Dissertation

In

Mayapuri, New Delhi

(Feb 1st to April 30th, 2020)

Cost Analysis of a dialysis unit in PPP model district level hospital

Ankit Dabra

(PG/18/013)

Dissertation submitted in partial fulfilment of the requirements

of the degree PG Hospital and Healthcare Management

(2018-2020)

International Institute of Health Management Research, New Delhi

ACKNOWLEDGEMENT

Any attempt at any level cannot be satisfactorily completed without the support and guidance of learned people. I owe a great debt to all the professionals at ***DCDC Health Services Pvt. Ltd., New Delhi*** for sharing generously their knowledge and time, which inspired me to do best during my summer training,

I would like to express my immense gratitude to **Mr. Kamal Raj** *(Vice president DCDC)*, **Mr. Puneet Chillar** *(Operations Manager)* **& Dr. Deepali Garg** *(Clinical Ops. Manager)* for providing support and guidance for my learning in the organization and for directing my thoughts and objective towards the attitude that drives to achieve and other aspects that won as no wise needs to be acquainted with. It has been a privilege to work under their dynamic supervision in the organization.

I am glad to acknowledge **Dr. A.K. Khokhar** *(Mentor)*, **Dr. Anandhi Ramachandran** *(Associate Professor)* IIHMR for incorporating right attitude into me towards learning and for helping and supporting whenever required, I am grateful to them in giving me an opportunity to learn administrative tricks and styles, so that I come to know how a hospital caters their patients successfully and how the hospital give quality treatment to the patients.

Ankit Kumar Dabra

PGDHM

IIHMR DELHI

To Whomsoever It May Concern

This is to certify that ***Ankit Kumar Dabra*** student of Post Graduate Diploma in Hospital and Healthcare Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at ***DCDC Kidney Care Unit, Civil Hospital Sonipat*** from ***1st Feb 2020*** to ***30th April 2020.***

The Candidate has successfully carried out the study designated to him during internship training and him approach to the study has been sincere, scientific and analytical.

The Internship is in fulfilment of the course requirements.

I wish him all success in all his future endeavors.

Dr. Pradeep K Panda
Dean, Academics and Student Affairs
IIHMR, New Delhi

Dr. A.K. Khokhar (Mentor)
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IIHMR, New Delhi

Certificate of Approval

The following dissertation report of titled ***"Cost Analysis of a dialysis unit in PPP model district level hospital"*** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of Post Graduate Diploma in Health and Hospital Management for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the report only for the purpose it is submitted.

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Dr. A.K. Khokhar

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INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,

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This is to certify that the dissertation titled **"*Cost Analysis of a dialysis unit in PPP model district level hospital"*** submitted by ***Ankit Kumar Dabra, Enrollment No. PG/18/013*** under the guidance of ***Dr. A.K. Khokhar*** for award of Postgraduate Diploma in Hospital and Healthcare Management of the Institute carried out during the period from ***1st Feb 2020*** *to* ***30th April 2020.***

Embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

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CERTIFICATE

The certificate is awarded to

Ankit Kumar Dabra

In recognition of having successfully completed his
Internship in the department of

Operations

and has successfully completed his Project on

Cost Analysis of a dialysis unit in PPP model district level hospital
(1st Feb, 2020 – 30th April, 2020)

At

DCDC Kidney Care Unit
Civil Hospital, Sonipat

He comes across as a committed, sincere & diligent person who
has a strong drive & zeal for learning.

We wish him all the best for future endeavors.

Mr. Puneet Chillar
Manager- Operations
DCDC Kidney Care

Certificate from Dissertation Advisory Committee

This is to certify that ***Mr. Ankit Kumar Dabra***, a graduate student of the Post- Graduate Diploma in Hospital Management has worked under our guidance and supervision. He is submitting this dissertation titled ***"Cost Analysis of a dialysis unit in PPP model district level hospital"*** at ***"DCDC Kidney care Unit, Civil Hospital, Sonipat"*** in partial fulfillment of the requirements for the award of the Post- Graduate Diploma in Health and Hospital Management.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Institute Mentor-
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FEEDBACK FORM

Name of the Student: Ankit Kumar Dabra

Dissertation Organization: DCDC Health Services Pvt. Ltd. (Civil Hospital Sonipat)

Area of Dissertation: Operations (Dialysis)

Attendance: Regular

Objectives achieved: Yes

Deliverables: Adequate Cost Analysis of a dialysis unit in PPP model district level hospital with respect to various operations in unit and suitable recommendations for cost reduction is discovered.

Strengths: Good management of people and stock, Good communication, Good Crisis management

Suggestions for Improvement: Cost Negotiation

Suggestions for Institute (course curriculum, industry interaction, placement, alumni): NA

Date: 26/06/2020
Place: New Delhi

Signature of the Organization Mentor
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DCDC Health Services Private Limited

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ACRONYMS

ESRD	End Stage Renal Disease
PPP	Public Private Partnership
BPL	Below Poverty Line
EWS	Economically Weaker Section
HD	Hemodialysis Dialysis
PD	Peritoneal Dialysis
EPO	Erythropoietin

