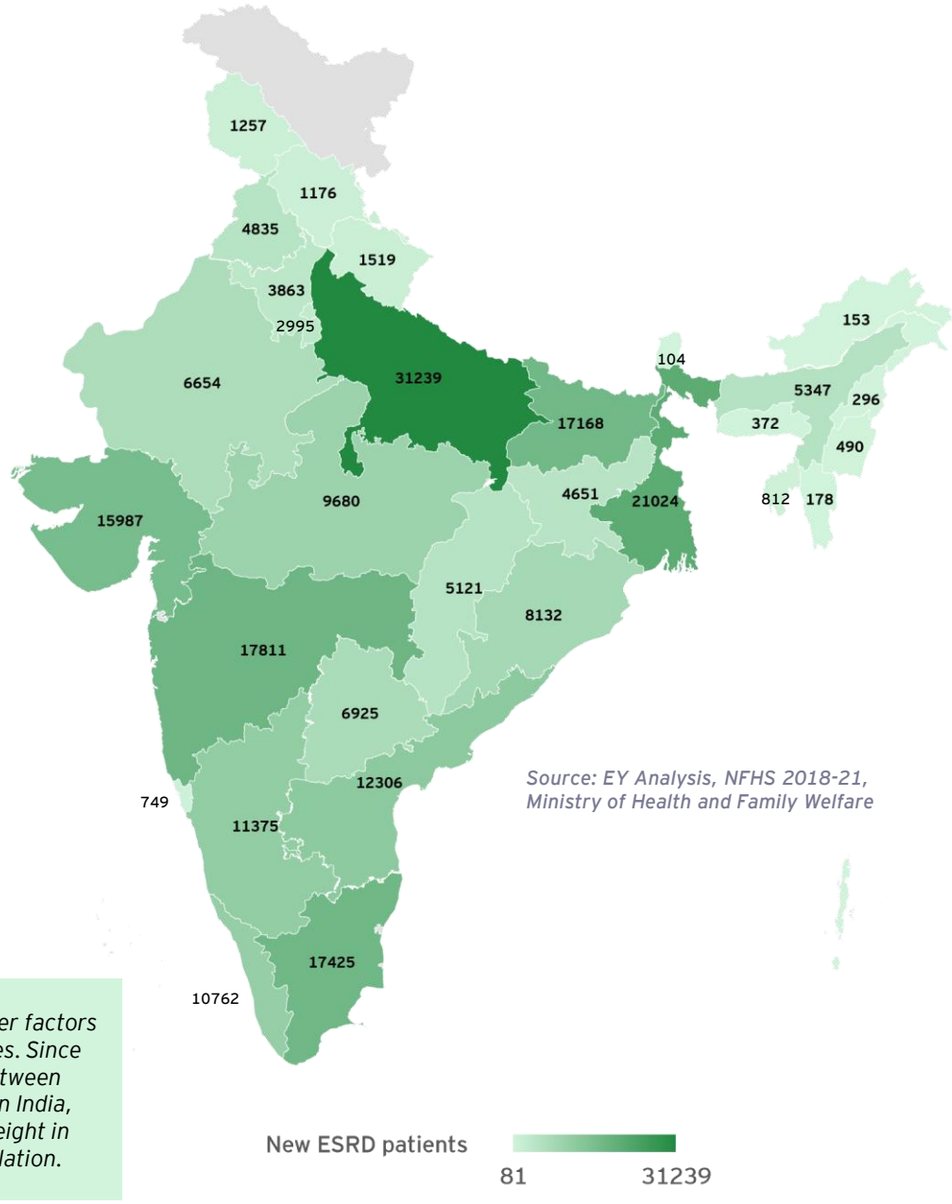
For representation purposes, the weight of each state has been taken to be the ***share of diabetic persons in that state in total population suffering from diabetes.*** *This weight has been taken as diabetes is the leading known cause of ESRD.*

However, there is a mismatch between the demand arising out of every state and the number of dialysis centres set up under the PMNDP program.

Note: Data from UT of Ladakh unavailable

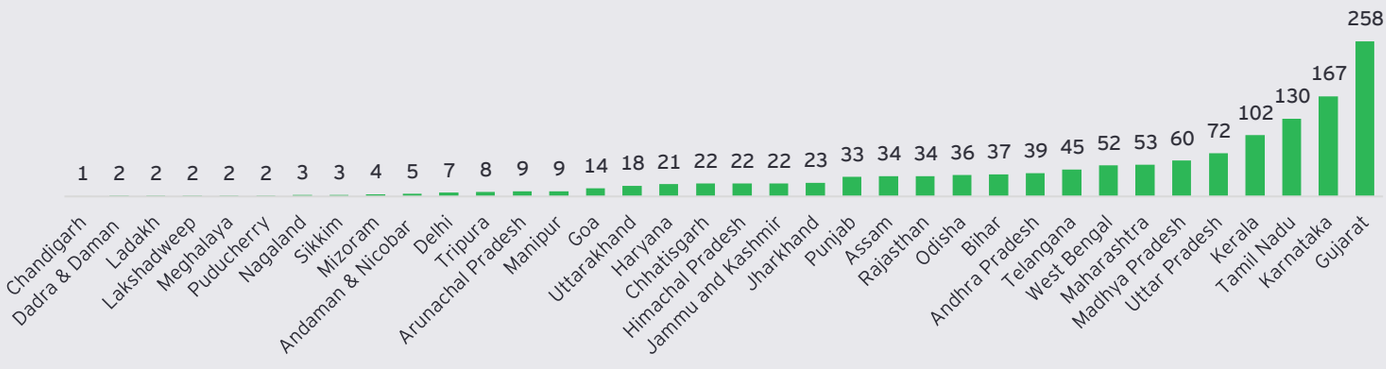
Note: ESRD is also caused due several other factors such as hypertension and unknown issues. Since there is no statistical disintegration between diabetes and hypertension population in India, diabetes has been used as a credible weight in determining the state-wise ESRD population.

New ESRD Patients added across states every year



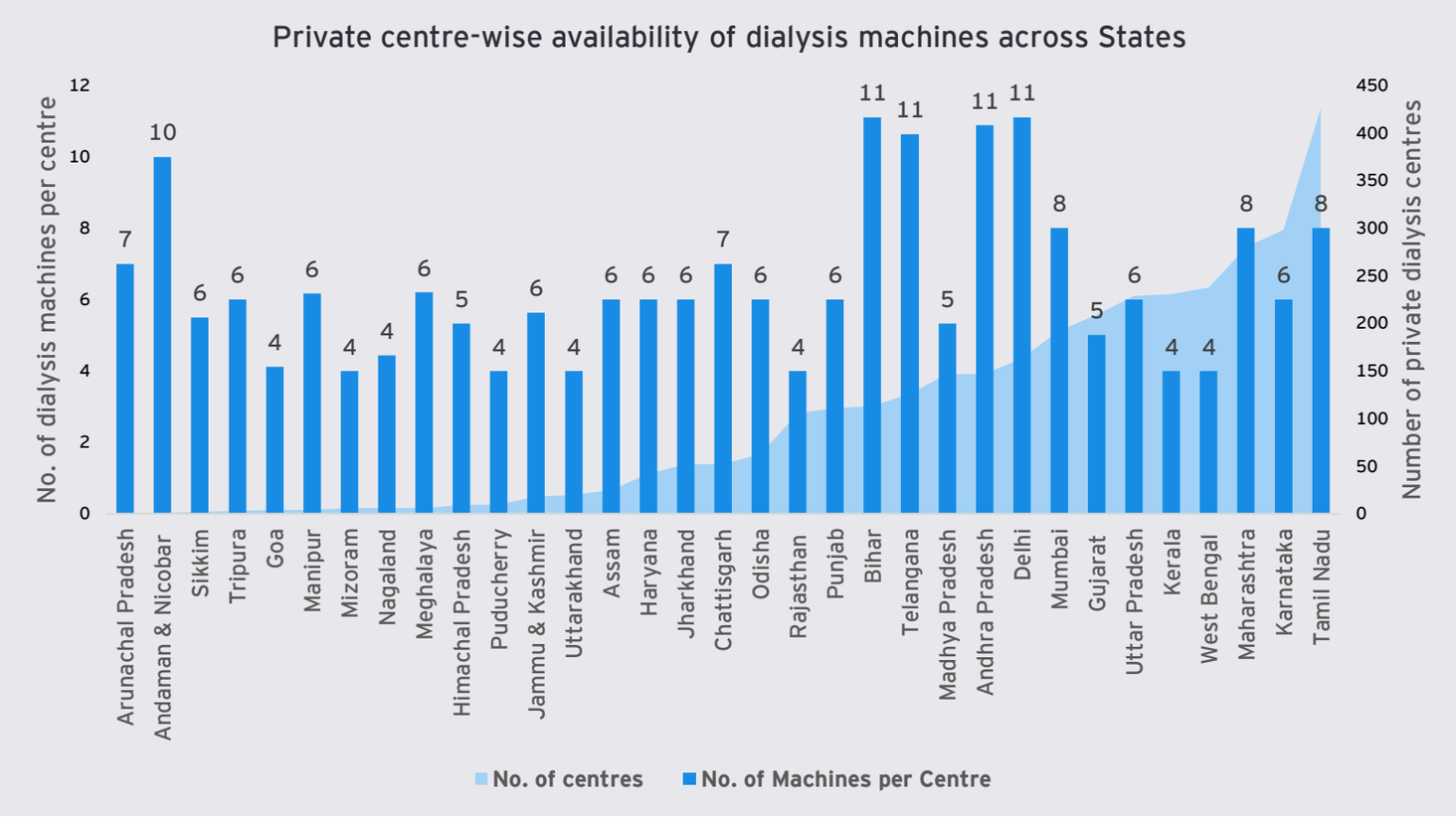
Source: EY Analysis, NFHS 2018-21, Ministry of Health and Family Welfare

