

Cost of Outpatient Department Services at a Community Health Center of Bankura, West Bengal

Sumana Samanta, Dibakar Haldar¹, Daliya Biswas², Sourav Lo³, Indrajit Saha¹

Department of Community Medicine, HIMS, Varanasi, Uttar Pradesh, ¹Department of Community Medicine, B S Medical College, Bankura, ²Department of Community Medicine, North Bengal Medical College, Siliguri, ³Department of Community Medicine, CMOH Office, Bishnupur Health District, West Bengal

Abstract

Background: Changing trends of privatization and globalization of health care compel the hospitals to practice cost accounting for providing accurate information about the cost of patient care. **Objectives:** The objectives were to determine unit cost and to identify major cost areas of outpatient department (OPD) services provided by the community health center (CHC) of Bankura district, West Bengal. **Materials and Methods:** A cross-sectional study was conducted at Amarkan CHC in 2016. Work sampling (WS) and time motion (TM) study were conducted for assessing the workforce cost, otherwise complete enumeration was done to assess the cost of different service areas such as medicine, logistic, maintenance, transport, electricity, building, equipment, and furniture. A predesigned pro forma and a questionnaire were used for WS and TM study and for interviewing the key informants for collection of information pertaining to different costs. Unit cost of different services as well as overall unit cost was estimated. **Results:** If a patient received injection, undergone dressing, and had electrocardiogram and X-ray both done in a day, then the total cost of OPD services for workforce was Rs. 85.33/-. Cost of logistics per patient per day was maximum in X-ray room. Manpower exerted the maximum cost incurred by the government to conduct OPD in Amarkan CHC. Overall, the unit cost in OPD incurred by the government was Rs. 44.53/-. **Conclusion:** Close monitoring is required by aligning the staffing pattern and patient activities and having adequate number of staff with right skill at right place and time for efficiency, productivity, and cost-effectiveness.

Keywords: Community health center, outpatient department services, overall cost, unit cost

INTRODUCTION

An essential principle of primary health care is its affordability to the country and community.^[1] In rural areas, primary health-care services are delivered through sub-center, primary health center, and community health center (CHC).^[2] In India, each CHC is covering a population of 80,000–1.20 lakh and having Medicine, Surgery, Pediatrics and Gynecology & Obstetric specialties. It has 30 indoor bed capacity with X-ray and Laboratory facilities.^[3]

Economic evaluations may not have an integral part of public health planning. It is widely perceived that cost data are difficult to generate and require laborious calculations.^[4] Economic issues are becoming a growing concern in health-care field as the sector's share of the gross national product has risen.^[5] Cost is a measurement, the amount of resources used for some purpose.^[6] The demographic and epidemiological transition in India increasingly demands for more share from government

resources to provide quality care. Measuring unit cost can be of definite help to sort out important economic issues.^[7]

Cost analysis is a tool which is useful to get the net financial value associated with each course of action.^[8] Nowadays, information on the cost of services can be used to assess the financial requirement of program introduction, maintenance, or expansion.^[9] It can be used to improve the management of health services and to determine whether the planned emphasis on different services is in tune with financial outlays.^[10]

Keeping in view the changing trend of privatization and globalization of health-care services, it has become

Address for correspondence: Dr. Dibakar Haldar, Anandapally, Sitko Road, Duttapara, Baruiapur, Kolkata - 700 144, West Bengal, India.
E-mail: dibahaldar@gmail.com

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mandatory to have scientific methods and practices in cost accounting.^[11] With this backdrop, the present study was conducted in Amarkanan CHC of Bankura District, West Bengal, to determine the unit cost of outpatient department (OPD) services provided by Amarkanan CHC and to identify the major cost areas of OPD services provided by that health facility.

MATERIALS AND METHODS

A facility-based, descriptive, cross-sectional study was conducted in Amarkanan CHC of Bankura District, West Bengal, from February to June 2016. Amarkanan CHC is the headquarters of health-care delivery system of Gangajalghati community developmental block. It caters to a population of 180,974 according to the 2011 census.^[12] The rural health training center under the Department of Community Medicine, Bankura Sammilani Medical College (BSMC), is situated at Amarkanan CHC, This CHC is different from the other CHCs of Bankura district as it provides training to interns and post graduate students of BSMC.

Different cost areas related to OPD services of Amarkanan CHC, for example, workforce (labor), medicines, logistics, maintenance, transport, electricity, building, equipment, and furniture, were considered the components of unit cost estimation. Information about labor cost was gathered by work sampling (WS) and time motion (TM) study. Assuming 50% of the working hours of the health-care providers (HCPs) as idle (p) and applying the formula $n = (Z^2pq)/l^2$, the sample size for observations to be made for WS was determined to be $n = 96$, where $Z = 1.96$, $P = 0.5$, $q = 1 - P = 0.5$, $l =$ absolute precision, that was assumed 10. Hence, 96 observations were to be made for each category of HCPs related to OPD services. The sample size was recalculated after 1st day's WS [as guided by the idle time estimation provided in Table 1] and for cost areas other than workforce, complete enumeration was done.