SECTION – 1

ORGANIZATIONAL LEARNING

1.1. INTRODUCTION

- Deep Chand Dialysis Centre commonly called as DCDC KIDNEY CARE, registered as DCDC Health Services Pvt. Ltd., is a leading chain for Dialysis, providing dialysis related care and services to end stage renal disease patients (ESRD) in India.
- The organization functions through independent clinics called as stand-alone centers, hospital dialysis at various private hospitals and through public private partnership (PPP) mode in government hospitals.
- There are lakhs of patients in the state who need dialysis and more than 3, 00,000 patients are added in the list every year.
- India currently has approximately 4950 dialysis centres with approximately 20,000 machines in tier 1 cities.
- Tier 1 cities have only 8% of the total dialysis demand.
- DCDC wants to make it easier for the patients with ESRD to avail affordable and top notch quality dialysis.
- Infrastructure:
  - 118 centres with 12 dialysis machines at each centre
  - 750+ number of machines
  - 6000+ happy clients
  - Services:
    - Nephrology consultations and transplant clinics
    - Preventive nephrology: aids in detecting the ESRD in early course of time and hence prevents it from progressing to complicated situation
    - Home comfort/ spa dialysis: DCDC believes that their relationship with the patient begins from the moment they step out of there house to reach DCDC

- Incentre hemodialysis: dialysis that utilizes machines to purify blood, in hemodialysis the blood flows through artificial kidneys or dialyzer with the help of a dialysis machine that filters away the waste products.

Mission -" ***DCDC aims to be the largest dialysis chain in India with plans to open 500 Centres in the next 5 years".***

1.2. COMMUNICATION CHANNELS

- Through public private partnership (PPP) integration with hospitals: In collaboration with government hospitals, civil hospitals, DCDC is providing dialysis services to poor and needy at subsidized rates.
- In the corporate hospitals: DCDC is providing all round integrated dialysis services to all throughout the subcontinent. DCDC is a rapidly expanding chain to have become 118 centres all over India already as per the recent data.
- Apart from these collaborations, DCDC has its stand-alone centres where patients can book appointments online and visit the centre anytime and get expert consultations.
- DCDC has collaborated with ESI hospitals all over India for dialysis centres.
- DCDC with increased CSR activities is actively participating in the fight against ESRD.

1.3. STRATEGIES

- In US, the cost of dialysis is approximately $300, whereas DCDC is providing dialysis facilities at less than $20
- India reports approximately 1.5 lakh new ESRD cases every year and out of them, 10% are able to avail the dialysis facilities due to poor socio economic condition and inadequate health infrastructure.
- With each dialysis session costing somewhere between 2000-4000 and patients requiring 10-15 dialysis sessions per month, the dialysis costs are more the per capita income of the Indian population.
- DCDC assures to cut down the dialysis costs to about 35% by its innovative service offerings.

1.4. FUNDING

- One of the first funding to DCDC kidney care was given by UK based CDC group- backed Pragati India fund in December 2014.
- Funding given was $5 million.
- In the Final Year 2018: -

Financing	Amount ($ million)
Asian development bank (ADB)	5.00
Co-financing	5.00
Others	25.10
Total	35.10

1.5. SERVICES

Incentre hemodialysis:

- DCDC is providing class apart services with eye catching infrastructure along with expert consultations from an expert panel of nephrologists.
- At DCDC the services are customized and made easily available for the patients in a way that the dialysis schedules are not a burden for the patients but are easily becoming a part of their daily lives.
- STATE OF ART INFRASTRUCTURE: DCDC has collaborated with world class companies for the dialysis machinery, RO plants, dialysis consumables manufacturing,
- EXPERT CONSULTATION: All the paramedical and medical staff is available 24X7 for the patient convenience. A team consists of doctors, expert nephrologist, certified technicians and nurses with quite a good number of years of experience. All the data is tracked and monitored online through cloud servers, for quality and clinical monitoring team that regulates each dialysis session. Any discrepancy in the parameters is immediately put forward in front of the clinicians through the DCDC app.

- FLEXIBLE DIALYSIS OPTIONS: DCDC has tailor made the dialysis procedures. If the dialysis schedules are interfering with the working hours of the patients, then they have an option of nocturnal in centre dialysis.

Home dialysis:

- For those who want dialysis to be done at home in that case, DCDC provides customized dialysis services at home.
- There are two option available:
- Peritoneal dialysis
- Home dialysis
- Some benefits of home dialysis include:
- Control over when your treatments are performed
- Maintenance of your lifestyle and ability to do many of the activities you enjoy
- The choice to complete treatments overnight while you sleep
- Helping provide you with more energy, restful sleep, and to feel better overall
- Improving appetite

1.6. DCDC Strategy

- Increase revenues
- Increased Inflow of patients resulting in growth in number of dialysis sessions per month
- Increased admissions from our partner centres
- Increase in cross patient referral
- Cost Saving
- World Class Infrastructure
- Increased patient care via set protocols
- Zero Infection Protocol (ZIP), trained staff, latest technology and world class infrastructure.
- Proven track record of maximum number of satisfied partnerships with departments in hospitals.

1.7. FUTURE GOALS

- Presently, DCDC has laid down its feet all over the Indian sub-continent and some parts of Sri Lanka as well.
- Now DCDC plans to expand in three ways:
  - Making PPP in district hospitals of various states who are currently giving tenders to setup dialysis units.
  - Taking over the existing centres as several private hospitals have announced outsourcing of the dialysis centres.
  - Setting up of more private centres either stand-alone centres or in collaboration with some private hospitals.

1.8. IMPACT

- Providing ESRD patients access to high quality dialysis in India and Sri Lanka
- Providing healthcare services to rural and vulnerable population
- More PPPs to improve healthcare delivery

1.9. OUTCOME

- Remarkable increase in accessibility to affordable dialysis to ESRD patients in India as well as Sri Lanka.
- Increasing network of DCDC Pvt. Ltd. has addressed the shortage of dialysis services and is expected to improve the conditions many fold in coming years with increasing network expansion.

