

To Study The Unit Costing Of A Haemodialysis Procedure, At A Tertiary Care Government Teaching Institute.

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I. Introduction

Kidney Diseases Rank third among-st life-threatening diseases and 100/million population succumb to kidney diseases every year. Conservative medical management of the patient and dialysis are the mainstay of therapy to acute renal patient [1].

With increasing life expectancy and prevalence of life style diseases, US has seen a 30% increase in prevalence of chronic kidney disease (CKD) in the last decade 2/3rd of the cases of CKD are attributed to diabetes and hypertension In India too, diabetes and hypertension today account for 40–60% cases of CKD [2].

(a) 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 [3]. As the number of people with end stage renal disease grows, the market for haemodialysis equipment and services is expected to expand, generating increased revenues throughout the forecast period [4]. Hospital costs to patients are rising to unprecedented heights, and the estimates of expenses always seem to be higher than the income generated [5]. The present study aims to ascertain the unit cost of a haemodialysis procedure at the Dialysis Centre, at a tertiary care government teaching institute with the help of workload and utilization of the facility and To make recommendation for attaining early break-even point

II. Methodology

It is a 4 week observational and descriptive study conducted out at Dialysis centre at a tertiary care superspeciality hospital at Pune. Direct observations on ground related to the entire process of carrying out haemodialysis procedure and perusal of relevant documents like SOPs, policy letters, financial documents for technology acquisition and miscellaneous documents was done. Interview and consultation with concerned staff of haemodialysis centre to ascertain the organisation, staffing and functioning of the centre. Operating costing method was applied to estimate unit cost by using the inputs such as fixed costs and variable costs.

III. Observation and Discussion

Planning parameter

No of dialysis stations in a centre = Number of annual clinic stops expected in centre

Number of clinic stops / dialysis station / year

Number of clinic stops / dialysis station / year

Operating days / year (300days)

Shifts (Hours of operation / day) (10 hours per day, Wednesday & Saturday are half days, so taken as 1 together i.e., 5 working days per week)

Time taken for one procedure (5 hours)

Workload

The workload for the past one year from Jan 2016 to Dec 2016 has been depicted in Table 1.

Table 1: Workload of haemodialysis Centre (Jan 2016 to Dec 2016)

S.No.	Month	No. of Procedures
(a)	Jan	411
(b)	Feb	543

(c)	Mar	466
(d)	Apr	481
(e)	May	535
(f)	Jun	553
(g)	Jul	526
(h)	Aug	610
(j)	Sep	547
(k)	Oct	598
(l)	Nov	601
(m)	Dec	547
	Total	6418

Procedure Mapping

One haemodialysis takes approximately 5 hours and continuous monitoring of patient is done during this period.. The initial ½ hour is spent for preparing & cleaning the hemodialysis machine and measurement of vitals of patients (every ½ hourly). The patient is put on haemodialysis machine by establishing the arterio-venous line either through A-V fistula or by making a fresh shunt.

After the process another 1/3 hour is consumed in removing the A-V line, rinsing the tubes with normal saline and disinfecting them. This entire process is carried out under the guidance and supervision of a Nephrologist .

All direct labour cost were taken as fixed cost. The total labour costs were apportioned based on the workload and activities they perform in dialysis centre. In the 2 weeks time of observation during working hours it was observed that the nephrologist devoted time in 40:30:30: ratio to haemodialysis, OPD & In-patients.

Staff Salary

Accordingly 40% of his salary was apportioned towards haemodialysis. The rate of monthly salary for each category of staff was calculated on the basis of actual salary received by them.

Salary of staff was calculated by **Hourly Rate Method** and the hourly salary where appropriate obtained was apportioned by considering the time spent by different categories of staff on the work related to haemodialysis centre. Considering 160 working hours available in a month (8 h / day X 5 days X 4 weeks = 160 h), staff salary was calculated and apportioned as per their working hours mentioned in Table 2. CT scan centre functions 4 full days and 2 half days in a week; for purposes of calculation, this has been taken as 5 full days a week.