Total number of functional Dialysis centres



Source: PMNDP data up to Jan 2023; Ministry of Health and Family Welfare

Dialysis delivering capacity in India: Tamil Nadu leads in Dialysis Coverage



Source: Industry estimates. Machines per centre is taken as approximate average value

Key features of dialysis delivery capacity in India

- In terms of private dialysis capacity, India, on an average, has 7 dialysis machines per centre. In fact, the majority of states in India have 7 machines or less per centre, with at least 11 states having a lower density of 5 machines or less. This includes key states like Rajasthan, West Bengal, Madhya Pradesh and Gujarat having 5 machines per centre or less.
- Tamil Nadu leads India by having 418 private dialysis centres with 3344 dialysis machines, followed by Karnataka (284 centres with 1704 machines), Uttar Pradesh (282 centres with 1692 machines) and Maharashtra (272 centres with 2176 machines).
- The states that have 100 machines or less include states with difficult terrains where availability of electricity and water may be an issue. These include the north eastern states and the hilly states of Uttarakhand and Himachal Pradesh.
- On including the PMNDP capacity, Gujarat and Kerala also lead in dialysis delivery capacity with aggregate (public and private) 209 and 231 dialysis centres respectively.
- Despite both public and private efforts, the dialysis delivering capacity in India is not sufficient. For instance in states with high rural population, the number of machines (either public or private) are much less than the dialysis demand. In terms of machine density or the number of new ESRD patients per machine, Tripura and West Bengal lead with highest gap of 14 new patients to a machine, followed by Uttar Pradesh (13 patients to a machine), Bihar (12 patients to a machine) and Assam (12 patients to a machine).
- **These findings indicate that present issue to resolve is to increase the dialysis delivering capacity to match the demand by new ESRD additions. In particular, the dialysis capacity needs to improve in states with lower socio-economic indicators where access to clean water and electricity is low.**

Source: Industry estimates; MoHFW; Details may be found in the Appendix

2

Need for standalone dialysis centres

Standalone dialysis centre: Key solution to Indian dialysis demand

01

Higher safety

Patients in standalone centres have lesser chances of developing hospital-acquired infections

02

Convenient and patient-friendly

A convenient and patient friendly solution for patients accessing services in multiple locations rather than hospitals for service billing, dialysis service, laboratory tests, cafeteria, etc.

03

Proximity to patient

These centres will reduce the travel cost and hassle for patients who live far away from the district hospitals; especially as dialysis sessions are required three times a week

Proposed features of a standalone centre

Infrastructure

- Proposed standalone centre to have a minimum 90 to 100 sq. feet area
- Minimum number of dialysis machines: 5 to 6 HD machines
- RO water treatment plant with output water provision as per AAMI standards for hemodialysis
- Dialyzer reprocessing machine for reuse of dialyzers after due disinfection
- 24x7 ambulance connectivity to the nearest hospital
- Availability of emergency medical equipment
- Provision for tele-consultation

Human Resource

- **Lead dialysis nurse/BAMS/ BHMS/Ayush/MBBS**
- Nephrologist visit once or twice a month
- Lead dialysis technician with five or more years of dialysis experience
- Ratio of 1 Renal Nurse/1 Technician per 5 occupied beds

Quality Assessment & Performance Improvement (QAPI)

- Centres must develop, implement, and maintain an effective QAPI program that documents, measures, analyses, and tracks quality indicators related to providing Quality Dialysis Treatments
- Clinical outcomes should be measured and analysed

(Presently, NABH/NQAS framework is followed)

Key areas of risk to be addressed while setting up a centre

- Emergency handling of critical patients by having a tie-up with nearby emergency hospital
-Consistent patient monitoring
-Controlling infections at the centre site
-Proper biomedical waste disposal

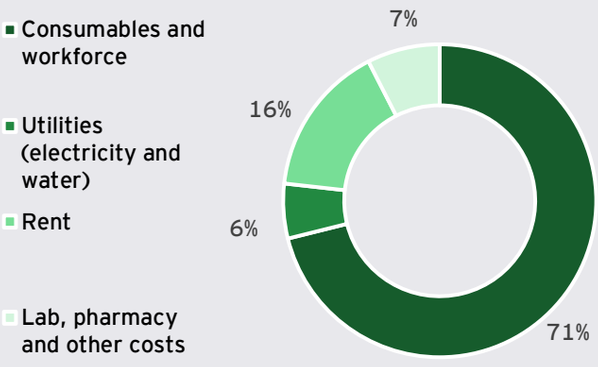
Source: Government inputs

Cost components of dialysis treatment in India: Manpower and consumables drive costs

Case for standalone dialysis centres in India

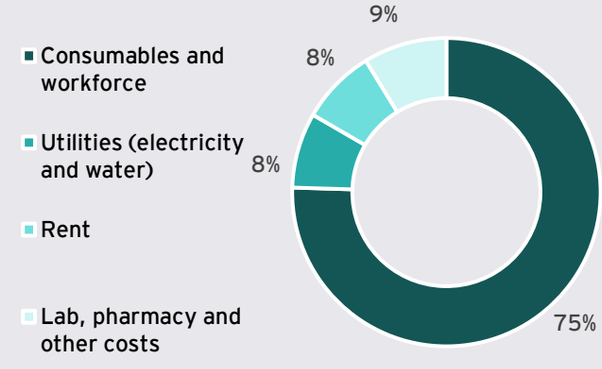
- India needs to catch up with the rest of the world and leverage standalone dialysis centres to improve access, affordability and safety.
- The broader acceptance of standalone dialysis centres in the world because of their low set-up costs and their scalability to penetrate rural and semi-urban areas is a proven example of improving accessibility in the Indian dialysis ecosystem.
- With the growing number of patients requiring dialysis in India, hospital-centric dialysis units are getting fully saturated and hence standalone dialysis centres can be utilized to meet the growing demand for an affordable model.

