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ORIGINAL ARTICLE

Why switch to Rental? Costing of Laundry Services at an Apex Tertiary Care Hospital from the View of Outsourcing based on Rental Linen Management Services

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ABSTRACT

Introduction: Modern hospitals are matrix organizations with a high investment in terms of capital, labor, and resources. It is imperative for the hospital administration to provide right material of right quality at the right time. Hospitals that set up in-house laundry operations generally make the decision without thoroughly identifying and accounting for total linen and laundry costs. Now evidence has emerged that hospitals that outsource were seeing improved linen utilization rates. If proper and clean linen is not provided, this can result in patient dissatisfaction. Further, innovations in laundry equipment have led to tremendous increases in efficacy. So, there is a need to ascertain the cost incurred in providing linen and laundry services so as to gauge the plausibility of transitioning to outsourcing-based models.

Aims and objectives: To study the cost incurred in providing linen and laundry services at an apex tertiary care hospital and to evaluate outsourcing model based on rental linen management.

Materials and methods: A descriptive, cross-sectional, retrospective, record-based study was conducted during a period of 1 month from March 1, 2016 to March 31, 2016.

Observations: The quantity of monthly linen washed in Dr Rajendra Prasad Centre was found to be 22,465 kg. The monthly laundry expenditure in Dr RP Centre was Rs. 1,415,295. The linen procurement expenditure per month at Dr RP Centre was Rs. 419,386. So total expenditure on linen and laundry per month at Dr RP Centre was Rs. 1,834,681. Thus, cost/kg (with inclusion of linen cost) was Rs. 82.

Discussion and conclusion: The rate quoted by a leading vendor to supply washed, sterilized linen to the hospital was Rs. 55 per kg. Since the expenditure incurred per kg at Dr RP Centre was Rs. 82, this amounted to a saving of around Rs. 27 per kg. It would mean saving of around Rs. 606,555 per month and Rs. 7,278,660 per annum. So, it was recommended that rental linen management services may be hired for Dr RP Centre after taking care of functional, operational, and strategic contingency.

Keywords: Apex, Linen, Rental.

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INTRODUCTION

Organizations that set up in-house laundry operations generally make the decision without thoroughly identifying and accounting for total linen and laundry costs. This was the conclusion of Textile Cost Manual for the Hospitality Industry #71578, a 1991 study completed for the Textile Rental Services Association of America by Pannel, Kerr, Forster, Certified Public Accountants.[1]

If proper and clean linen is not provided, this can result in patient dissatisfaction. Almost all soiled linen (96.1%) possess some detectable bacteria.[2]

A study by association for the advancement of medical instrumentation found that reusable garment if laundered properly is 70% more effective in providing barrier precaution. Staff handling used linen is predisposed to risk and can be potential agent for environmental contamination.

Moreover, the evidence is emerging that hospitals outsourcing linen and laundry services are seeing improved linen utilization rates. For example, when the University of Nebraska Medical Center outsourced its linen services, it saw its pounds per adjusted patient day decrease. The savings were nearly $100,000 in the first year and the anticipated savings in the future is $250,000 per year.[3]

Further, innovations in laundry equipment have led to tremendous increases in efficiencies. Large tunnel washing systems, with the capacity to wash more than 3,000 pounds of textiles at one time, have significantly decreased water usage from three gallons per pound to less than 0.75 a pound today.[3] These systems, along with chemical injection systems that precisely control the amount of chemicals injected into the washer, have allowed health care textile service companies to reduce the amount of chemicals they need to wash a pound of laundry. Water reuse and recycling systems are becoming more commonplace in professional laundries and are

also helping to reduce the amount of water necessary for the wash process. Heat reclamation systems are allowing energy to be captured throughout the laundry process and returned to heat wash water.[3]

Approach to Costing

Cost is the sacrifice incurred in an economic activity to achieve a specific objective, such as to consume, exchange, or produce. Cost is incurred when, in order to achieve its objectives, an organization acquires resources, transforms them in some manner, and delivers units of products or services to its customer.