Table 2: Staffing of Haemodialysis Centre (Jan 2016 to Dec 2016)

S. No	Category	Monthly salary and salary per hr	Total working hr	Total monthly salary
(a)	1 x Nephrologist	1,15,000 /-	160	1,15,000 (40% of salary = 46,000)
(b)	7 x Technician	35,000	160	2,45,000 /- (40% of salary = 98,000)
(c)	2 x Civilian Technicians	35,000 /-	480	70,000 /-
	1 x Civilian Nurse	30,000 /-	480	30,000 /-
(d)	1 x Housekeeper (Gp 'D')	15,000 (94)	160/2=80	80 X 94 = 7,520/- (50% of salary = 3760)
(e)	1 x Ward sahayika (Gp 'D')	15,000(94)	2h x 6d x 4= 48 h	48 X 94 = 4,512/-
	Total monthly salary			2,52,272
	Salary for study period (Jan 2016 to Dec 2016)			30,27,264

Maintenance Costs of Building

As per Engineering Department, there is a fixed rate laid down for the maintenance of building i.e. flat rate of 69.04 per Sqm works and 21.69 per Sqm for E/M (Electrical & Mechanical) works. The B/R works include those works related to the repair of building, washing, painting etc, whereas the E/M maintenance includes works like maintenance of electrical and plumbing fixtures of the building. The cost of B/R and E/M maintenance for haemodialysis centre is as under:-

- (a) Total area of maintenance = 150 sqm
- (b) Rate of yearly maintenance
 - (i) 150 x 69.04 for B&R = 10,356
 - (ii) 150 x 21.69 for E&M = 3253.5
- (c) Total cost of maintenance = **13,609.5 / yr**

Costs of Equipment

SN	Equipment	No. of Machines	Unit Cost	Total Cost	Year of purchase	Life of machine	Years of utility	Depreciation cost
1	Haemodialysis Baxter Machine & Stabilizer	06	6,50,000	39,00,000	2009		10	7 170000
2	Haemodialysis Fresenius Machine & Stabilizer	05	7,20,000	36,00,000	2012		10	4 432000
3	Haemodialysis Baxter Machine & Stabilizer	02	8,40,000	16,80,000	2014		10	0 2 1344000
Total Costs								19,46,000

Depreciation of Equipments

Straight line method of depreciation of equipments used in dialysis centre. The useful life of each equipment was considered to be 10 years. Reverse osmosis plant and haemodialysis machines are exclusively used for haemodialysis. Other equipments and furniture used for haemodialysis centre are also shown:

Equipment maintenance cost

Equipments are under five years guarantee/ warrant. Under this contract free routine service is carried out by the respective companies for a period of five years from the date of satisfactory installation / acceptance of the equipment i.e up to year 2017 & 2019 respectively. The older machines that were bought in 2009 are under Annual Maintenance Contract.

Maintenance cost per annum at rate of 4% of value of equipment = Rs 3,90,000

SN	Equipment	Quantity	Unit Cost	Total Cost	Depreciation Cost/ Maintenance Cost
1.	Permionics Reverse Osmosis water Plant (1998)	01	3,00,000	3,00,000	12,000
2.	Aqua Hydro System Reverse Osmosis water Plant (2007)	01	4,50,000	4,50,000	18,000
3.	Weighing Machine	01	10,000	10,000	400
4.	Hospital Bed (ICU type)	12	1,00,000	12,00,000	48,000
5.	Trolley	12	6000	72000	2880
6.	Chair	12	3500	42000	1680
7.	Glass Cupboards	06	12000	72000	2880
8.	Air conditioner	06	25000	150000	6000
9.	Table	01	20,000	20,000	800
10.	Computer	01	40,000	40,000	1600
11.	Printer	01	8500	8500	340
12.	Sideboard	02	15,000	30,000	1200
13.	Crash cart	02	10,000	20,000	800
Total Costs					96,580