Cost break-up of single-use dialyser in Tier 1/Tier 2 cities



Source: Industry Inputs

Cost break-up of single-use dialyser in Tier 3 cities



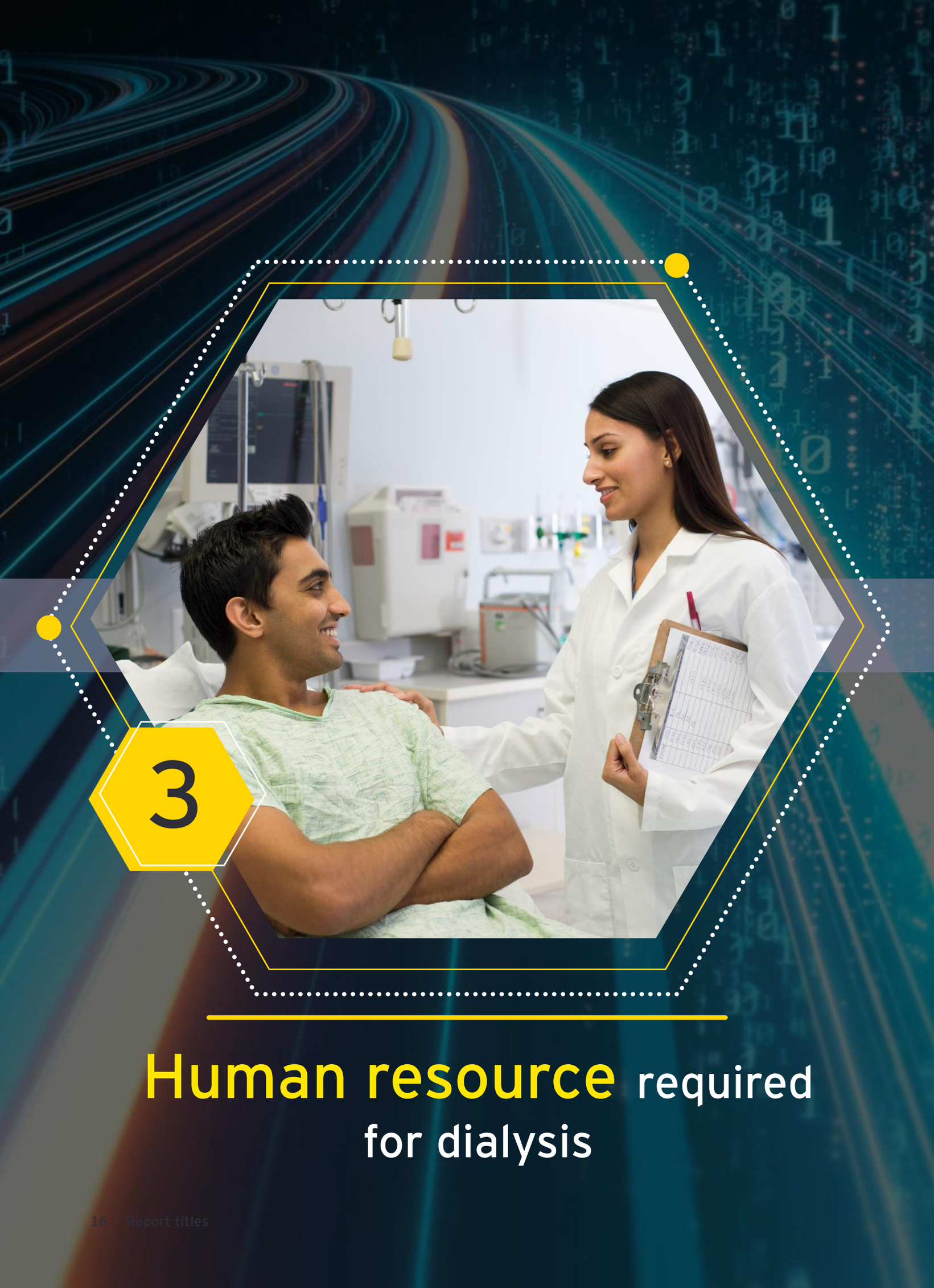
Source: Industry Inputs

Key challenges to be addressed

Location: As per the present PMNDP guidelines, standalone dialysis units can be set up within 3 kms of the district hospitals. However, this clause restricts the service providers from choosing an optimal location based on their assessment and evaluation of the real estate and thereby discourages them from making investments.

High attrition of MBBS doctors: The other major concern that the dialysis service providers face pertains to the human resources element such as the high attrition of MBBS doctors deployed at the dialysis centres, along with inadequate availability of dialysis technicians (DTs) and Nurses. This leads to a drastic impact on the operations of the standalone units and also puts patients' safety at risk.

Delay in empanelment: The delay in empanelment under the Ayushman Bharat and other health schemes of the government, which impacts financial viability of the dialysis service providers. Meanwhile, delay in empanelment at state level and subsequent delay in patient referrals affect driving sustainability of dialysis centres. Standalone centres may be decoupled from the PMNDP Standard Bidding document proposed in the National Health Mission.

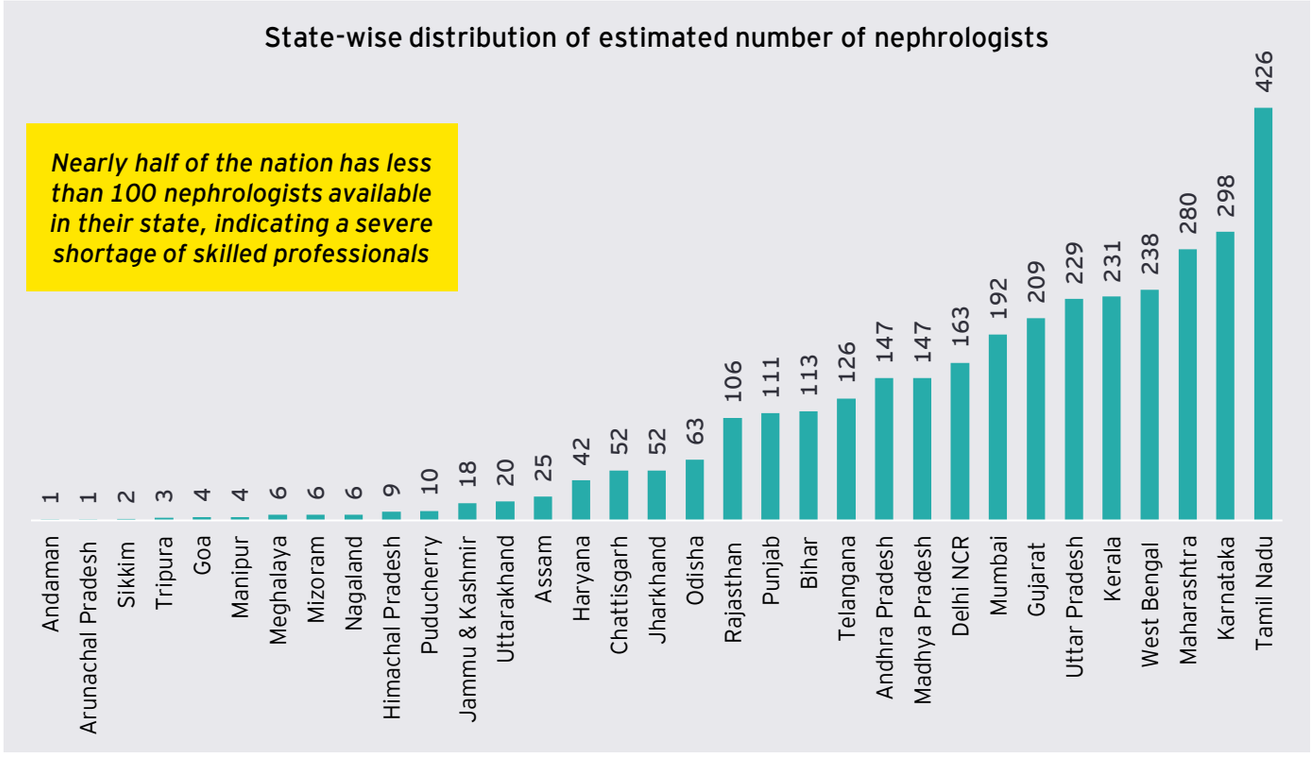


3

Human resource required for dialysis

Human resource for dialysis delivery: Shortage of skilled manpower varies across states

Currently, India suffers from a shortage of nephrologists, thereby having a very low nephrology workforce density. As per the Global Dialysis Perspective: India (2020) study, there were about 2,600 nephrologists, or 1.9 nephrologists per million population, as of 2020. Recent industry estimates indicate that the total number of nephrologists in India has increased to 3,340 in 2022. However, there is a state-wise disparity in the availability of these nephrologists. Population dense states such as Rajasthan, Punjab, Bihar and Telangana have less than 150 nephrologists in the state. Meanwhile, Tamil Nadu is leading the country in its human resource availability with over 400 nephrologists. The other two key healthcare professionals for dialysis are trained renal nurses and dialysis technicians. The dialysis industry reports a severe shortage of both these skilled professionals, along with lack of registries of such professionals.



Source: Industry estimates

The report titled "Rural Health Statistics", published by the Ministry of Health and Family Welfare, also reflects shortage of skilled medical professionals in India. This report provides the shortfall in terms of specialists such as surgeons, physicians and pediatricians required at community healthcare centres. In aggregate terms, there is an unmet demand of 17,519 specialized healthcare professionals, such as physicians and surgeons, in rural areas of India.

Other multipurpose workers engaged in the dialysis ecosystem include sanitation workers, machine cleaning, and dialyzer reprocessing services. In addition, only a few standalone dialysis centres have access to renal dieticians. As per the WHO estimates, India will face a severe shortage of public health professionals in the near future. This demand-supply gap may increase from 45,000 professionals to a scarcity of 64,000 professionals by 2026, thereby reemphasizing the urgent need to undertake training of healthcare professionals in order to meet the human resource requirements.

Training requirements in dialysis ecosystem: Understanding gaps in the system

India needs to address several gaps in terms of training healthcare professionals and building a skilled workforce to deliver quality dialysis services. Few of the gaps as per the industry in the dialysis ecosystem are the following:

1. **Dialysis Technicians**
   - Addressing **shortage of Dialysis Technicians (DTs)** in the country
   - **Ensuring employability** of DTs in the country
   - Need for **training curriculum** where HD technicians can be trained for PD treatment as well.
2. **Need for short-duration courses** to accelerate the upskilling of existing pool of nurses, doctors and allied professionals. These courses are to be provided with **universal accreditation** and **recognition.**
3. **Addressing the requirement of training centres** available in the country
4. **Making** these **training courses low-cost and affordable** will be imperative in encouraging more people to undertake such courses, thereby meeting the dialysis human resource demand. Distance-learning may also be promoted.

Apart from these, for the long-term vision of building adequate human resource capacity for Dialysis Treatment in India, longer duration programs are required for each key healthcare professional. While such programs may already exist, the following table provides key features of training program features, which may be adopted as part of dialysis policy in India.