1.10. OUTPUT

- Aim of DCDC Pvt. Ltd. is to improve the dialysis and ancillary services for ESRD patients with the current plan of installing 1,910 machines.
- DCDC is currently operating with 118 centres in India as well as Sri Lanka.

1.11. WHAT MAKES DCDC Different?

- Each dialysis session takes about 3-4 hours and having 2-3 sessions per week makes it tiring and boring for the patient.
- At DCDC, they provide a peaceful environment for dialysis services.
- To avoid psychological taxing of the patients DCDC has taken an initiative to create a homely comfortable environment for the patients by providing entertainment facilities for the patients like individual LCDs, video programs, movies, play stations and good Wi-Fi connectivity.

1.12. PATH BREAKING INITIATIVES

- DCDC is charging mere Rs 1500/- for a single dialysis session which is fraction of what big corporates are charging from there dialysis patients.
- Corporate hospitals like Fortis is charging no less than Rs 3000/- per dialysis session, yet again Apollo is charging Rs 3000/- per session and Sir Ganga Ram hospital is charging Rs. 2400/- per session, so what DCDC is charging is 40-50% less than the big corporates and that too at the inferior or the same quality services.
- Also if needed be DCDC kidney care does not charge anything from BPL card holders and EWS category patients and still guarantee them quality services.
- Innovative breakthrough DCDC has come up with is mobile dialysis where in if any patient is due to any reason unable to come up to the centre then an ambulance with necessary equipment, doctor and technician reach up to his location and perform the necessary dialysis.
- Also each patient is given supplies and medications for the period until next session at each appointment.

SECTION – 2

TITLE: Cost Analysis of a dialysis unit in PPP model district level hospital.

2.1. INTRODUCTION

Dialysis has gotten viable in dragging out the lives of patients with renal deficiency. Traditional clinical management of the patient and dialysis are the pillars of treatment to acute renal disease patients. It is estimated that 220000 new ESRD patients are added to the pool every year, which requires an additional demand of 34 million dialysis sessions across India. The burden of ESRD is rising dramatically in India, with the proportion of deaths due to kidney failure increasing from 2.1% in 2001–3 to 2.9% in 2010–13. The age-adjusted incidence of ESRD in India is 226 per million populations. Dialysis is a life-sustaining treatment modality for these patients. The late referral of the patients, lack of medical facility about preventive measures and more cost-effective alternatives like renal transplantation or peritoneal dialysis (PD) are important issues in the provision of care to ESRD patients. About 20% of patients with chronic renal failure are totally rehabilitated by dialysis, and another 30 to 40% of non-diabetics may be expected to be rehabilitated to functional level. Recording the number of kidney patients undergoing hemodialysis worldwide show that around 1.7 million patients are currently kept alive by such a therapy. The dialysis market has seen a robust growth in the past 5 years. What makes this market more interesting and challenging is its customer base, which is relatively small yet of high value.

It is among the most lucrative markets in per capita terms. Indian market for dialysis equipment and consumables was valued at Rs.231 Crore in 2008. As the number of people with end stage renal disease grows, the market for hemodialysis equipment and services is expected to expand, generating increased revenues throughout the forecast period. Hospital costs to patients are rising to unprecedented heights, and the estimates of expenses always seem to be higher than the income generated. Patients expect that hospitals should base their prices on the direct patient care alone. But this approach can’t be useful for the long term perspective of the hospital.

Patients undergoing the treatment receive services from various different departments. The hospital need to recover the expenses of the direct departments and department of support services also. The Cost of the services becomes evident after cost finding studies. The departmental charges

should be set a minimum or equal these costs. The cost analysis is a tool which is useful in setting priorities for various courses of action to meet objectives, and provide an estimate of the net financial value associated with each course of action (e.g. manpower and labour, material and equipment, facilities).

Revenues of hospitals within the voluntary sector shouldn't only cover the normal direct patient expenses but must also contribute towards, providing sufficient finances to satisfy current responsibilities, covering the prices of service to impoverished patients and generating funds for up-gradation and expansion of the prevailing facility.

Unequal distribution of nephrologists, with a concentration in large cities and in the private sector are major barriers to equitable provision of dialysis to all sections of the society. Inadequate insurance coverage further aggravates the situation. Furthermore, 70% of those who start dialysis in India eventually give up dialysis due to financial constraints or death. Thus only 10–20% of dialysis patients in India continue long-term treatment. This high need for care is particularly relevant given the way health care is financed in India. Although access to dialysis, particularly hemodialysis (HD), has increased in recent years, only a minority of patients are able to continue long-term HD, mostly because of the high OOPEs. Taking into account the financial pressures on the affected households, the government of India recently announced a National Dialysis Service Programme (now referred as the Pradhan Mantri National Dialysis Programme) to provide free dialysis services to the poor in public sector hospitals in its Union Budget 2016–17. Implementation of this ambitious programme will involve major augmentation of existing service delivery infrastructure. Alternatively, the government may consider purchasing dialysis services from the private sector. Presently the National Dialysis Programme is in its nascent stages in India. The proposed programme aims to deliver dialysis services to the poor through a **public–private partnership** mode. In this programme the private partner provides for medical human resources, dialysis machines, water treatment infrastructure, dialyzer and consumables. The state government provides space, power and water within district hospitals so as to provide dialysis care. It is important to note that dialysis is not the final curative treatment for those with ESRD. The management of ESRD needs to be considered on a holistic basis, which implies adequate attention on prevention of ESRD through better primary and secondary prevention strategies. PD, found to be cost-containing in the long term, should be strongly considered in the low- and middle-income

country context. While the more expensive HD is the dominant dialysis modality in the health benefit plans in Malaysia, Taiwan and the UK, PD is preferred in Thailand and Hong Kong. Whatever the service provisioning model, it first calls for estimating the economic implications of such a programme. Second, given that it will entail a significant cost, it becomes imperative to assess the cost-effectiveness of various service. The current study aims to estimate the overall cost of performing hemodialysis (HD) in the PPP Model district-level hospital from the provider's perspective.