Selection of observation intervals for WS for each HCP related to OPD services except electrocardiogram (ECG) technician and X-ray technician was done by simple random sampling technique. Observation intervals of 10 min were selected randomly out of the total 300 min of OPD hours (9 a.m. to 2 p.m.). Idle time (p) for ECG and X-ray technician was high for which minimum 96 observations were to be made. Due to lack of feasibility, TM study for a single day was done for them to estimate their productive time.

The study variables were divided into two groups: labor cost and non labor cost per patient per day. Nonlabor cost included cost of logistics, cost of medicine, cost of electricity, cost of maintenance, cost of transport, and capital cost. A predesigned pro forma was used for WS and TM study for collection of different cost data and for interviewing the key informants (accountant, three staffs who were staying in rented house at Amarkanan area). WS formats contained number of observations, time slot, and whether it was productive or nonproductive. Formats of TM study included the time at

which observation was started, time period, number of patients attended, productive time, and activity during nonproductive time.

Ethical clearance was taken from the Institutional Ethics Committee of BSMC. Permission from the block medical officer of health was obtained. Block accounts manager and all HCPs related to OPD services were informed and explained the purpose beforehand. On the date of visits, observations for WS and TM study during the scheduled period of OPD were made. Interview with the key informants were held in the later part of the day. Costs of different components from April 1, 2015, to March 31, 2016, were reviewed from the records of the accounts section of Amarkanan CHC.

Unit cost of different services means the cost of services per person per day provided in the OPD. The unit cost of HCPs was estimated by apportioning. The total salary of one person had been divided by the total working hours and then 1 h was multiplied by the service hours for OPD of that person.

RESULTS

There were a total of ten staffs working during the OPD period [Table 2]. A public health laboratory was also running at the OPD time, but as it was running on the basis of public-private partnership (PPP) model, its staffs were not considered

Table 1: Revised sample size of observation intervals for work sampling of different outpatient department staffs based on the estimated prevalence of idle time observed on day 1 work sampling

Staffs	Total time observed (min)	Idle time in min (%)	Sample size*
Doctor	240	60 (25)	72
Nurse	140	115 (82)	56
Gr. D doing registration	160	16 (10)	34
Gr. D doing dressing	160	136 (85)	49
Pharmacist	160	14.5 (9)	31
Sweeper	160	140 (87.5)	42

*Applied the formula $n=(Z^2pq)/l^2$, for the number of observations to be made

Table 2: Distribution of sampled staffs as per their activities in outpatient department services

Activity	Staff	Number
Registration	Gr. D doing registration	1
Prescribing	Medical officer	2
	Intern	1
	Pharmacist	1
Dispensing	Nurse	1
	Gr. D doing dressing	1
Assisting wound management	Gr. D doing dressing	1
Investigation	ECG technician	1
	X-ray technician	1
Sweeper	Sweeping activity	1
Total		10

ECG: Electrocardiogram

in workforce analysis. Maximum idle time was observed in sweeper's duty and minimum in pharmacist's duty [Table 3]. ECG and X-ray technicians had idle time >50% [Table 3]. If a patient received injection, underwent dressing, and had ECG and X-ray both done in a day, then the total cost of OPD services for workforce would be Rs. 85.33 [Table 4]. Cost of logistics per patient per day was maximum in the X-ray room [Table 4]. Capital cost in a year/equivalent annual cost (EAC) = Replacement cost/annuitizing factor. Real interest rate = $\frac{[1 + \text{nominal interest rate}]}{[1 + \text{annual inflation}]}$ - 1 = $\frac{[1 + 6.5]}{[1 + 5.65]}$ - 1 = 0.1278, so the real interest rate was 12.78 ≈ 13% (interest rate of Reserve Bank of India in April 2016 was 6.5% and inflation rate in 2016 was 5.65%). The annuitizing factor had been calculated at 13% interest rate from a chart given in the analysis of hospital cost: a manual for managers by the WHO depending on the total life of the asset.^[11] All equipment with a life of > 1 year were taken to be part of the capital goods. Various items of equipment were divided into three groups, depending on their life spans (10, 5, and 2 years), and this was calculated by interviewing the experts who had been using these instruments for over 5 years as well as by a consensus among the investigators. After listing all the furniture, the present market rates were used to calculate the costs, a life of 10 years was assumed, and the EAC was calculated. Daily cost of capital goods of registration area was Rs. 20/- (6064/303), so the unit cost was Rs. 0.05/- (20/408, average daily OPD attendance was 408). The daily cost of capital goods of OPD proper was Rs. 33.55/- (10,166/303), so the unit cost was Rs. 0.08/- (33.55/408). The daily cost of capital goods of nurse's room was Rs. 50.15/- (15,195/303), so the unit cost was Rs. 1.56/- (50.15/32) as the average number