Program	Eligibility	Curriculum	Assessment	Training facility
Dialysis Nursing training program	Bachelor of Science (B.Sc.) in Nursing, General Nursing and Midwifery (GNM), Diploma	6 months training program –3 months of theory, practical and field visits+3 months of internship in a dialysis unit under supervision	3 monthly assessments followed by final exam of theory, practical and viva by a clinical trainer and nephrologist.	Lecture room, skill lab – fully equipped with all renal replacement modalities, including water treatment system, mannequins for access training and emergency management crash cart.
Dialysis Duty doctor training program	Candidate should be minimum Ayush, BAMS, BHMS, MBBS with basic knowledge and registered with the respective medical council.	3 months of training (1 month is classroom training and 2 months on the job)	Same as above	
Dialysis technician training program	Candidates should be 12th pass, preferably from science	24 months training (theory, practical and field visit training followed by an internship in a dialysis unit under supervision)	6 monthly assessments, Final exam would be theory, practical and viva by a senior trainer and a nephrologist.	

Specific Training Requirements in PD Treatment

Home-care manual: A patient home care manual (paper and online) where patients can record daily therapy information – exchanges, fluid status, diet, exercise and medication. Essential training tools and schedule to include a 6-step hand-washing, maintaining a safe environment for exchanges, safe disposal, what to watch out for, patient help-line etc.

Training Nurses: To expand the reachability of PD treatment, nurses could be encouraged may be trained about the nuances of PD (along with HD). This includes emphasis on homecare trainings to ensure safety of patients.

Training Surgeons: Besides training of paramedical staff, surgeons needs to be trained for catheter insertion.

4

Key challenges in the dialysis ecosystem

Major challenges in dialysis ecosystem: A summary

Lack of access to dialysis centres leads to low frequency of treatment

HD treatment is conducted thrice a week in established countries. However, in India**, only 20% of patients are dialyzed three times a week** (R. Chauhan and S. Mendonca, 2015) and balance undergo HD either once or twice a week. The cause of low frequency of visits in India are various reasons, such as the lack of access to dialysis centre in the district, lack of availability of attendants to accompany them for dialysis, traveling from far of distances to the dialysis centres and having limited finances. Further, central health schemes such as CGHS, ESIC, ECHS don't **recognize empanelment of standalone dialysis centres** further adding to lack of access to dialysis services

Erratic and low price of reimbursements affects operation of dialysis centres

Service provider's experience under several government schemes such as under CGHS, ESIC and ECHS schemes, along with PMNDP program is such that the reimbursements received are erratic, which impacts the operations of service providers that undertake large capital expenditure in establishing dialysis centres. Meanwhile, ensuring low price per dialysis treatment makes the market less attractive for many private players who incur heavy capex for setting up the centre. There is a lack of uniformity in state tenders, which leads to varying state-level experience. In addition, there is a lack of necessary price escalation clause to account for inflation. This may help service providers avoid quoting higher prices from the project initiation date to ensure project sustainability over the tender tenure.

Lack of skilled workforce

Under the domain of training and technical requirements, a key issue grappling with the dialysis delivery in India is the shortage of DTs in the country. There is a lack of any kind of incentive or assurance of employability of DTs in the country, which deters the youth from entering this domain. In addition, there is a need for training curriculum where HD technicians can be trained for PD treatment as well. Meanwhile, for the trained professionals, such as the existing pool of nurses, doctors, and allied professionals, there is a requirement for short-duration courses to accelerate the upskilling and meet the demand on the ground. Along with this, training centres need to be identified to deliver dialysis-related trainings in India.

PD treatment yet to take off

The key reason for a low update of PD in India is the high cost and low clinical adoption as compared to HD treatment. In addition, low level of awareness of PD services in the country amongst the patients causes low adoption. On the delivery side, lack of established supply side channels for provisioning and storage of CAPD bags leads to higher costs and inconvenience for PD patients. In terms of clinical concerns, reducing infection rates and health complications arising out of PD treatment is of key importance. There is a need for defining clinical outcomes, improving access to care for PD patients, monitoring the status of patients, and providing emergency care.

Import dependence on key dialysis consumables
Issue faced by certain dialysis service providers

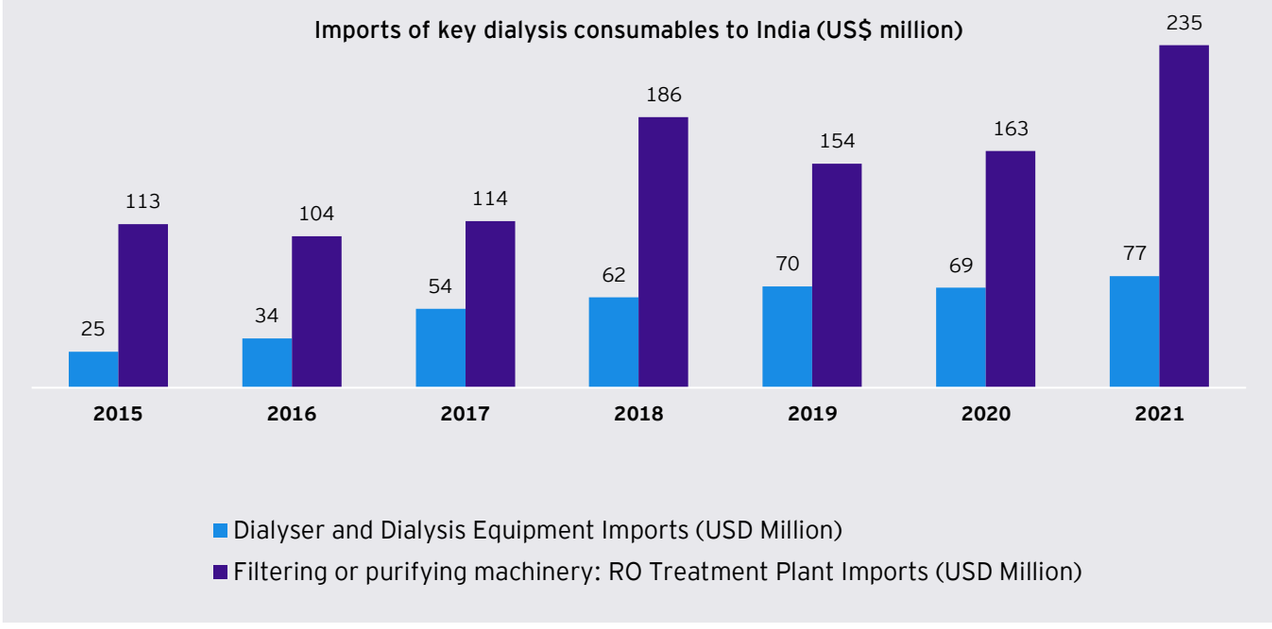
- Dialysis machines are essential components for dialysis treatment and the present quantity of these machines and equipment in India are not sufficient to meet the dialysis demand. Hence, service providers look to import the equipment from outside India to provide the highest quality service to dialysis patients. Any customs duty levied on these inputs to dialysis service is an additional burden on the patient.
- Custom duties and additional taxes levied on the import of these consumables required for dialysis treatment are in turn passed on by the importers to their customers, such as dialysis centres and hospitals, thereby making the treatment even more expensive for patients in India.
- For hemodialysis (HD) treatment, there is a clear indication of import dependence on two of the critical components- the dialysis machines and dialyzers and the RO treatment plant, which adds to the cost of services. While the PLI scheme exists to encourage domestic production of the dialysis equipment in India, domestic manufacturing is yet to catch up to the domestic demand for dialysis equipment.

Custom duty levied on key dialysis consumables imported in India

HSN Code	Description	Basic Custom Duty
90189031	Artificial kidney (dialysis) apparatus	7.5%
84212900	Filtering or purifying machinery and apparatus for gases	10%
38089400	Disinfectants	10%
30019091	Heparin and its salts	10%

Import of dialyzer and RO plants add to overall HD treatment costs

The following figure indicates the growing level of imports of products of two HSN codes: 90189031 (Artificial kidney (dialysis) apparatus: Dialysis Machine and Dialyzers) and 84212900 (Filtering or purifying machinery: Reverse Osmosis (RO) Treatment plants), indicating added costs due to custom duties and goods and services tax (GST) levies.