2.2. RATIONALE

The economic evaluation of hemodialysis unit is useful in context of resource allocation and decision support to the service provider. The study provides cost and benefit analysis of the dialysis setting which can further help to reduce the extra cost expenditure in order to attain optimum and effective dialysis service to be a cost-effective and successful PPP model.

Study findings would be useful for planning and designing the new dialysis units in the hospital and also help the policy makers for further implications and also helps in setting provider payment rates for dialysis under various public and private sponsored health insurance schemes.

2.3. OBJECTIVES

2.3.1. *GENERAL OBJECTIVE*

- To estimate the cost of hemodialysis in PPP model district level hospital.

2.3.2. *SPECIFIC OBJECTIVES*

- To estimate the direct cost per dialysis.
- To estimate the net profit & profit margin between panel and cash dialysis.

2.4. LITERATURE REVIEW

Authors (year)	Study	Salient features
T A Malatji, J T Wamukuo, F L M Hyera 2019	An analysis of the direct cost of renal dialysis provided through a public-private partnership at a tertiary hospital in Limpopo Province, South Africa	• 5 year cost analysis was conducted covering 2007 - 2012 at the renal dialysis unit. • Top-down approach was used estimated cost per patient (unit costs) for HD and PD. • The total annual cost for both HD and PD was divided by the annual number of patients on chronic HD and PD, respectively, to determine unit costs for the each year.
Ganapathy Murugan, Allam Ashraf, Sulakshana Nandi, Vandana Prasad 2017	Outsourcing of Hemodialysis services in Delhi: A Case Study	• The hemodialysis centres are open to all patients, who are categorized into "paying patients" and "sponsored patients". • Sponsored patients are those patients approved by the Delhi government for hemodialysis and other procedures at the identified hemodialysis centre on a cashless basis. • The company is reimbursed by the government for the dialysis provided to these sponsored patients as per the agreed charges, from the Delhi Aarogya Kosh (DAK). • 'Cashless' dialysis is available only to those who are residents of Delhi and have an income of less than Rs. 3 lakhs a year, or patients with the National Food Security Card.
HESAM EZATABADI POOR, MAHDI MORTAZAVI, HADI RAJABBEIGI 2013	Identifying and investigating variables affecting Public Private Partnerships (PPP) in Iran by Importance-Performance Analysis (IPA)	• PPP contracts include some types of contracts which public sector due to its limited capability in infrastructure procurement or public service deliverance goes into partnership with private sector. • There are different models for PPP, such as Build-Own-Operate (BOO), Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO) and Design-Build-Finance-Operate (DBFO) in action. • "Trust between partners" is the most important influencing variable existing throughout Iran's PPP contracts..

Ashwini Nayak S, Libert Anil Gomes 2012	Cost Analysis of a Dialysis Unit at a Tertiary Care Multi-Specialty Teaching Hospital	• The cost analysis is a tool which is useful in setting priorities for various courses of action to meet objectives, and provide an estimate of the net financial value associated with each course of action (e.g. manpower and labour, material and equipment, facilities). • The costs were considered under direct and indirect costs incurred per procedure. • Direct costs included direct labour, direct material cost, depreciation and repair & maintenance cost of the equipment. • Indirect costs included indirect labour, building and electrical maintenance and electrical consumption. Overhead cost was taken as 5 % of the total cost i.e. direct plus indirect costs.
Gunjeet Kaur, Shankar Prinja, Raja Ramachandran, Pankaj Malhotra, Krishan Lal Gupta and Vivekanand Jha 2018	Cost of hemodialysis in a public sector tertiary hospital of India	• The cost centers involved in the provision of HD were identified. The cost center that was directly rendering the service for treating the patient, that is, the dialysis unit, was deemed as primary. • Cost centers not directly involved in treating the patient, like laundry and administration, were considered as secondary cost centers. • All medical and non-medical equipment and furniture utilized for the HD unit were determined. • Assumptions regarding the life of the equipment were made after discussion with experts.
Martin McKee, Nigel Edwards & Rifat Atun 2006	Public–private partnerships for hospitals	• Public–private partnerships are a feature of hospital construction and operation and there is increasing interest in a model in which a public authority contracts with a private company to design, build and operate an entire hospital. • Compared with the traditional system, new facilities are more likely to be built on time and within budget, but this seems often to be at the expense of compromises on quality.
Asian Development Bank 2018	Equity Investment and Administration of Equity Investment DCDC Health Services Private Limited DCDC Dialysis Network Project (Regional)	• The project involves the expansion of one of the largest networks of independently run dialysis centers in India and its regional expansion into Sri Lanka. Within India. • DCDCPL plans to expand in three ways: (i) start PPP centers in multiple states that are