of patients attended daily by the OPD nurse was 32. The daily cost of capital goods of pharmacy was Rs. 114/- (34,672/303), so the unit cost was Rs. 0.28/- (114/408). The daily cost of capital goods of ECG room was Rs. 93/- (28,294/303), so the unit cost was Rs. 9.30/- (93/10) where the average number of daily ECG taken was 10. The daily cost of capital goods of X-ray room was Rs. 392/- (118,944/303), so the unit cost was Rs. 32.67/- (392/12) as average number of daily X-ray taken was 12. Only in laboratory, the cost of ceiling fans was the hospital's expense. EAC of fans by annuitization method was Rs. 4384. Daily patient (average of one month) in laboratory was 60 and the daily cost of capital goods in the laboratory was Rs. 14.47/- (4384/303), so the unit cost was Rs. 0.24/- (14.47/60) [Table 4].

Replacement cost of the building in 2016 was Rs. 700,000/- (as per the Public Works Department), life year of the building was 30 years, and the annuitizing factor was 7.496 (as per the chart given in the WHO manual) at 13% interest rate. Hence, the EAC of the building was Rs. 99,383.13 (700,000/7.496). The daily capital cost of building was Rs. 308.19 (99,383.13/303) as the working days in a year was 303 days. Number of daily patients attending the OPD of Amarkan CHC was 408 (average of 1 month), so the unit cost of building was Rs. 0.75 (308.19/408). In the case of building, we had calculated the opportunity cost, which refers to the rent of the building per patient per day. The local rate was Rs. 10/sq. ft./month. The rent of registration room + OPD proper + pharmacy + waiting area + toilet was Rs. 7680/month. Hence, the monthly unit cost of rent of the above area was Rs. 0.75/- (7680/[408 × 25]). The rent of the laboratory was Rs. 1440/per month, so the monthly unit cost for rent of the laboratory was Rs. 0.96/(1440/[60 × 25]), with 60 patients per day for 25 OPD days in a month). The rent of nurse's room was Rs. 480/per month, so the monthly unit cost of rent of nurse's room was Rs. 0.60/- (480/[32 × 25]), with 32 daily patients for 25 OPD days in a month). The rent of ECG room was Rs. 800/per month, so the monthly unit cost of rent of ECG room was Rs. 3.2/- (800/[10 × 25]), with 10 daily patients for 25 OPD days in a month). The rent of X-ray room was Rs. 3680/per month, so the monthly unit cost for rent of X-ray room was Rs. 12.26/- (3680/[12 × 25 = 300]), with 12 daily attendance over 25 OPD days in a month) [Table 4].

A total of 341 prescriptions were snapped during the WS of the doctors. Afterward, the total cost of medicines which were distributed by the pharmacy in a single day was calculated as Rs. 7894/according to the price chart provided

Table 3: Distribution of outpatient department staffs as per their idle time during the service hours

Category of staffs	Time (min)		Percentage of idle time
	Observed via WS/TM	Idle time	
Doctor	720	212	29
Nurse	560	402.5	72
Pharmacist	320	26.5	8
ECG technician	300	202	67
X-ray technician	300	255	85
Gr. D doing registration	340	32.5	9.5
Gr. D doing dressing	500	392	78
Sweeper	480	420	87.5

ECG: Electrocardiogram; WS: Work sampling; TM: Time motion

Table 4: Distribution of various unit costs (international normalized ratio)

Cost areas	Registration	Prescribing	Dispensing	Injection	Dressing	ECG	X-ray	Sweeping	Total
HCPs	1.70	8.20	2.75	7.59	19.33	34.0	11.58	0.18	85.33
Rent		0.75		0.6	NA	3.2	12.26	NA	16.81
Capital cost*	0.05	0.08	0.28	1.56	NA	9.30	32.9	NA	44.17
Logistics		0.44		8.62	NA	4.0	41.00	0.08	54.14
Total		14.25		18.37	19.33	50.5	97.74	0.26	200.45