Source: WITS, World Bank, Ministry of Commerce

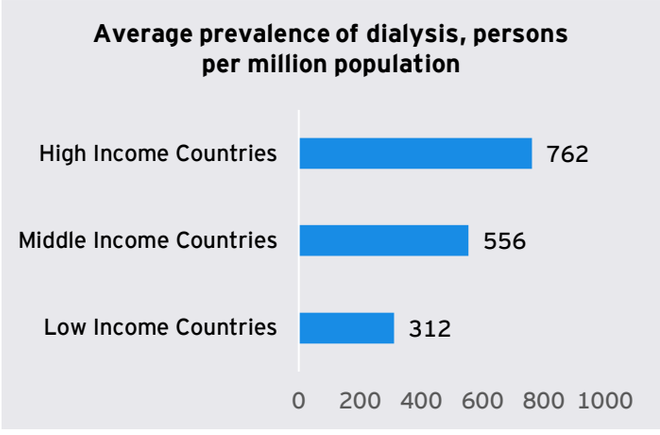
5

Global perspective

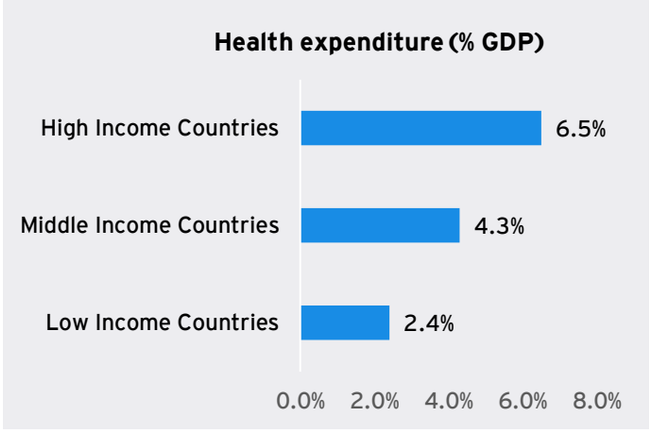
for dialysis

Global trends:
Higher income countries have a strong focus on dialysis

Higher Income countries dedicate a higher share of their GDP on health expenditure, allowing a greater number of people to access dialysis services



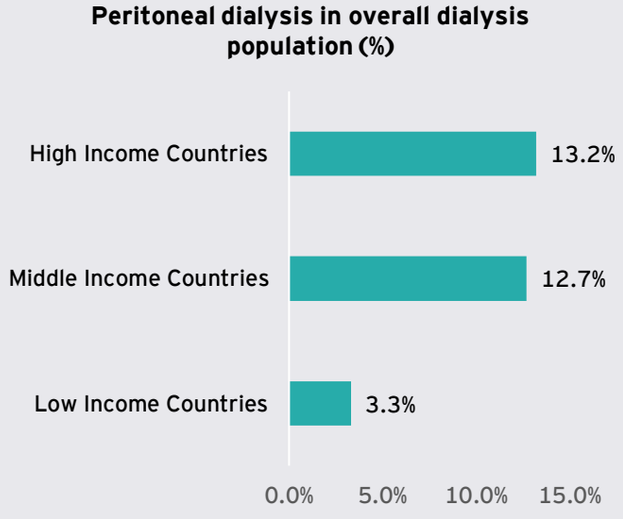
Source: An International Analysis of Dialysis Services Reimbursement, CJASN, Multiple Authors, 2018



Source: An International Analysis of Dialysis Services Reimbursement, CJASN, Multiple Authors, 2018

- In low-income countries such as India, the average number of persons on dialysis per million population is about 312.
- The global discourse indicates that the government's support and reimbursement under dialysis services is influenced by economic factors.
- Thus, in-centre HD services, which require incurring labour costs, are promoted in countries where labour costs are low. In contrast, expenditure in PD treatment is over various consumables, such as CAPD bags and tubing.
- In low- and middle-income countries these consumables are mostly imported, and thereafter transported over long distances which adds to overall costs of PD services. Consequently, the prevalence of PD in these countries is low.

PD prevalent in countries with PD first policy

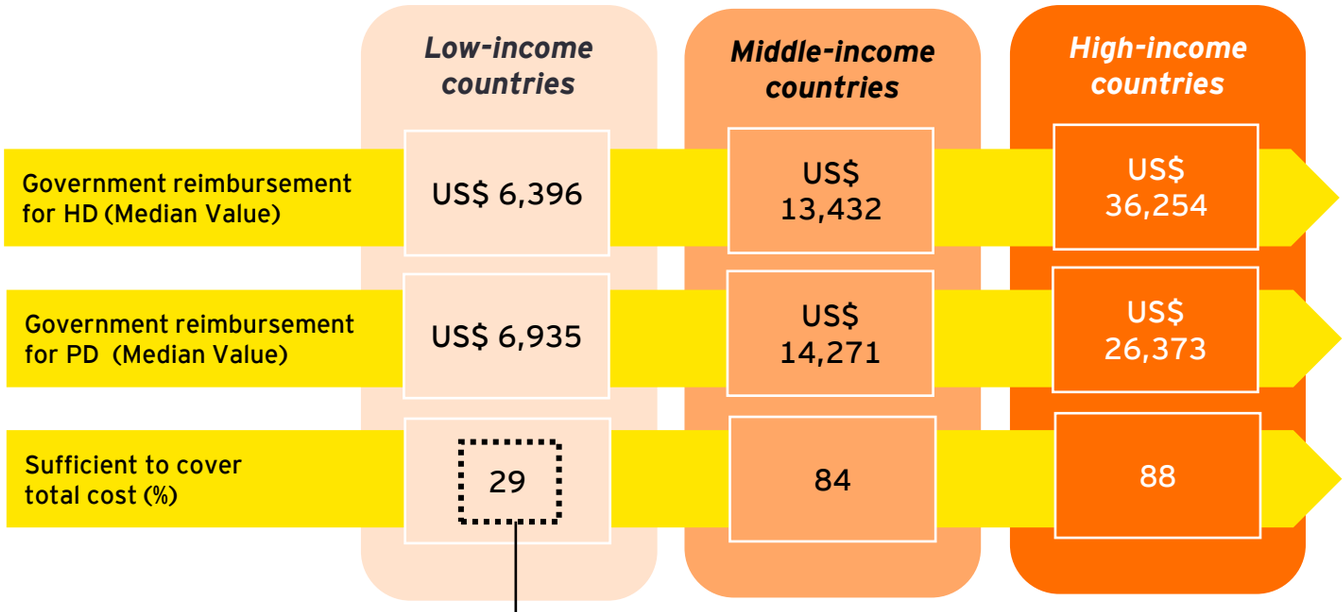


- The prevalence of patients on PD is much lower than that of patients on HD worldwide.
- Countries that have a non-financial PD-first policy such as Denmark, Hong Kong, Latvia, Malaysia, Mexico, Philippines, South Africa, and Thailand have a higher percentage of patients on PD.
- Studies suggest that financial incentives aimed solely at hospitals or care providers are not sufficient to increase use of PD
- To increase use of PD, costs of PD need to be reduced by local production and supply of PD fluids, or reduced taxes on imported fluids.

Source: An International Analysis of Dialysis Services Reimbursement, CJASN, Multiple Authors, 2018

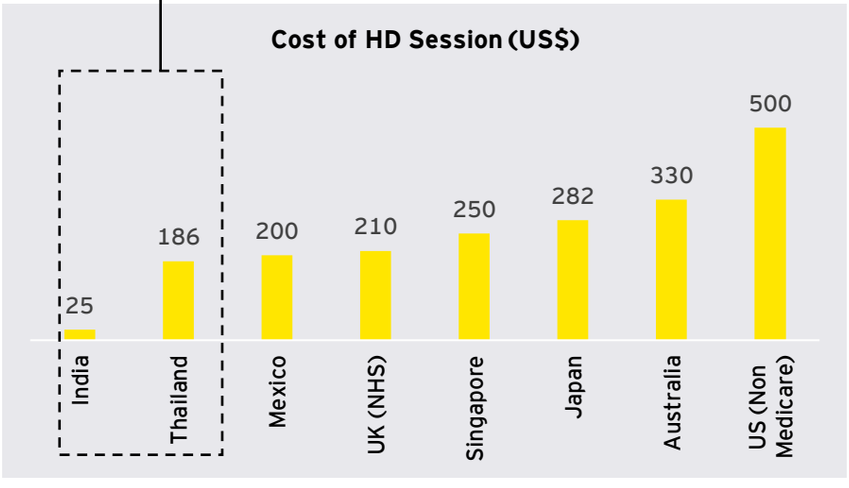
India's standing in the global landscape: Insufficient reimbursement to cover overall costs

India's cost of an HD session is much lower than that of comparable countries. In the same measure, the government reimbursement for HD treatment per patient is also the lowest in India.

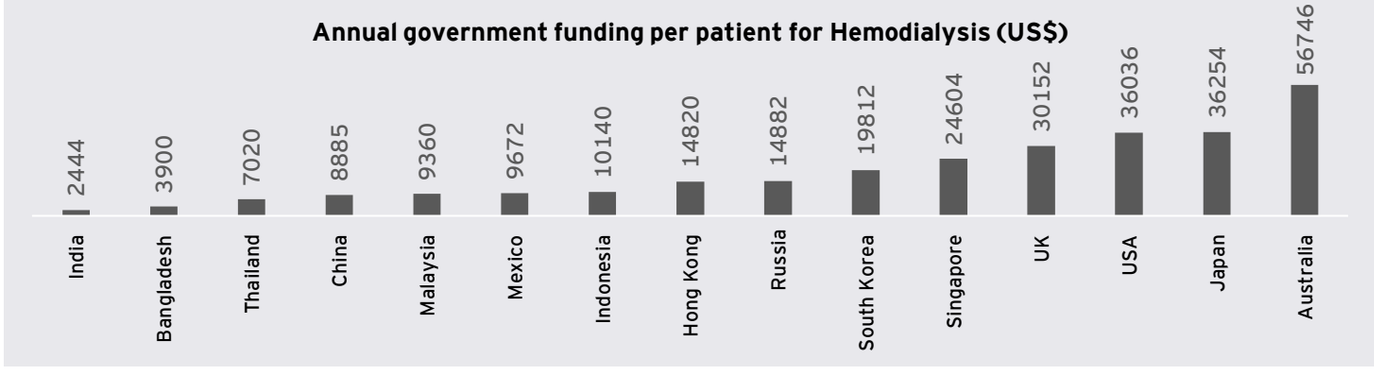


Source: An International Analysis of Dialysis Services Reimbursement, CJASN, Multiple Authors, 2018

- Even though cost of one HD session is lower in comparison to other key countries, the government reimbursement provided is not sufficient to cover total cost.
- Cost of HD sessions in developed countries may be higher due to real estate cost, latest equipment and workforce deployed. Meanwhile in India, to deliver at the lowest price point at the same level of international quality, Indian private dialysis service providers operations remain stressed.
- Developed countries spend a significant share of their government expenditure into medical programs, especially that of end stage renal care. This, in turn, helps reduce mortality and improve quality of life of ESRD patients.