Elements of costing are[4]:

- Manpower
  - Direct manpower, also known as process labor, productive labor, etc., is one which actively or directly takes part in the production of a commodity.
  - Indirect manpower is the labor employed for carrying out of tasks incidental to the goods produced or services provided.
- Material/Resources
  - *Direct material*: The material which becomes an integral part of a finished product and which can be conveniently assigned to specific physical unit is termed as direct material.
  - *Indirect material*: This is the material which cannot be conveniently and wholly allocated to a specific cost center. The material, i.e., used for purposes ancillary to the business and which cannot be conveniently assigned to specific physical units is termed as indirect material. Consumable stores, printing and stationery material, etc., are some of the examples of indirect material.
- Expenses
  - *Direct expenses*: are those that can be wholly and directly allocated to the goods produced or to the service rendered, e.g., cost of buying the equipment.
  - *Indirect expenses*: For example, water or electricity charges which cannot be directly allocated to the expenses incurred are indirect expenses.

MATERIALS AND METHODS

Study Setting

The study was conducted at the Laundry of All India Institute of Medical Sciences (AIIMS), New Delhi, and Dr RP Centre for Ophthalmic Sciences at AIIMS, New Delhi.

Study Design

Descriptive, cross-sectional, retrospective, record-based study.

Study Period

The period of study was 1 month from March 1, 2016 to March 31, 2016.

Inclusion Criteria

The laundry services at AIIMS including the outsourced services have been included in this study. Both infected and noninfected linen have been considered together for calculation of cost per kg of linen.

Exclusion Criteria

- Cost of the land was excluded from the study.
- Minor costs on stationery, etc., were excluded.

Data Collection

The data collection was done in the following phases:

- The process of laundry services from receipt in wards to delivery to the wards was considered for the study. The operational aspects were studied and data collected for enabling calculation of the cost of the process.
- The data were collected during the month of March 2016.
- Key informants included laundry manager and the engineering representatives, medical store personnel from whom various details of cost heads and operational aspects were found.
- The engineering section was approached to acquire the Central Public Works Department (CPWD) rates in order to calculate the cost of laundry building and boiler room.
- Details of rate contract of outsourcing were also perused.

Cost Ascertainment Process

The cost centers (cost heads) were identified and data pertaining to each were collected under the following heads. The traditional method of costing was used for cost estimates as follows.

Building Cost

Depreciation cost of building: The land being that of the government, cost of land was not considered. Replacement cost method was used to arrive at the current construction cost, based on current CPWD construction rates (CPWD manual).[5] The area was physically calculated on ground. Life of the building being assumed as 100 years and the annual depreciation is estimated to be 1%.

Maintenance of building: The maintenance rate of the building as per engineering department as on 10.11.89 was Rs. 15/sqm. The cost index was Rs. 5,104/sqm (CPWD memorandum dated 23.02.15)[6] with base of

100 on 01.01.79. The annual maintenance cost was calculated on this basis.

Since the laundry was not air conditioned, no cost has been apportioned to the same.

Cost of Equipment, Fixtures, and Fittings

Depreciation of equipment, fixtures, and fittings: The inventory of the equipment purchased from the supplier firm was generated from the stores section along with cost incurred. Depreciation was computed based on the useful life of the product. An inventory list of electrical fixtures was generated with the help of the electrical engineering in-charge of the area and depreciation computed using straight line method, i.e., the cost of the asset was divided by the useful life, to arrive at the annual cost to the department.

Maintenance: The cost of maintenance of the equipment was already part of the contract drawn and was the responsibility of the vendor.

Cost of Electricity

The direct electricity consumption was calculated using the wattage system as the submeters were not installed. The total wattage and number of working hours have been taken to work out the electricity consumption cost.

Manpower cost

This was determined based on the pay commission as gross monthly salary. Other indirect manpower cost, e.g., that of the staff of the medical stores department, was not considered, being negligible.