Indirect Expense on account of depreciation of Furniture

Table 4. Cost of Consumables

S No.	Consumables	Quantity Consumed	Cost per item in Rs	Total cost
1	Hollow fiber haemodialysers + Guide wire	1500	1100	16,50,000
2	Femoral catheter	1000	250	2,50,000
3	Haemodialysis solution	42000	40	16,80,000
4	Saline solution (500ml)	18,000	45	8,10,000
5	Disinfection concentrate	70 litres	200	14,000
Total Costs				44,04,000

Consumables:-

S.No	Items	Quantity	Total Cost (Rs)
1.	Cotton Wool Absorbant Pkt of 50 gm	120	360
2.	Cotton Wool Absorbant Pkt of 500 gm	60	6300
3.	Gauze Surgical, Open Wove, Unmedicated: 60 cm wide	40800	142800
4.	Gauze Surgical, Open Wove, Unmedicated : 60 cm x 3	600	3000
5.	Gauze Absorbent, Folded : 2.5 cm x 100 metres	600	63000
6.	Dressing sterile 4" x 4" box of 5	1200	630000

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7.	Dressing sterile 8" x 8" box of 3	1200	7,80,000
8.	Adhesive Elasto-plast tape; 7.5cmx5 meter	240	9600
9.	Povidone Iodine 10% solution, bott of 100 ml	1200	258000
10.	Dressing wound care dressing 10cm x 10cm (box of 5)	1200	168000
11.	Dressing wound care dressing 20cm x 20cm (box of 3)	1200	510000
12.	Dressing extra thin wound care dressing 10cm x 10cm	1200	120000
13.	Dressing extra thin wound care dressing 20cm x 20cm	1200	420000
14.	Disposable Mask	6000	48000
15.	Disposable Cap	6000	48000
16.	Disposable gown	2400	120000
17.	Disposable shoe cover	12000	120000
18.	Syringe disposable, plastic,sterile, 2 ml with needle	2400	4800
19.	Syringe disposable, plastic, sterile, 5 ml with needle	4800	14400
20.	Syringe disposable, plastic sterile,10 ml with needle	12000	36000
21.	Vacuum blood collection tubes with needles : EDTA	2400	21600
22.	Vacuum blood collection tubes with needles : Sterile tube	2400	21600
23.	Vacuum blood collection tubes with needles : Sodium	720	6480
24.	Unsterile Hand Gloves,size 6 1/2 pair of	9600	144000
25.	UnsterileHand Gloves,size 7 pair of	9600	144000
26.	Unsterile Hand Gloves, size 7 1/2 pair of	9600	144000
Total Costs			38,87,940

Cost of Electricity

Table 5. Variable Consumption of Electricity (Jan 2016 to Dec 2016)

S.no.	Equipment	Wattage	Daily usage(hr)	Annual usage (hr)	Annual usage (kwh)
1	AC (6 x 2 KW)	12 KW	10	3000	36000
2	Lights (16x 0.040 KW)	0.64 KW	10	3000	1920
3	Lights (6 x 0.020 KW)	0.12 KW	10	3000	360
4	Ceiling Fan (6 x 0.05)	0.3	10	3000	900
5	01 computer @ 0.5 KW	0.5 KW	10	3000	1500
6	Laser printer @ 0.25 KW	0.25 KW	01	300	75
Total annual consumption					40,755

Fixed Cost of Electricity for Equipment

S.no.	Equipment	Wattage (KW)	Daily usage(hr)	Annual usage (hr)	Annual usage (kwh)
1	Reverse Osmosis plant (2 x 3KW)	6	8	2400	14400
2	Haemodialysis machines (13 x 2KW)	26	10	3000	78000
Total annual consumption					92400

Cost of Electricity per procedure. Cost of electricity per procedure for each of the options is calculated and presented in Table 6