		currently issuing tenders to set up dialysis centers in district hospitals; (ii) acquire existing centers, because several private hospitals have announced decisions to outsource their dialysis centers; and (iii) set up new private clinics, either on a stand-alone basis or in private hospitals. • A typical stand-alone clinic is designed for 12 beds and can service a maximum of 100 patients per week. It costs approximately about $230,000 and will break-even at 25 patients per week with each patient receiving a 4-hour dialysis session three times a week. Its EBITDA margins will reach 30% on average once revenues stabilize after 2–3 years.
Surg Capt Sambhu Dutta, Surg Lt Cdr Jayant Kumar Panda 2015	Projectisation of Setting up of A Dialysis Centre at A Zonal Service Hospital	• It is observed that having five machines in the hospital at rates between Rs 900 to Rs 1000 would be the ideal choice to opt for PPP model. • It is to be noted that the cost of dialysis service - Rs 900 to Rs 1000 is the amount reimbursed by the government to the service provider. • The amount which the service provider receives from the government may vary from time to time depending on the policy decision. Based on the financial calculations the Pre-Tax IRR for both the scenarios is 9% and 37% depending on the provision of capital investment for building respectively.
Christian Kronborg, Trine Kjær & Michael Bech 2010	Cost analysis of establishing dialysis facilities for the treatment of chronic renal failure in Greenland	• In a cost-benefit framework, the additional cost of an average DKK 1.4 million per year if dialysis facilities are established in Nuuk, Greenland. • The societal benefit of having the possibility to offer treatment in Nuuk has been estimated at DKK 6.4 million per year. That is, the societal benefits are expected to be higher than the costs to the Greenlandic health care system to establish and offer dialysis treatment in Nuuk.
Alain Beaudry, Thomas W. Ferguson, Claudio Rigatto, Navdeep Tangri,	Cost of Dialysis Therapy by Modality in Manitoba	• Health care system and includes all costs related to dialysis care and management (direct labor, supplies, equipment, utilities,

Sandi Dumanski and Paul Komenda 2018		drugs related to dialysis, overhead, training, and capital costs) • The presented model comprises three summed components for each modality: a labor component, a consumables component (including dialysis-related drugs), and a capital costs component.
V. Lorenzo, l. Perestelo, M. Barroso, A.Torres, J. Nazco 2010	Economic evaluation of hemodialysis. Analysis of cost components based on patient-specific data	• Prevalence costs produced during one year of HD therapy. Direct sanitary and non-sanitary costs were organized in 6 categories: HD sessions, medication costs, hospitalization costs (evaluated by Diagnosis-Related Groups classification system), outpatient care (including consultation and complementary studies); sanitary material and patient transportation. • The price of HD included the cost of consumables, depreciation of non-disposable material, staff, and medication administered during the HD session, with the exception of erythropoietin.

2.5. METHODOLOGY

2.5.1. Study Type: Observational Study

2.5.2. Study Area: DCDC Dialysis unit, Civil Hospital Sonipat

2.5.3. Study Time Period: 3 months (1st Feb 2020 to 31st April 2020)

The study was carried out in the dialysis unit, to identify the cost incurred by the provider in PPP model district level hospital for providing the service.

The bottom up costing method is used to identify all the cost centers along with nature of the service being provided. Further, all the resources used in providing services were identified and measured. All the cost centers divided into two categories which are: -

- **Direct cost per dialysis**
- **Indirect cost per dialysis**

Direct costs include direct material cost, direct medical equipment cost, direct human resource cost, electricity cost, water consumption cost, linen and laundry cost (Table 2.4).

Indirect costs include indirect human resource, non-medical equipment cost, building and infrastructure cost, maintenance cost, administrative cost (Table 2.5).

Direct material cost evaluated by including all the material which are needed and used directly for the dialysis session like: - Dialyzer Reuse/ Single use, Blood Tubing, IV set etc. The cost of direct material was estimated in Quantity/Dialysis and multiplied by the actual cost of the material to evaluate the direct material cost (Table 2.3).

The total cost was estimated by adding the individual costs of each cost center. Unit cost value was arrived at by dividing this total cost by the number of units of services rendered. Assumptions regarding the life of the equipment were made after discussion with experts (company officials). Prices for equipment, consumables and medicines were obtained from department records or supply chain department. In case of unavailability of a price for any item, market prices were searched on internet and used. Information regarding the cost of human resources like salaries of the medical and non-medical staff involved with HD was drawn from their salary slips and discussion with the HR. (Table 2.1).

Type of resource	Source of data	Method of data collection
Material Cost	Stock registers, indent records	Qty/dialysis * Unit price
Human Resource Cost	Salary slips, review records	Gross salary / no. of dialysis
Equipment Cost	Review records, procurement dept.	Purchase price / no. of dialysis performed
Building Infrastructure Cost	Observation of unit, records	Overall infra. Cost / life of infra.
Administrative Cost	Record review, indent records	Monthly amount / no. of dialysis
Overheads (water, electricity)	Review monthly bills	Monthly amount / no. of dialysis

Table 2.1 - *Study methodology for health system costing.*

2.5.4. UNIT COST ESTIMATION

A bottom up approach was used to arrive at an estimated cost per patient (unit costs) for HD. The total monthly cost for HD was divided by the monthly number of patients on HD.

2.5.5. ETHICAL CONSIDERATIONS

Ethical approval was obtained from the DCDC Kidney Care and to conduct the study. Consent was obtained verbally from respondent and confidentiality of their information was assured to them. The data was maintained and used for research purposes only.

2.5.6. INCLUSION & EXCLUSION CRITERIA

Since the cost analysis was conducted from the provider's perspective, the indirect costs i.e. incurred 'privately' by the patients to access the dialysis unit were not included. The study also excluded the costs associated with surgical interventions, any type of complication, access creation, PD patients' abdominal catheter procedures, and hospital admissions.