Other Cost Heads

- Cost of outsourcing
- Cost of diesel
- Water Cost

Costing unit: Cost/kg of dirty linen

OBSERVATIONS AND DISCUSSION

Outsourcing Details

As a result of the decision taken by the hospital, the laundry services were outsourced, following a tendering process in November 2009. Six firms took part in the open tendering process and one of them was selected as per the rates quoted and specifications of tender document. Since January 2010, laundry services of AIIMS have been partially outsourced.

Costing

For the ease of analysis and costing, the various cost heads have been described along with the description of the infrastructure, equipment, manpower, and consumables. The equipment, however, was considered to depreciate at the rate of 10%.

Facility Cost

Facilities cost consists of the cost of the space utilized and the cost of electricity to operate the equipment.

Building Cost

Total area of laundry complex = 611.7 sqm

Total area of boiler room = 43.7 sqm.

The CPWD building cost index April 2015 with 01/10/12 (as base 100) issued by director general (DG) CPWD is 104. The building cost for 1 sqm area calculated after incorporating this cost index and after discussion with the engineering department[5] was Rs. 37,465.

Area of laundry + area of boiler in sqm	*CPWD rate per sqm*	*Total building cost*	*Annual building cost of laundry (1%)*
655.4	Rs. 37,465	Rs. 24,554,561	Rs. 245,545

There are three passenger lifts, the cost of which was apportioned as 32 lakh, each based on plinth area rates. So, the total cost of lifts was Rs. 96 lakh.

Chartered Institution of Building Service Engineers (CIBSE) has a lift cycle that indicates the life span of a lift as 15 years. Based on this, the annual cost of lift came to be Rs. 6.4 lakh.

So, the net monthly cost of lift was apportioned as Rs. 53,333.

Building Maintenance Cost

- The cost index was Rs. 5,104/sqm (CPWD memorandum dated 23.02.15),[6] with base of 100 on 01.01.12. The annual maintenance cost required to maintain the building was:

Area of manifold	*Maintenance per sqm*	*Annual maintenance cost*
655.4 sqm	Rs. 5,104	Rs. 3,345,162

The annual maintenance cost of lifts at laundry was Rs. 594,000.[5]

So, the monthly maintenance cost of lifts was apportioned as Rs. 49,500.

- *Electricity cost of equipment and fixtures*: The electricity cost has been worked out based on Rs. 10 per unit* (NDMC rates). The following formulae were used after consultation with the electrical engineering in-charge:
  - 1 kW = 1 unit
  - 1 Horsepower (HP) = 0.76 kW

*Average unit cost including DG sets

As there was no separate submeter to measure the consumption of electricity at the laundry, the total wattage and number of working hours was taken to work out electricity consumption cost.

Equipment

Machine Details

Washer extractor: There were 13 washer extractors in the laundry section. The washer extractors were used to wash and rinse the cloths. There were six washer extractors of capacity 100 kg; six washer extractors were of capacity 50 kg; and one washer extractor was of capacity 25 kg. Thus, the total capacity was 925 kg/cycle time.

Hydro extractor: There were nine hydro extractors in the laundry section. The hydro extractors were used for the removal of water from the linen mechanically. There were total nine hydro extractors of capacity 50 kg each. So, total capacity was 450 kg/cycle time.

Tumbler dryer: There were 12 tumbler dryers in the laundry section. The tumbler dryers were of capacity 50 kg each. The tumbler dryers were used for drying the washed and hydro extracted linen. Two energy sources were available for drying linen in tumbler dryer – steam and electricity. Therefore, the total capacity was 600 kg/cycle time.

Calendar dryer: There were two calendar dryers in the laundry section. The calendar dryers were used to press and final finishing of linen. The calendar dryer utilizes steam as energy source to press the linen which could then be finally used in the hospital.