Table 6. Cost of Electricity

S.No.	Cost Element	Cost
1	Annual consumption of Electricity	133155
2	Annual cost of electricity	1141138.4

(MSEB rate @ 8.57 / unit) [Authority: Maharashtra State Electricity Board (MSEB)]

Table 7. Cost of Water

S.No.	Cost Element	Cost
1	Annual consumption of water	16,000 x 300= 48,00,000
2	Annual cost of Water	1560

(MSEB rate @ 3.25 / 10,000 litres)

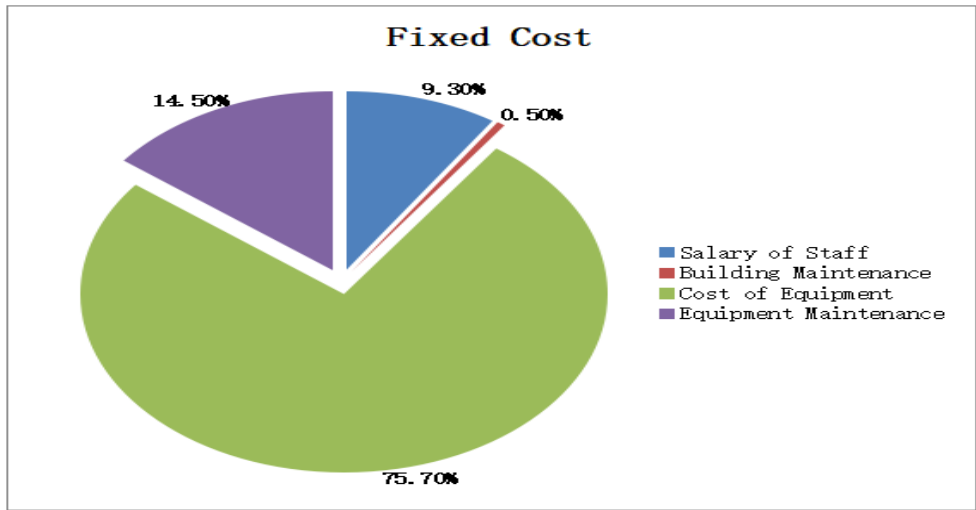
[Authority: Maharashtra State Water Supply tariffs]

Fixed Cost:

S.No.	Cost Element	Cost (Rs)
1	Salary of staff	252,272

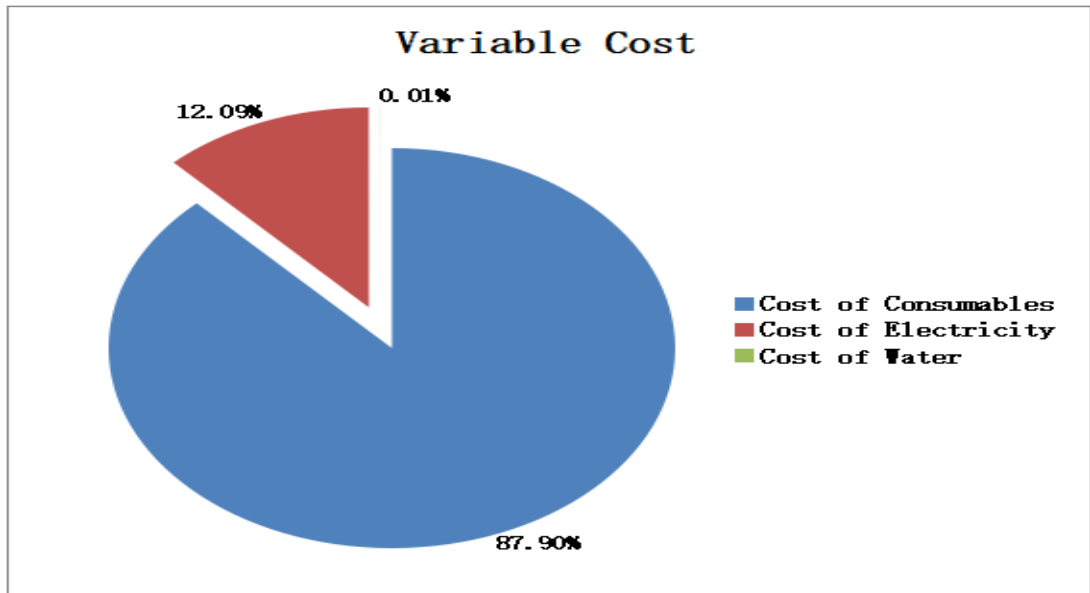
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2	Maintenance Cost of building	13,609.5
3	Cost of equipment	19,46,000 + 96,580 =20,42,580
4	Equipment maintenance cost	3,90,000
	Total	26,98,462