2.6. RESULTS & ANALYSIS

The derived cost and patient data were captured and analyzed using Excel version 2016 (Microsoft, USA). The data collected were cleaned and necessary follow-ups were made for validation in the case of errors and/or outliers before estimating total and unit costs. For all the annual cost estimates, a discount rate of 4% was applied to account for the devaluation of cost over time.

Dialysis Unit Specifications	
Avg. No. of dialysis per day	25
No. of machines	14
No. of shift	2
No. of working days	26
Avg. no. of dialysis per month	650

Table 2.2 – *Specifications of the dialysis unit.*

2.6.1. Direct material cost per dialysis: -

S.No.	Material	Qty/Dialysis	Unit Price	Cost/Dialysis
1	Dialyzer Reuse	0.25	322	81
2	Dialyzer single use	1	131	131
3	Blood Tubing	1	94	94
4	Fistula needle	2	16	32
5	IV set	1	5	5
6	Normal Saline	1	22.5	22.5
7	A-part & B-part	0.06	750	45
8	Formaline	0.001	1575	1.575
9	Xylocane	0.05	12	0.6
10	Heparin	0.25	76	19
11	Disinfectant	0.02	280	5.6
12	Gauze roll	0.04	155	6.2
13	Syringe 10 ml	1	3.2	3.2
14	Syringe 5 ml	2	1.85	3.7
15	Betadine	0.001	275	0.275
16	Spirit	0.008	700	5.6
17	Micropore	0.02	240	4.8
18	Neosprin/povipen powder	0.05	10.45	0.5225
19	Hypo solution	0.001	650	0.65
20	G-plast/Dynaplast	0.05	82	4.1
21	Gloves Ster/ Unster	8	3.5	28
22	Cap	0.08	3	0.24
23	Shoe cover	0.08	3	0.24
24	Mask	0.08	3.4	0.272
25	Cotton	0.015	115	1.725
26	Citric acid	0.04	89	3.56
27	Oxygen	0.008	1400	11.2
28	PCM/Pentop/other general med.	0.04	20	0.8
		Total recurring cost/ dialysis	If reuse dialyzer used for -ve patients	381
		Total recurring cost/ dialysis	If single use dialyzer used for +ve patients	431
			Avg. Cost	**406**

Table 2.3 – *Direct Material Cost per dialysis*

2.6.2. Direct cost per dialysis: -

Direct Cost/ dialysis	(in rupees)
Direct material cost	406
Direct medical equipment cost	340
Direct human resource	380
Electricity cost	44
Water consumption cost	9
Linen & laundry cost	7
Total	**1186.1095**

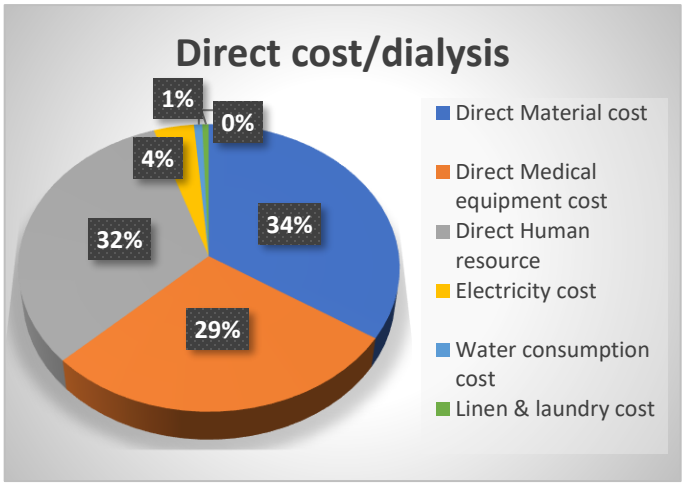

Table 2.4 – *Direct cost per dialysis.*

Findings: From the above data and chart it is evident that direct cost per dialysis was **Rs. 1186,** major cost proportions are**: - material cost (34%)** followed by **human resource cost (32%)** and **medical equipment cost (29%).**

2.6.3. Indirect cost per dialysis: -

Indirect Cost/ dialysis	(in rupees)
Indirect Human resource	46
Corporate Cost	74
Infrastructure cost	38
Maintenance cost	7
Administrative cost	12
Total	**177**

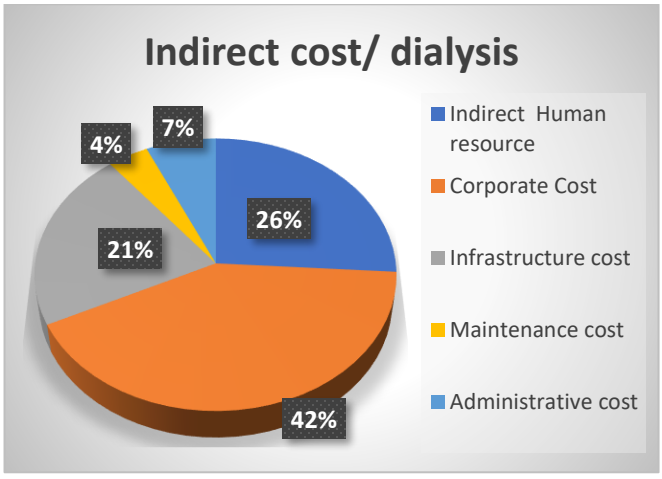

Table 2.5 – *Indirect Cost per dialysis.*

Finding: From the above data and chart it is evident that indirect cost per dialysis was **Rs. 177, corporate cost (42%)** followed by **indirect human resource cost (26%)** and **infrastructure cost (21%)** is a major part of the indirect cost.