Other equipments were:

- Boilers—electric as well as diesel
- Steam presses
- Water softening plant
- Director general set

Process Description

Laundry Steps with Time

Sl. no.	*Laundry steps*			*Quantity*	*Time taken*	*Temperature*
1	Rinsing		Water	400 L	5 minutes	43°C
2	Washing	Chemicals	Opal	500 gm	40 minutes	60–75°C
3			100S	100 mL		
4			OX-bleach	500 mL		
5			Legro	300 mL		
6			Whitener	400 mL		
7		Hypo wash	Hypo	500 mL	10 minutes	39°C
8		Shower	Johnson Diversey/Washing powder	As per required	10 minutes	36.2°C
9		Rinsing	Normal water	400 L	5 minutes	33°C
10		Neel wash	Neel	250 mL	5 minutes	32°C
11	Hydro				15 minutes	
12	Drying				40 minutes	
13	Total				125 minutes	

ANALYSIS OF AVERAGE WEIGHT OF LINEN AND LINEN WASHED PER DAY

To analyze average weight of the linen, different linen items processed in the laundry department and their respective weight have been taken. The historical data was obtained retrospectively to see the baseline.

Weight trials were undertaken to crosscheck the weights of different linen. The average weight per linen was evaluated based on number of pieces processed of different type of linen and their respective weight. The details are as follows:

Different Type of Linen Pieces received at Laundry per Month and Their Average Weight

Sl. no.	*Description*	*Qty. per month*	*Weight per piece*	*Total weight*
1	Bedsheet	76,163	0.65	49,506.0
2	Draw sheet	28,328	0.323	9,149.9
3	Patient coat	18,917	0.215	4,067.2
4	Patient pyjama	17,037	0.21	3,577.8
5	Women skirt	3,566	0.21	748.9
6	Women jacket	3,155	0.215	678.3

(Contd…)

(Contd…)

Sl. no.	*Description*	*Qty. per month*	*Weight per piece*	*Total weight*
7	Pillow cover	18,493	0.115	2,126.7
8	Turkish towel	782	0.475	371.5
9	Hand towel	1,034	0.15	155.1
10	OT towel	100,884	0.122	12,307.8
11	DL wrapper	33,337	0.267	8,901.0
12	Screen cover	6	0.72	4.3
13	OT gown	28,057	0.547	15,347.2
14	Curtain	189	0.72	136.1
15	Surgical shirt	20,938	0.1425	2,983.7
16	Surgical pyjama	20,158	0.17	3,426.9
17	Surgical frock	8,407	0.285	2,396.0
18	Patient sheets	2,632	0.203	534.3
19	Abdominal sheet	3,901	0.72	2,808.7
20	Trolley cover	13,202	0.187	2,468.8
21	Lagging	3,090	0.38	1,174.2
22	Syringe capper	8,277	0.086	711.8
23	Blanket	252	1.9	478.8
24	Baby frock	3,910	0.03	117.3
25	Children coat	1,070	0.114	122.0
26	Children pyjama	420	0.111	46.6
27	Door panel	99	0.02	2.0
28	Baby sheet	1,951	0.132	257.5
29	Couch cover	129	0.72	92.9
30	DL bags	2	0.1	0.2
31	Binder	9	0.12	1.1
	Total	418,395		124,700.4
	Average weight/piece			0.298 kg

Different Types of Linen Pieces received from Dr RP Centre and Their Average Weight

Sl. no.	*Items*	*Total monthly linen (no.)*	*Avg weight (kg)*	*Total weight (kg)*
1	Bedsheet	10,492	0.650	6,819.80
2	Draw sheet	373	0.323	120.48
3	Patient gown	3,095	0.215	665.43
4	Patient pyjama	2,904	0.210	609.84
7	Pillow cover	4,290	0.115	493.35
8	Bath towels	87	0.475	41.33
9	Hand towel	431	0.150	64.65
10	OT towel	17,931	0.122	2,187.58
11	DL wrapper	8,598	0.267	2,295.67
13	Surgeon gown	9,259	0.547	5,064.67
15	Curtains	31	0.720	22.32
16	Dr Kurta	5,956	0.142	845.75
17	Dr Pyjama	5,809	0.170	987.53
18	Surgeon's frock	5,326	0.285	1,517.91
24	Trolley cover	2,598	0.187	485.83
25	Child coat	561	0.114	63.95
26	Child pyjama	376	0.111	41.74
33	Blankets	72	1.900	136.80
	Total	78,189		22,464.62