Source: EY Analysis



Source: An International Analysis of Dialysis Services Reimbursement, CJASN, Multiple Authors, 2018

6

Focus on Clinical Outcomes and Standards

Clinical outcomes monitoring: Essential to quality dialysis delivery

- An essential component of quality delivery of dialysis services is recording and monitoring clinical outcome of ESRD patients for improving their safety and clinical care. There are several important clinical outcomes which are considered critical for dialysis patients; however, the four key indicators are mortality, anemia, seroconversions and dialysis access.
- Monitoring and tracking these outcomes helps improve the understanding of the effect of dialysis treatment on patients and thereby helps the service providers in turn to improve their services in order to increase the lifespan of patients and enhance their quality of life. Service providers may play a key role in educating the patients on the utility of proper dialysis access (AVF/AVG/Perm Cath) thereby improving clinical outcomes.
- Presently, there is a lack of record keeping of the clinical outcomes of ESRD patients, which also severely impacts patient safety and quality of service delivery.

01 Mortality

Share of patients died at least three months/one year after they started dialysis in a year (%)

Mortality among patients with ESRD remains high. So, measuring mortality is important to ensure that the quality of dialysis being provided is as per the clinical standards.

02 Anemia

Share of patients who have their HB measured once a month and % of those tested who are in the recommended range (9.5 to 11.5 g/dL) (%)

Anemia is one of the most common problems faced by dialysis patients, resulting in several side effects like fatigue, lack of energy, increased risk of infection, etc. It is important to measure and correct anemia to ensure improved longevity, reduced mortality and morbidity and a Better Quality of Life.

03 Seroconversions

Share of patients who have seroconverted with Hepatitis C in a year (%)

Seroconversions are a huge problem in dialysis centres. The very nature of hemodialysis makes it susceptible to seroconversions. However, following proper protocols can reduce the incidence of seroconversions significantly.

04 Dialysis Vascular Access

Share of patients who have an Arteriovenous Fistula (AVF) or an Arteriovenous Graft (AVG) within 3 months of initiating Hemodialysis (%)

AVF is associated with the best Clinical Outcomes in hemodialysis patients, followed by AVG. Temporary accesses such as non-tunneled and tunneled catheters are known to worsen outcomes due to their inherent nature of being external accesses compared to AFVs and AVGs which reside under the skin. Providers must strive to ensure their patients get an AVF or an AVG as soon as possible.

Source: Compiled Industry Inputs

Maintaining standards:
Dialysis-centred requirements

Any policy guideline for dialysis must be centred toward ensuring patient safety and quality treatment. This is why, it is extremely important to have universal Dialysis service standards under NABH. The majority of Asia-pacific countries, including Malaysia, Philippines, Hong Kong, Taiwan, Singapore, Australia, Indonesia, China, and Thailand, have published mandatory Dialysis Service Standards. Following are standards recommended by Indian dialysis stakeholders:

Facility	▶ **Dialysis Clinics including standalone centres should have tie-ups with nearby healthcare facilities to treat/handle emergency complications.** ▶ Infra and space should be adequate as per ISN recommendations ▶ Mandate to have dedicated machines to treat isolation cases (HCV/HbSAg/HIV)
Manpower	▶ **Standalone dialysis centre to be managed by certified renal nurse/ MBBS/ BAMS/ BHMS/ BUMS doctor** ▶ Manpower should be adequate as per machine ratio (one staff per three occupied machines) ▶ All staff including technicians should be certified in BLS ▶ Clinic must have dedicated staff to treat isolation and suspected cases ▶ Regular nephrologist visit: once in a fortnight
Products and consumables	▶ **Reuse of dialyzer for Hepatitis B and HIV, and such suspect cases, should be avoided strictly.**
Diagnostics	▶ Virology testing of patients, through HCV RNA and HBV DNA method, should be preferred over Antibodies/ Rapid Kit method, where these tests are available in the facility ▶ No refurbished machines to be allowed
RO/Water treatment unit	▶ TDS of RO water to be recorded every day by provider to ensure AAMI standards are met ▶ Loop line disinfection to be done monthly ▶ Dialysate Endotoxins to be measured on a six months basis and Dialysate CFU (Colony Forming Unit) test to be done on a monthly basis ▶ Complete chemical analysis (23 parameters) to be done annually

Source: Compiled Industry Inputs

7

Key Recommendations

Short-term recommendation: Promoting standalone centres for HD Treatment

Issue	Key recommendations
Improving access	Access to dialysis can be improved by allowing flexibility to service providers in choosing the location for setting up of standalone dialysis units if the space is not provided in the district hospitals. Two types of models can be adopted: ► **PPP Model: Setting up of standalone dialysis centre at the district hospital level or other primary healthcare centres under PPP Model.** ► **Non-PPP Model: Private entities may set up centres under a private-lease model. However, this standalone centre may be empanelled under Ayushman Bharat, to serve to patients under Ayushman Bharat, any other health schemes, insurance schemes and also other private patients** **Access creation:** In few apex hospitals (may be medical colleges/referral hospitals) in a state, government may create the necessary infrastructure for free dialysis access creation for patients. This must include access to Arteriovenous Fistulas (AVF), arteriovenous graft (AVG) and Perm Cath creation for patients. **At community healthcare centres and primary healthcare centres, one dialysis bed may be added to provide for immediate care for patients from lower income groups.**
Optimal use of human resource, maintaining standards and mitigating other costs	**Human Resource:** As witnessed in successful countries like the US, the UK, Singapore, Philippines, China and others, trained Dialysis/renal care nurses may be allowed to manage the standalone centres. The nephrologists may visit the facility once or twice a month. If a Renal/Dialysis nurse is not available, any of the BAMS, BHMS, Ayush or MBBS with basic knowledge and registered with the respective medical council can be considered for managing the standalone centres. **Maintaining Standards:** Dialysis quality and RO water quality to be maintained as per AAMI standards. In addition, the practice of reuse of dialyzer must be as per the set standards to improve the quality of the treatment. **Reducing cost of equipment:** Equipment incurring high custom duties may be considered for relaxation/exemptions to reduce overall costs of equipment and thereby facilitating affordability.
Resolving empanelment delays	► **Guidelines for empanelment of standalone centres under Ayushman Bharat scheme to be simplified and made uniform across the country.** ► **To ensure empanelment process concludes in a time-bound manner, provision of "deemed approved",** or an automated approval process at state level could be considered under central schemes and centrally supported schemes. Here, minimum infrastructure, consumables and human resource compliance need to be met. ► **Auto/Default-approval for specialized dialysis networks with significant years of experience with dialysis services and PMJAY empanelment:** For e.g., those with over 3 years of experience; 100 dialysis machines; 3 PMJAY empanelled units operational for one year, auto approval to be given in 30 days while an in-person visit/audit can happen in three to six months to ensure compliance so that access is not compromised for needy patients during the usual waiting period.
Maintaining price point and reimbursements	► **Reimbursement rates to be increased** considering the overall cost of treatment to providers in NHA, CGHS and other government reimbursement scheme. ► The final price point for dialysis services at the standalone centre may be linked to the Wholesale Price Index (WPI) with the provision of an annual revision of price to manage rising costs arising due to inflation.