2.6.4. Total cost per dialysis: -

Total cost per dialysis	(in rupees)
Direct cost per dialysis	1186.1095
Indirect cost per dialysis	177
Total cost	**1363.1095**

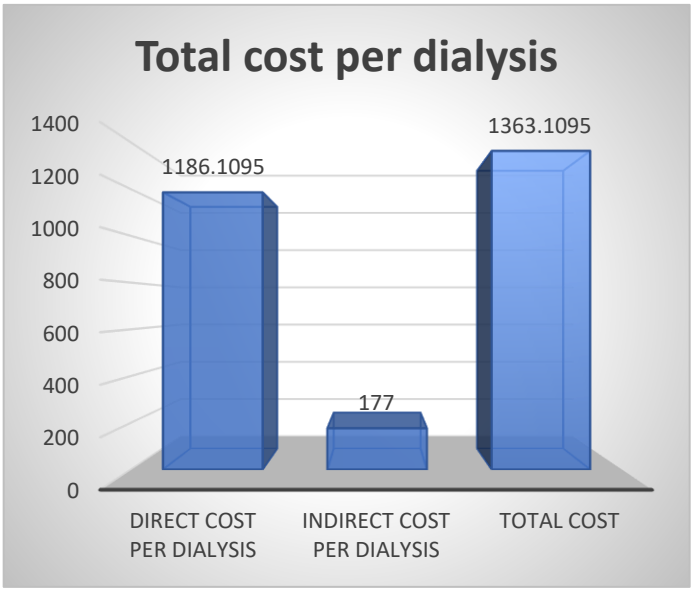

Table 2.6 – *Total Cost per dialysis.*

Finding: From the above data and chart it is observed that the total cost per dialysis incurred by the provider is **Rs. 1363**.

2.6.5. Costing of cash dialysis: -

Price per cash dialysis	(in rupees)
Price for -ve patient	1013
Price for +ve patient	1143
Avg. price per dialysis	**1078**

Table 2.7 – *Price per cash dialysis.*

Loss per cash dialysis	(in rupees)
Price per dialysis	1078
Total cost per dialysis	1363.1095
Loss per dialysis	**285.1095**

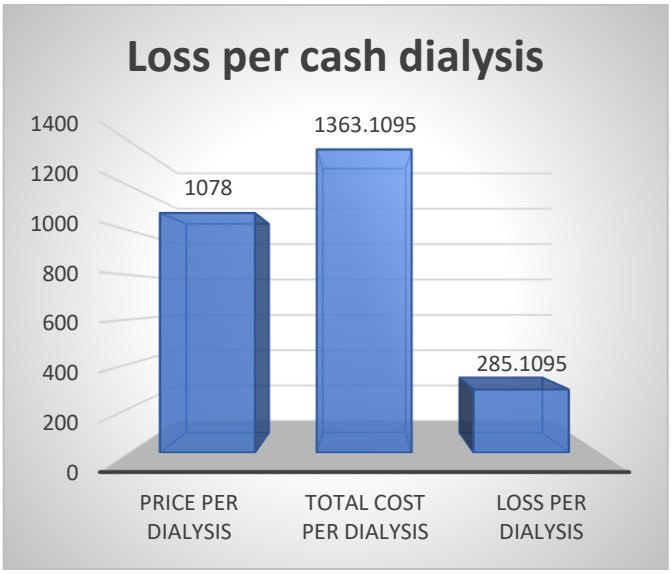

Table 2.8 – *Loss per cash dialysis.*

Finding: The above data and chart shows that the provider incurred the loss of **Rs. 285** per cash dialysis, which shows that in spite of profit the provider is bearing a loss on one of its services.

2.6.6. Costing of panel dialysis: -

Cost of panel dialysis	(in rupees)
Direct cost per dialysis	1186.1095
Indirect cost per dialysis	177
EPO	160
Carnisure	50
Total cost per dialysis with EPO & Carnisure	**1573.1095**

Table 2.9 – *Cost of panel dialysis.*

Price per panel dialysis	(in rupees)
Avg. Cost /dialysis	1078
EPO	1036
Carnisure	128
Total price/panel dialysis	**2242**

Table 2.10 – *Price per panel dialysis.*

Profit per panel dialysis	(in rupees)
Price/panel dialysis	2242
Cost/panel dialysis	1573.1095
Profit/panel dialysis	**668.8905**

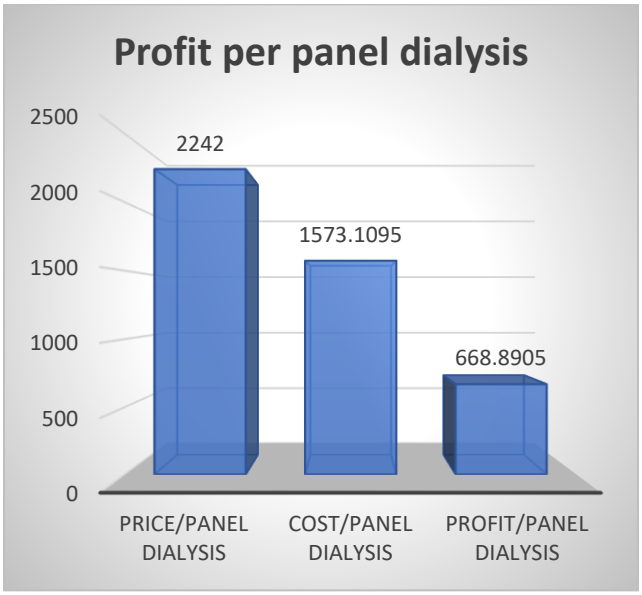

Table 2.11 – *Profit per panel dialysis.*

Finding: The above data and chart shows that the provider is earning profit of **Rs. 668** per panel dialysis, which was at a capacity utilization rate of **59%.** If the capacity utilization rate increases to 80 to 90% the profit per panel dialysis can be increased.