Monthly Average Linen processed

Monthly linen processing for one year was evaluated using retrospective data based on monthly linen processed and average weight evaluated in an earlier table.

Month	Average monthly qty. in pieces	Average weight/ piece	Monthly total weight (kg)	Working days	Average weight/ day
Oct-15	402,099	0.298	119,825.5	26	4,608.7
Nov-15	381,653	0.298	113,732.6	26	4,374.3
Dec-15	397,719	0.298	118,520.3	26	4,558.5
Jan-16	398,152	0.298	118,649.3	26	4,563.4
Feb-16	408,340	0.298	121,685.3	26	4,680.2
Mar-16	419,266	0.298	124,941.3	26	4,805.4
Apr-16	392,345	0.298	116,918.8	26	4,496.9
May-16	409,644	0.298	122,073.9	26	4,695.2
Jun-16	383,928	0.298	114,410.5	26	4,400.4
Jul-16	398,387	0.298	118,719.3	26	4,566.1
Aug-16	432,524	0.298	128,892.2	26	4,957.4
Sep-16	425,042	0.298	126,662.5	26	4,871.6
Average	404,091.9		120,419.3		4,631.5

Average daily washing load: 4,632 kg

Average monthly washing load: 120,419 kg; i.e., 120.4 ton

Monthly Average Payment to the Outsourced Agency

Month	Monthly payment to outsourced agency
Oct-15	2,647,329
Nov-15	2,465,403
Dec-15	2,564,746
Jan-16	2,576,412
Feb-16	2,624,396
Mar-16	2,689,817
Apr-16	2,515,558
May-16	2,624,915
Jun-16	2,461,197
Jul-16	2,558,877
Aug-16	2,789,313
Sep-16	2,747,897
Average	2,605,488

Average payment to the outsourced agency/month: Rs. 2,605,488 per month

Rs. 31,265,860 per annum

The payment made to the outsourced agency covers the scope of work outsourced. The payment covers the following cost:

- Manpower
- Material
- Equipment maintenance expenses
- Water treatment expenses

In addition to the payment made to the outsourcing agency, AIIMS incurs cost of:

- Electricity
- Water
- Generator
- Boilers
- Manpower expenses (other than supplied by outsourced agency)
- Building maintenance

ANALYSIS OF UTILITY ENERGY CONSUMPTION

Boiler Fuel and Electricity Consumption

The boiler house has one oil fired boiler and two electricity operated boilers. This was operated as per requirement to meet the steam demand of the laundry unit. The general operational details of the boiler are as follows:

- *Operating pressure*: 4 kg/cm^2
- *Operating temperature*: 130 to 140°C
- *Boiler steam capacity*: 500 kg/hour
- *Boiler make*: INDCON
- *Electric boiler model*: ES20
- *Electric boiler make*: COLLIN WALKER
- *Electric boiler rating*: 215 kW

The pressure at steam header was around 3 kg/cm^2 and at the machine end it was approx.1 to 1.5 kg/cm^2.

All three boilers were operated to cater steam demand of laundry. To evaluate fuel consumption in steam boiler trials have been taken and based on that it has been found the average fuel consumption per day in boiler was approximately 80 to 85 liters/day (diesel).

To evaluate the energy input of electrical boilers three phase power analyzer was used to record power consumption of electric boiler. All relevant electrical parameters like voltage, current, harmonics, kW and kVA power and power factor were recorded. The details are as follows.