Source: Compiled Industry Inputs

Medium-term recommendation: Building human resource for dialysis

Issue	Key recommendations
Scarcity of Dialysis Technicians	► To address shortage of dialysis technicians (DTs), a broad set of candidates with minimum qualification of higher secondary, preferably from science, biology background, can be trained. In addition, there should be a qualifying entrance test to maintain the quality of trainees. These technicians can be trained on both HD and PD treatments. **This training may be provided with accreditation and universal recognition.** ► **On the job trainings and internship opportunities**: Promoting sponsored internships/sponsorships in partnership with the private sector. This will encourage interested youth to be involved in the dialysis ecosystem. A key feature of this model must be on-the-job training at standalone centres.
Accelerated learning for trained professionals	► Nurses play a critical role in dialysis treatment, and **therefore short-term trainings may be formulated for nurses on both HD and PD treatments.** This may be provided with accreditation and universal recognition. ► **Short-duration training courses for Ayush, BAMS, BHMS, MBBS doctors to be formulated. This may be provided with accreditation and universal recognition**. ► In addition, Train the Trainers program can be introduced to help reduce the turnaround time and making a balance between quality and quantity of the allied professionals.
Infrastructure requirements: training centres	To address infrastructure challenge, state governments can engage in public private partnerships (PPP) with service providers. Here, two types of PPP models can be used: ► Any public hospital meeting a minimum benchmark of infrastructure requirement can be used to deliver training sessions, whereas the training material and equipment will be provided by the service providers. ► The state government can directly engage with service providers to set up facilities wherein the existing pool of nurses and doctors can be trained on the equipment provided by service providers.
Creating Awareness	As discussed, HD treatment is conducted thrice in a week in established countries, while in India, only 20% of patients are dialyzed three times a week. Hence awareness creation by healthcare workers may be encouraged to ensure that the dialysis patients undertake timely visits to the centre. This will in turn improve the health outcomes and reduce mortality.
Specific human resource requirements for PD	► **Home-care manual**: A patient home care manual (paper and online) where patients can record daily therapy information – exchanges, fluid status, diet, exercise and medication. Essential training tools and schedule to include a 6-step handwashing, maintaining a safe environment for exchanges, safe disposal, what to watch out for, patient helpline, etc. ► **Training nurses**: To expand the reachability of PD treatment, nurses could be encouraged to be trained about the nuances of PD (along with HD). This includes emphasis on home care trainings to ensure safety of patients. ► **Training surgeons**: Besides training of paramedical staff, surgeons need to be trained for catheter insertion.

Source: Compiled Industry Inputs

Recommended Standards for Standalone Dialysis centres
(1/2)

No.	Standard	Details
1	**Patient requiring continuous monitoring beyond scope of care shall be referred to identified facility**	▶ For patients requiring unanticipated stay, the centre shall have a tie up with appropriate facility
2	**Assessment is done in all patients before procedure**	▶ The clinical assessment shall also reaffirm the working diagnosis. The assessment shall also cover history, co-existing disease (e.g. Hypertension, Diabetes mellitus, COPD, seizure etc.) vital signs, documentation of drug allergies, review of the medications the patient is taking currently etc. ▶ The pre procedure instructions shall include but not limited to written instructions about arrival time, place, fasting requirements, post- procedural course, driving limitation, need for responsible accompanying adult etc.
3	**Informed consent is taken before the procedure**	▶ There shall be separate consent for procedure and sedation/ anaesthesia. Informed consent shall adhere to statutory norms. ▶ Informed consent shall include information regarding the procedure; its risks, benefits, alternatives and as to who will perform the procedure in the language they can understand. ▶ The informed consent shall be taken by the person performing the procedure.
4	**Procedural safety checklist is implemented**	▶ centre shall use a documented checklist to prevent adverse events like wrong site, wrong patient and wrong surgery (for example before fistula procedure). ▶ centre should use two identifiers to identify a patient of which one will be Unique Identification number. ▶ Patient and/or relative may be involved in ensuring correct patient, correct procedure and correct site.
5	**Written guidance governs procedural sedation**	▶ Written guidance at a minimum shall include identification of procedures and patients which will need sedation, along with the drug and doses. If sedation is given, Intra-procedure monitoring includes at a minimum the heart rate, cardiac rhythm, respiratory rate, blood pressure, oxygen saturation, and level of sedation (for example Ramsay sedation scale). Certain other parameters may be monitored on a case-to-case basis. Competent person shall be appropriately trained in ALS. ▶ The sedation notes shall include pre procedure assessment, monitoring during and after procedure, discharge/transfer out criteria after the procedure. Person monitoring sedation is trained in detection of rhythm abnormality/apnea/airway obstruction and is different from the person performing the procedure. Whenever parenteral route is used this may be administered by a doctor or a nurse under supervision of a doctor.
6	**Written guidance governs administration of anaesthesia**	▶ Written guidance at a minimum shall include identification of procedures and patients which will need anaesthesia along with anaesthesia plan. During anaesthesia monitoring includes regular recording of temperature, heart rate, cardiac rhythm, respiratory rate, blood pressure, oxygen saturation and end tidal carbon dioxide and is documented. During regional anaesthesia instead of end tidal carbon dioxide, adequacy of ventilation is monitored by continual observation of clinical signs. ▶ Certain other parameters may be monitored on case-to-case basis. Anaesthesiologist will be present throughout the case Intraoperative adverse anaesthesia events shall be clearly defined and monitored. The post operative care plan shall advice on IV fluids, medication, care of wound, nursing care, observing for any complications, etc. ▶ The plan could be written by surgeon in collaboration with anaesthesiologist When anaesthesia is provided on urgent basis, the pre-anaesthesia assessment and pre-induction assessment may be performed immediately following one another, or simultaneously, but should be documented separately.

Source: Compiled Industry Inputs

Recommended Standards for Standalone Dialysis centres
(2/2)

No.	Standard	Interpretation
1	The operative procedure note is documented	▶ The note provides information about the procedure performed, Intraoperative findings, if any, status of the patient after procedure. This shall be documented by the doctor performing the procedure
2	Patients are monitored for adverse events before discharge and documented	▶ Patients at the time of discharge are monitored for 1. Vitals 2. Weight of the patient 3. Bleeding from the site of incision. 4. Any eventful stay to the centre. ▶ All the above parameters shall be recorded in the discharge summary and patient records.
3	Nursing Care is provided to patients in the centre in consonance with clinical protocols.	▶ Written guidance governs nursing care before, during and after the procedure. ▶ For example, nursing initial assessment, shall guide the nursing care plan. Nurses are trained in identifying early warning signs and actions thereof. ▶ Nursing care training shall also include care of vascular access (centreline catheters, fistula, grafts etc.)
4	The written guidance governs equipment and engineering controls	▶ Standard operating procedures for dialysate and equipment maintenance are available. This shall include for example, monthly microbiological and biochemical analysis of the dialysate, once daily log for the hot disinfection of each machine, weekly logs for front disinfection with bleach, yearly machines servicing and calibration records etc. ▶ Dialyzers reprocessing protocols addressing time for reprocessing (within two hours after termination of dialysis), storage (dialyzer closed with caps and disinfectant is filled completely; dialyzer and dialyzer storage box marked with Patient Name and ID) shall be maintained. ▶ Periodic monitoring of RO water as per standard guidelines (for example daily monitoring of TDS of the RO water, post softener hardness; monthly monitoring of Endotoxin levels and microbiological analysis of RO water and six-monthly Chemical analysis of RO water shall be done). Such monitoring shall be governed by established standards and guidance updated from time to time.
5	The dialysis centre develops appropriate key performance indicators suitable to monitor clinical structures, processes and outcomes.	▶ The dialysis centre shall at a minimum identify and monitor the following indicators 1. Line infection rates 2. Adverse events during dialysis 3. Percentage of cases where dialysis was interrupted
6	Emergency readiness	▶ Paramedical staff should be eligible for administering dialysis. All staff must be trained on BLS. One staff must be trained and having certification on ACLS, it could be a Staff Nurse ▶ Crash cart has complete set of medicines with an expiry date more than 3 months away. ▶ centre has adequate quantities of working Oxygen Flowmeters and Cylinders and they have been kept in designated place with proper visible labelling ▶ Suction Apparatus, Nebulizer Laryngoscope, Defibrillator are all working, and all clinical staff know how to use.
7	Reduction in infection rate	1. Separate beds for Hepatitis B & C, and HIV patients 2. Hand rub disinfectant is available at each bedside and hand hygiene opportunities are used