*Goods and equipment. ECG: Electrocardiogram; HCPs: Health-care providers; NA: Not available

by the Drug Procurement Department of Amarkanan CHC. Finally, per capita medicine cost became Rs. 23.15/. The average daily electric bill per patient was Rs. 1.19/(487/408 where yearly electric bill of the hospital was Rs. 586,102/ and 25% of the bill was for OPD). The transport cost in 2015–2016 was Rs. 60,000/and 10% of this cost was for carrying OPD medicines, so the daily transport cost was Rs. 20/-. About 10% of the driver’s salary was for carrying OPD medicine $([Rs. 18,321/25] \times 10\% = Rs. 73/)$, so the daily cost of medicine carriage was Rs. 93/(Rs. 20/- + Rs. 73/-) and the overall unit cost of transport was Rs. 0.23/-(93/408). The yearly maintenance cost of OPD area was Rs. 24,000/, so the daily cost was Rs. 79/(24,000/303), and the overall unit cost was Rs. 0.19/- (79/408). Manpower exerted the maximum unit cost rendered by the government to conduct OPD in Amarkanan Rural hospital [Figure 1]. The overall unit cost (workforce + logistics + capital cost + medicine + others) was Rs. 44.53/- $(14.88 + 2.4 + 2.49 + 23.15 + 1.61)$, where capital costs included building, goods and equipment; others included electricity, maintenance, and transport cost [Table 5].

DISCUSSION

Most of the studies have shown that bulk of the expenditure is on workforce. The present study showed that the percentage of labor cost was 41%, whereas Berman *et al.* in Indonesia^[9] found it as 49% and Hussain^[13] in Bangladesh found it 40%. Another study of a voluntary organization (Society for

Education, Welfare, Action)^[14] also found the same (49%). Prinja *et al.*^[15] found that the cost of human resource was 58.9% in CHC, and Anand *et al.*^[4] found that salaries constituted 78% of the total cost at a sub-district hospital in Haryana. The difference in various studies is because of the different staffing patterns of different types of institutions. It was found that unit cost of workforce regarding nurse, ECG technician, and X-ray technician was in higher side because the number of beneficiaries in these areas is less. The finding was also true for unit cost of logistics and capital cost in the above-mentioned areas where it showed quite high expenditure due to underutilization of those service areas.

The present study found that the capital cost was 21%, whereas a Bangladesh study^[13] had found a very large capital expenditure because they had included a hospital with wards so that expenditure on land and building was high. An Indonesian study^[9] found that 14% was spent on capital goods, whereas a North Indian study^[10] found it as 20%. However, a study in Ahmedabad^[16] showed capital cost much lesser (3%–6%) than that of the present study. It could be explained by the fact that there were differences in the population covered by the health facilities. The amount spent on medicine varied from 6.5% in Uttar Pradesh and 15% in Haryana,^[15] whereas in the present study, it was found 11%. Alam and Ahmed showed higher proportion of spending on drugs.^[17] Anand *et al.*^[4] showed that cost per outpatient consultation was about Rs. 20.50/- but in our study, it became Rs. 44.53/-. The difference in the reported costs could be attributed to the time difference, and the inflation might have changed the currency values many folds between the two time frames.

This cost calculation done based on apportioning was an approximation and might not be the reflection of the exact unit cost, for which a well-planned, multicentric, prospective study can be attempted. Dresser was actually an indoor staff, so the idle time as calculated was actually not idle as he was doing work at indoor. Logistics of dressing could not be ascertained as there was no record of daily dressing. Assumptions were made for calculation of the overall unit cost of electricity, transport, and maintenance.

CONCLUSION AND RECOMMENDATION

The out-of-pocket expenditure incurred to medicine might be due to irrational prescribing out of the listed medicines other than supplied to the government health facility or might be due to improper management of medicine demand and supply chain. Monitoring of prescribing and establishment of standard operating procedures may be helpful in this regard. The study revealed inadequate utilization of workforce, particularly the nursing staff. Indoor nursing staffs may be utilized to conduct OPD activities such as indoor General Duty Assistant (GDA) acting as dresser for OPD patients. It seemed that ECG and X-ray services were underutilized, so PPP model can be adopted for these purposes where both OPD + IPD and patients from outside of government facility can be involved.

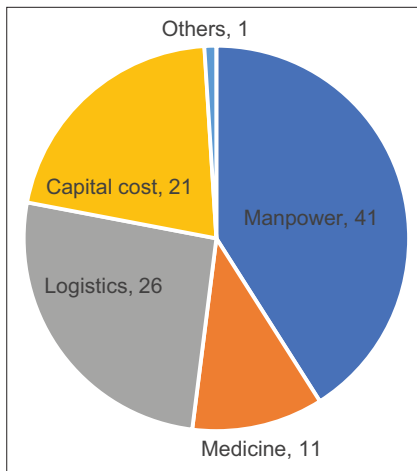


Figure 1: Unit cost in different heads. (Capital costs included building, goods, and equipment; others – electricity, transport, and maintenance)

Items	Cost (per capita per day [INR]) (%)
Medicine	23.15 (93.49)
Electricity	1.19 (4.81)
Transport of medicine	0.23 (0.93)
Maintenance	0.19 (0.77)
Total	24.76 (100)

INR: International normalized ratio

Altogether, proper aligning of staffing pattern with patient activities should be done to get adequate number of staff at right time and right place.

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Conflicts of interest

There are no conflicts of interest.

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