Load Profile of Other Utilities

The details of the electrical load profile of other equipment and utilities are as follows:

Type	Name	Voltage	Current	kW	PF
Utility	1. Compressor	388.3	9.98	5.778	0.857
	2. Submersible Pump-1	401.3	10.93	6.89	0.629
	3. Submersible Pump-2	401.1	8.517	5.198	0.876
	4. Filling pump-1	402.5	12.5	7.348	0.861
	5. Filling pump-2	398.1	11.06	6.857	0.897
	6. Filling pump-3	401.7	12.33	7.773	0.905
Lighting	1. Lighting			15	

Total Load of Other Utilities: 54.5 kW

Laundry Machines Power Consumption

The power consumption of all the machinery process like washer extractors, tumbler dryers, hydro extractor, and calendars was evaluated respectively. The details are as follows:

Type	*Equipment name*	*Nos*	*Load/equipment*	*Average load (kW)*	*Power factor (liters/day)*	*Load (kVA)*
Utility	1. Electric boiler	2	206	412	0.85	484.71
	2. Diesel boiler	1			88	
	3. Submersible pump-1	1	6.9	6.9	0.85	8.12
	4. Submersible pump-2	1	5.2	5.2	0.85	6.12
	5. Overhead tank pump	3	7.43	22.29	0.85	26.22
	6. Compressor	1	6.8	6.8	0.85	8
Rest utilities	1. Ceiling fans	31	0.07	2.17	0.85	2.55
	2. Exhaust fans	21	0.25	5.25	0.85	6.18
Equipment	1. Washer extractor	13	2.33	30	0.85	35.29
	2. Hydro extractor	9	1.66	15	0.85	17.65
	3. Tumbler dryer	12	28.3	340	0.85	400
Lighting	1. Lighting	250	0.06	15	0.85	17.65

Capital Cost of Equipment and Machinery Depreciation Cost

The cost of the equipment have been taken from an unpublished study done in the year 2011 to 2012.

- The cost of equipment with maintenance cost was Rs. 74 lakhs.
- The boilers have been installed at a capital cost of Rs. 3,000,000.
- The panels have been installed in new laundry at a cost of Rs. 3,600,000.
- Total approximate machinery cost = Rs. 14,000,000.

*The lifespan of equipment was taken as 10 years, thus depreciation of 10% was calculated on per annum basis.

Machinery Depreciation Cost

- Approximate machinery cost: Rs. 14,000,000
- Estimated life: 10 years
- Depreciation per year @10%: Rs. 1,400,000
- Monthly depreciation: Rs. 116,667

Manpower Cost

Overall manpower cost borne by AIIMS toward laundry is given below:

Sl. no.	*Category*	*No.*	*Pay/month/ in Rs.*	*Total*
1	Laundry manager	1	50,000	50,000
2	Laundry supervisor	1	46,000	46,000
3	Assistant laundry supervisor	3	35,000	105,000
4	Clerk	3	18,000	54,000
5	Tailor	2	25,000	50,000
6*	Laundry attendant	32	25,000	800,000
7*	Sanitary attendant	5	25,000	125,000
8*	Sulabh volunteers	28	10,000	280,000
Total				1,510,000

*Used for distributing washed linen to all the hospital areas as well as to collect dirty linen from these areas daily

Water Cost

Average monthly water bill of AIIMS for the months of Aug, Sep, and Oct 2016

Sl. no.	*Source of supply*	*Water consumption (in Kiloliters)*	*Cost/month (in Rs.)*
1	Delhi Jal Board	54,160	4,638,555
2	NDMC	1,492	104,470
	Total		4,743,025

The cost of water was apportioned to laundry @ 2%, i.e., Rs. 94,860 per month.