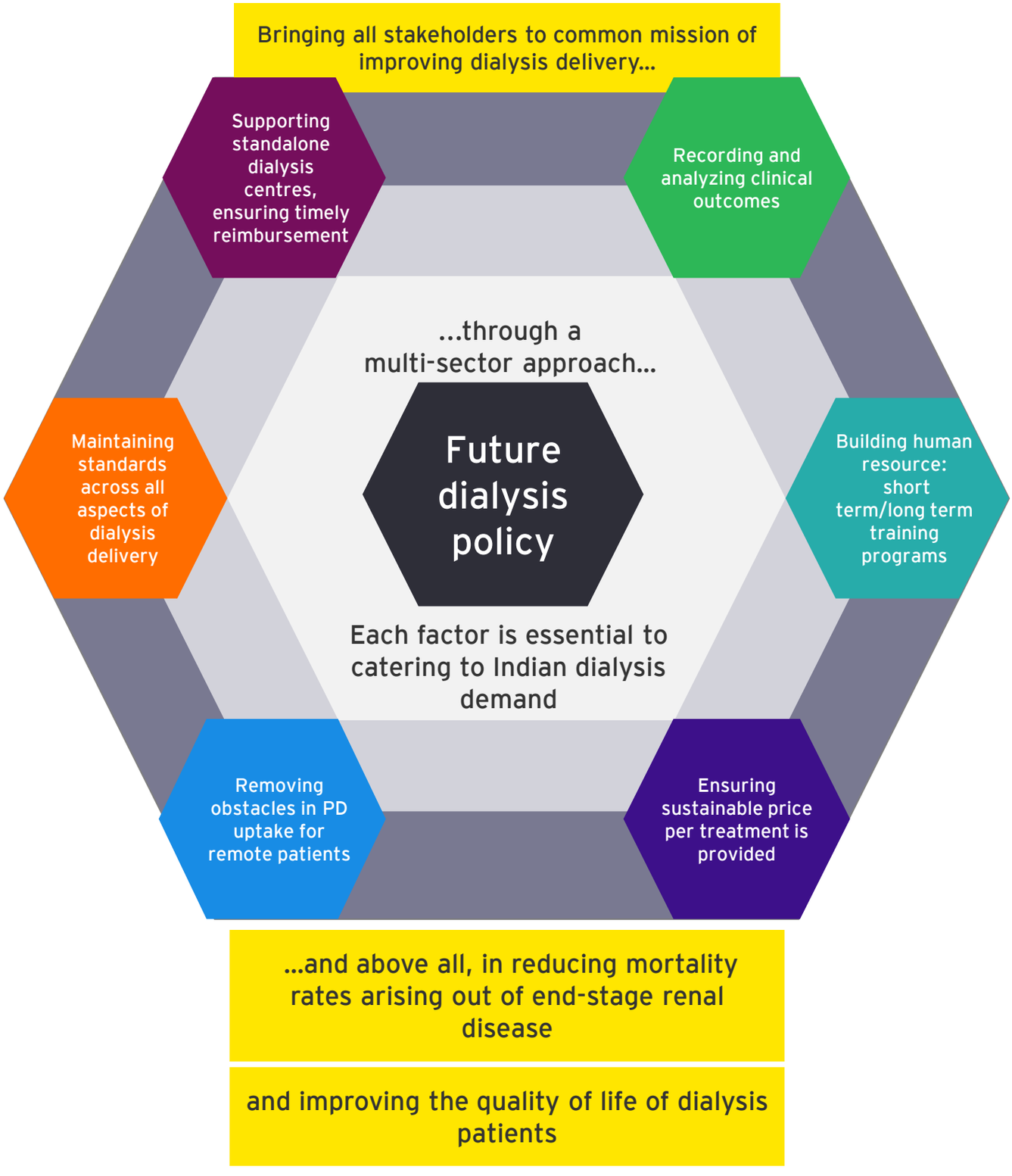
Source: Compiled Industry Inputs

Recommendations for peritoneal dialysis: Making PD treatment an accessible and viable alternative

Issue	Key recommendations
PPP Model for PD treatment	This treatment may be offered under a PPP model wherein the consumables (including the delivery of CAPD bags) may be provided by the private entities to the district level healthcare centre, while the care and delivery to the patient may be handled by the states in their existing healthcare facilities such as district hospitals, standalone centres.
Building Awareness among patients	Promoting **awareness of PD treatment** for ESRD patients through mass campaigns. Lack of awareness is a barrier to PD penetration, which could be addressed through information and education campaigns. These educative campaigns may be organized at the state/district level (along with service providers) to improve the penetration of this treatment. This should also include aspects of safety and hygiene to be taught to the patients.
Making PD treatment cost competitive	**Custom Duty reduction on CAPD Bags**: CAPD bags being imported in India may be considered for Custom Duty reduction to make bulk buying of bags more affordable to service providers. **Encouraging domestic manufacturing:** The domestic production of CAPD bags can be promoted under the existing PLI scheme for medical devices in line with the government's Make in India agenda.
Clinical support infrastructure	**Defining clinical outcomes:** Central government can decide a specific list of clinical outcomes to be monitored in PD patients in consultation with nephrologists, service providers and professionals with field experience. **Encouraging clinical outcomes monitoring for PD:** specific clinical outcomes measures for PD treatment, such as incidents of fluid overload, cardiovascular events and malnutrition indicators, be recommended to be monitored by district and state level hospitals having patients on PD treatment. This will help improve the quality of care provided to the patients. **Allocating PD Rooms:** States can allocate a specific percentage of all standalone dialysis centres to have PD rooms. This will ease the process of initial PD sessions under guided supervision to improve clinical outcomes for patients.
Promoting community healthcare	PD can be promoted in India under **community healthcare model**. This may include the following: ► Engage Asha workers or social workers to provide first point of assistance to PD patients. ► Engage PD Coordinators, who may record the patient status – through scheduled video and in-person evaluations. ► Evaluations may include indicators of clinical condition such as fluid status, compliance with therapy, nutrition status, fatigue assessment and complications that will need escalation ► Registry of PD patient with the nearest district hospital, standalone centre; practicing nephrologist may provide services in critical conditions.

Source: Compiled Industry Inputs

Summary:
Dialysis policy to be centred around critical sectors



Appendix:
Estimated Dialysis Capacity in India

The following table provides the state-wise estimates of dialysis delivering capacity in India. This includes the PMNDP data (updated to January 2023) and private dialysis centres capacity.

State	Nephrologists	Total No. of Dialysis centres	Total no. of dialysis machines
Sikkim	2	5	39
Andaman & Nicobar	1	7	52
Meghalaya	6	7	37
Mizoram	6	8	40
Arunachal Pradesh	1	10	39
Nagaland	6	10	43
Tripura	3	11	60
Manipur	4	15	77
Puducherry	10	20	95
Goa	4	32	200
Himachal Pradesh	9	34	181
Uttarakhand	20	41	223
Jammu and Kashmir	18	44	254
Assam	25	71	445
Haryana	42	72	510
Chhatisgarh	52	73	460
Jharkhand	52	80	425
Odisha	63	105	757
Bihar	113	145	1439
Rajasthan	106	163	620
Punjab	111	163	883
Madhya Pradesh	147	165	842
Telangana	126	172	1742
Delhi	163	178	1970
Andhra Pradesh	147	186	2107
Mumbai	192	193	1544
West Bengal	238	305	1522
Kerala	231	321	1976
Maharashtra	280	325	2523
Uttar Pradesh	229	354	2447
Karnataka	298	451	2344
Gujarat	209	496	2371
Tamil Nadu	426	548	4457

Source: Industry Inputs; PMNDP (up to Jan 2023), Ministry of Health and Family Welfare

Appendix:
Estimated Gap in Dialysis Delivery

The following table provides the state-wise estimates of new ESRD patients added very year, and the dialysis machines availability (including both private capacity and PMNDP capacity).

State	Total no. of dialysis machines	Estimated new ESRD patients added every Year	Patients per machines
Sikkim	39	104	3
Andaman & Nicobar	52	81	2
Meghalaya	37	372	10
Mizoram	40	178	4
Arunachal Pradesh	39	153	4
Nagaland	43	296	7
Tripura	60	812	14
Manipur	77	490	6
Goa	200	749	4
Himachal Pradesh	181	1176	6
Uttarakhand	223	1519	7
Jammu and Kashmir	254	1257	5
Assam	445	5347	12
Haryana	510	3863	8
Chhatisgarh	460	5121	11
Jharkhand	425	4651	11
Odisha	757	8132	11
Bihar	1439	17168	12
Rajasthan	620	6654	11
Punjab	883	4835	5
Madhya Pradesh	842	9680	11
Telangana	1742	6925	4
Delhi	1970	2995	2
Andhra Pradesh	2107	12306	6
West Bengal	1522	21024	14
Kerala	1976	10762	5
Maharashtra	2523	17811	7
Uttar Pradesh	2447	31239	13
Karnataka	2344	11375	5
Gujarat	2371	15987	7
Tamil Nadu	4457	17425	4

Source: EY Analysis based on, data from NFHS 2018-21, Ministry of Health and Family Welfare; industry inputs

List of Abbreviations

AAMI	Association for the Advancement of Medical Instrumentation
AVF	Arteriovenous Fistula
AVG	Arteriovenous Graft
BAMS	Bachelor of Ayurvedic Medicine and Surgery
BHMS	Bachelor of Homeopathic Medicine and Surgery
BPL	Below poverty line
BUMS	Bachelor of Unani Medicine & Surgery
CAPD	Continuous ambulatory peritoneal dialysis
CFU	Colony Forming Unit
CGHS	Central Government Health Scheme
CKD	Chronic Kidney Disease
DNA	Deoxyribonucleic acid
DT	Dialysis Techician
ECHS	Ex-Servicemen Contributory Health Scheme
ESIS	Employees State Insurance Scheme
ESRD	End Stage Renal Disease
GDP	Gross Domestic Product
GNM	General Nursing and Midwifery
GST	Goods and Services Tax
HCP	Healthcare Practitioners
HCV	Hepatitis C virus
HD	Hemodialysis
HIV	Human immunodeficiency virus
MBBS	Bachelor of Medicine and Bachelor of Surgery
NABH	National Accreditation Board for Hospitals
NFHS	National Family Health Surveys
PD	Peritoneal Dialysis
PLI	Product Linked Incentive
PMJAY	Ayushman Bharat- Pradhan Mantri Jan Arogya Yojana
PMNDP	Pradhan Mantri National Dialysis Program
PPP	Public private partnership
QAPI	Quality Assessment & Performance Improvement
RNA	Ribonucleic acid
RO	Reverse Osmosis
RRT	Renal replacement therapy
RSBY	Rashtriya Swasthya Bima Yojana
WPI	Wholesale Price Index

Notes

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