2.6.7. Net Profit per month: -

Loss per month	(in rupees)
Number of cash dialysis	100
Loss per cash dialysis	285.1095
Total Loss	**28510.95**

Table 2.12 – *Loss per month.*

Profit per month	(in rupees)
Number of panel dialysis	550
Profit per panel dialysis	668.8905
Total profit	**367889.775**

Table 2.13 – *Profit per month.*

Finding: From the above data it is observed that the service provider getting the loss of **Rs. 28,510** per month on cash dialysis and earning the profit of **Rs. 3,67,889** per month on panel dialysis, which clearly shows that in order to attain maximum profit the number of panel dialysis should be increased.

Net Profit per month	(in rupees)
Loss per month	28510.95
Profit per month	367889.775
Net Profit	**339378.825**

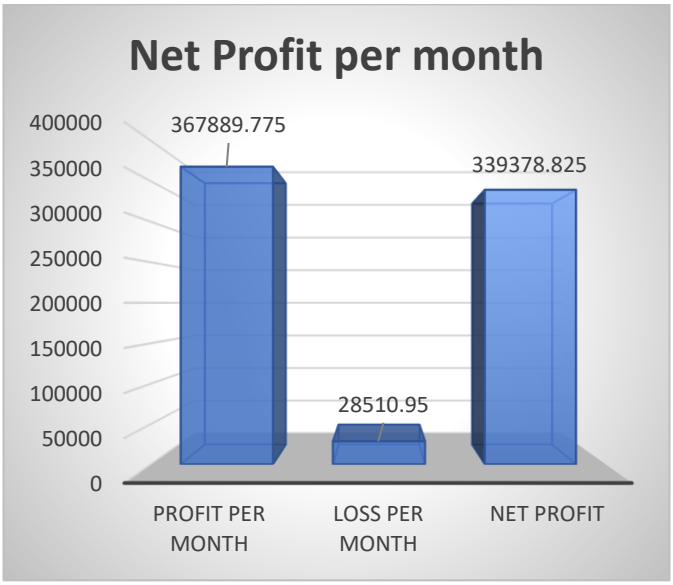

Table 2.14 – *Net profit per month.*

Finding: From the above data and chart it is observed that the provider is earning the profit of **Rs. 3,39,378** per month, which can be further increased if the number of panel dialysis increase and capacity utilization rate increases up to 80 to 90%.

2.7. DISCUSSION

The study was carried out with the aim to calculate the overall cost to perform the dialysis procedure and the result suggests that the direct cost incurred per procedure was Rs. 1186, and indirect cost per procedure was Rs. 177. The total cost to perform the dialysis was Rs. 1363. As the average price per cash dialysis was Rs. 1078. Hence, the loss incurred by the provider on cash dialysis per procedure was **Rs. 285**.

For panel dialysis the payment is made by the government to provide free dialysis services to the poor in public sector hospitals through PPP mode. As per the contract with the government the injections - **EPO & Carnisure** are part of the treatment and need to be provided to the patients as per the need **(only if the Hb is below 11).** Whereas in cash dialysis injections like – EPO & Carnisure are not the part of the treatment, patients need to carry their own injections.

The cost incurred by the service provider per EPO & Carnisure is **Rs. 160** & **Rs. 50** respectively. The total cost to perform the panel dialysis was Rs. 1573 and the price charged from the patient was Rs. 2242. Hence, the profit obtained by the service provider on panel dialysis per procedure was **Rs. 668**.

Since, it is a PPP model, hence, the proportion of the panel dialysis to the cash dialysis was 84% and 16%. The capacity utilization rate of **59%** earned the provider a net profit of **Rs. 339,378**.

It is evident from the study that material cost (34%) followed by human resource cost (32%) and medical equipment cost (29%) are the major cost proportions of direct cost and corporate cost (42%) followed by indirect human resource cost (26%) and infrastructure cost (21%) are the major part of the indirect cost to setting up a dialysis unit. The average number of procedures carried out in the dialysis unit per day was 25, which includes both panel as well as cash dialysis. The average of panel dialysis per day was 21 whereas cash dialysis was 4. So, the profit made by the dialysis unit per day was **Rs. 12,996.**

2.8. RECOMMENDATIONS

- Major part of direct cost is direct material cost which is 34% of overall direct cost which can be decreased by opting the rate contract method in entire supply chain system.
- It is observed that local purchase of many items increase the cost expenditure, which should be avoided.
- Material transfer is another activity which is adding transportation cost, which can be curbed.
- Since, the cash dialysis is not profitable and panel dialysis service is making the greater chunk of profit. It is recommended to increase the number of panel dialysis in order to attain an average profitability in all the quarters.
- Capacity utilization rate, which is at 59% should be escalated to 80-90% to achieve higher profits.
- Some medicines which are not in regular use, should be kept less in quantity.
- Efficiently need to monitor the pilferage.

2.9. CONCLUSION

Cost information is part of the basic information needed by managers and policy makers for making decisions about how to improve the performance of a hospital and where to allocate the resources.

Cost data are not easily available from routine data systems, due to poor information systems and lack of resources devoted to hospital management. Without quality cost data it is not possible to make accurate projections, improve technical efficiency, control expenditure and enhance accountability of managers. Cost control method is a very important tool for managements to fulfill these needs and hence, it is imperative for the successful running of a hospital.

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