Overall Cost of Laundry per kg of Linen

Overall expenses of laundry/kg of linen have been evaluated based on the following details:

- Average weight/linen
- Average monthly production
- Electrical load profile of utilities
- Electrical load profile of machineries
- Fuel consumption in boiler
- Contractual expense
- Maintenance expense
- Softener expense
- Manpower expense (AIIMS)

The details of overall cost of laundry/kg of linen were as follows:

Total Monthly Cost

Sl. no.	Equipment name	Nos.	Load/ equipment	Average load (kW)	Power factor	Load (kVA)	Running hours	Avg. days/ month	Unit cost	Cost/ month
I.	*Electricity cost*									
1	Electric boiler	2	206	412	0.85	484.71	9	26	10	1,134,221
2	Washer extractor	13	2.33	30	0.85	35.29	9	26	10	82,579
3	Hydro extractor	9	1.66	15	0.85	17.65	9	26	10	41,301
4	Tumbler dryer	12	28.3	340	0.85	400	9	26	10	936,000
5	Lighting	250	0.06	15	0.85	17.65	12	26	10	55,068
6	Ceiling fans	31	0.07	2.17	0.85	2.55	12	20	10	6,120
7	Wall fans	21	0.25	5.25	0.85	6.18	12	20	10	14,832
8	Submersible pump-1	1	6.9	6.9	0.85	8.12	6	26	10	12,667
9	Submersible pump-2	1	5.2	5.2	0.85	6.12	12	26	10	19,094
10	Overhead tank pump	3	7.43	22.29	0.85	26.22	2	26	10	13,634
11	Compressor	1	6.8	6.8	0.85	8	6	26	10	12,480
II.	*Oil cost*									
12	Diesel boiler	1		88	liter/day			26	56/liter	128,128
III.	*Consumable cost*									
IV.	*Depreciation cost*									
13	Machinery depreciation cost									116,667
V.	*Maintenance cost*									
14	Boiler maintenance cost	3						26		370,000
VI.	*Building cost*									
15	Building cost (including lifts)									73,795
16	Building maintenance cost (including lifts)									328,264
VII.	*Manpower cost*									
17	Manpower cost (AIIMS)									1,510,000
VIII.	*Outsourcing cost*									
18	Outsourcing expenditure									2,605,488
IX.	*Water cost*									94,860
	Total expense per month									7,555,198

	Average annual linen purchase at Dr RP Centre					
Linen items	*Year 2013–14*	*Year 2014–15*	*Year 2015–16*	*Average annual quantity*	*Rate per piece (in Rs.)*	*Average annual cost (in Rs.)*
Bedsheet	2,000	2,500	3,500	2,667	416	1,109,333
Draw sheet	0	0	500	167	89	14,833
Patient kurta	2,000	1,000	2,000	1,667	198	330,000
Patient pyjama	2,000	1,000	2,000	1,667	180	300,000
Pillow cover	1,000	1,000	2,000	1,333	86.03	114,707
Eye towel	7,500	7,100	9,000	7,867	105.6	830,720
DL wrapper	2,100	1,000	2,000	1,700	189	321,300
Surgeon gown	2,000	4,100	4,500	3,533	252	890,400
Dr Kurta	2,000	1,100	1,500	1,533	97.08	148,856
Dr Pyjama	2,000	1,100	1,500	1,533	152	233,067
Surgeons frock	1,500	1,000	1,000	1,167	199	232,167
Trolley cover	1,500	1,000	2,000	1,500	185	277,500
Child kurta	500	500	500	500	98.01	49,005
Child pyjama	500	500	500	500	98.01	49,005
Blankets	400	200	200	267	494	131,733
Average annual cost						5,032,626

Cost of laundry per kg		
Laundry monthly expense	7,555,198	Rs.
Average monthly output of washed linen	120,419	kg
Cost of washing linen per kg	63	Rs.
Cost of linen processing for Dr RP Centre		
Monthly linen washed in RP Centre	22,465	kg
Monthly laundry expenditure in RP Centre	(a) 1,415,295	Rs.
Linen procurement expenditure per month	(b) 419,386	Rs.
Total (a + b)	1,834,681	Rs.
Cost/kg (with inclusion of linen cost)	82	Rs.