Variable Cost:

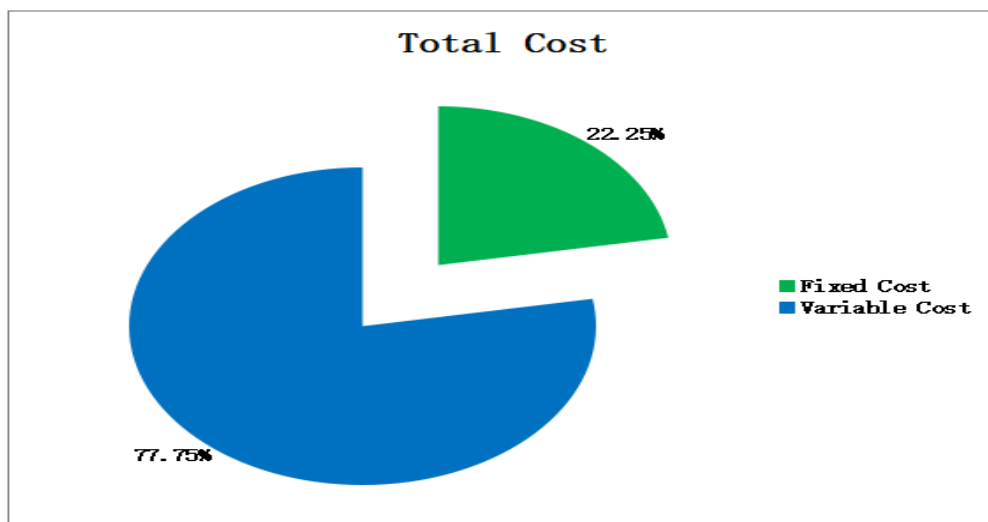
S.No.	Cost Element	Cost (Rs)
1	Cost of Consumables	82,91,950
2	Cost of Electricity	11,41,138
3	Cost of Water	1560
	Total	94,34,648



Total Costs incurred on the Dialysis Centre for year 2015 = 121,33,110

Total no. of procedures done in the year 2015 = 6418

Therefore, costs incurred per dialysis procedure = 121,33,110/ 6418 = 1890.4815 = Rs.1890/-



IV. Discussion

The unit cost for a haemodialysis turned out to be Rs 1890, at the Dialysis Centre . Another study was conducted at Kasturba Medical College, Manipal, to ascertain the unit cost of a haemodialysis procedure, where the unit cost turned out to be Rs 1526 [20].

V. Conclusion

Cost information is part of the basic information needed by managers and policy makers for making decisions to improve the performance of a hospital, to allocate the resources within or among hospitals and to compare the performance of different hospitals to one another. Some of the basic reasons for wanting cost information are to improve efficiency, increase effectiveness, enhance sustainability, and improve quality. Without quality cost data it is not possible to make accurate projections, improve technical efficiency, control expenditure and enhance accountability of managers. A scientific costing system is a very important tool for managements to fulfil these needs and hence, is imperative for the successful running of a hospital.

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