SUMMARY AND CONCLUSION

The laundry system at the AIIMS follows the outsourced system wherein the linen, machinery, electricity, water, and space was provided to the vendor by the Institute.

It was observed that the current system of laundry management entails a number of costs, such as cost of space, electricity, water, linen, and supervisory manpower designated for the laundry. In addition, other costs which are borne by the Institute in the current system are linen procurement-related costs, storage costs, both at the central and the ward level. Further, a lot of nursing manpower was being utilized only for linen management in the hospital which could have been used for other patient care services. Yet, the quality of wash and linen being supplied remains uncertain in terms of microbial load it may carry postwash and cross-contamination occurring during the various laundry process from collection of dirty linen to supply of clean linen to the user areas. The above statement can be corroborated from the fact that a large quantity of linen was getting condemned on a regular basis prior to its expected useful life.

Internationally, laundry services in health care are expected to conform to a few standards, such as RABC (EU), BS-EN, HLAC (USA), DHS, etc. These standards dictate not only the linen quality, but also the wash processes to be followed in order to ensure efficient and effective washing expected in a hospital. In the current scenario, where patients are becoming increasingly aware of their rights and responsibilities in a hospital and the law tightening its noose on health care institutions for every lapse in service, it is time to accept and develop systems which shall enable us to follow such international standards to provide the best quality of linen and a linen safe environment to our patients.

Financial Implications

Financial Implications in the Existing Model

In the existing model, the vendor was responsible for following services:

- Operating the laundry machines
- Collecting and distributing linen
- Ironing of linen
- Repairing of linen
- Repair and maintenance of laundry machines
- Provision of manpower
- Provision of materials

In this model, linen, space, machinery, electricity, steam, and water were provided by the Institute.

The Vendor was being paid Rs. 2,605,488 per month, which is equivalent to Rs. 31,265,856 Annually

Linen was procured and provided by the Institute.

Expenditure incurred in procuring linen per year at Dr RP Centre = Rs. 50,32,626

In addition to the direct expenditure being incurred on linen, cost was also being incurred on procurement, storage, as well as condemnation of linen, which if calculated would be significant.

In addition to the cost calculated earlier, a few indirect costs which had not been taken into considerations but if calculated would have been significant were as follows:

- Procurement
- Linen inventory management costs
- Water costs

Financial Implications of the Proposed Model

The rate quoted by a leading vendor to supply washed, sterilized linen to the hospital: Rs. 55 per kg. Since the expenditure incurred per kg at Dr RP Centre is Rs. 82, so, there can be a saving of around Rs. 27 per kg. It would mean saving of around Rs. 606,555 per month and Rs. 7,278,660 per annum. So, it was recommended that rental linen management services could be hired for Dr RP Centre after taking care of functional, operational, and strategic contingency.

In the proposed system, the vendor shall be responsible for purchasing, washing, sterilizing, collecting, distributing, and mending any linen required by the hospital. The vendor shall also be responsible for condemning and replacing linen as and when the need arises. Further, a feedback about the existing rental linen management services in the National Capital Region of Delhi was also collected to gauge the plausibility of transitioning to such a system.

Feedback about the available Rental Linen Management Services from various hospitals in national capital Region of Delhi:

Sl. no.	Hospital	Feedback (written verbatim)
1	A 1,000 bedded corporate hospital	Uninterrupted supply of high-quality disinfected linen, professional approach
2	A 600 bedded missionary hospital	Meets high standards for its services in all respects in a very professional manner; highly appreciated by all the stakeholders in the hospital, namely patients, staff, and management; have no reservation in recommending its services to other hospitals
3	A 300 bedded private hospital	Uninterrupted and smooth supply of consistently high-quality disinfected linen; professional approach and high-quality has played a key role in enhancing patient satisfaction and has added value to services provided by hospital
4	A 150 bedded trust hospital	Services provided by them are to our most satisfaction and the work done by them is commendable

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