Cost-Effectiveness Analysis of Telemedicine for Primary Healthcare Delivery in the Amansie-West District, Ghana

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Abstract

The study aimed at investigating the cost-effectiveness of telemedicine for primary health care in the Amansie-West District.

A cost-effectiveness analysis was conducted using a study population of four primary healthcare sites. The evaluation was retrospective (January-December, 2013) and was conducted from the provider's perspective. Capital assets were annuitized at a 3% discount rate. Data on the costs of telemedicine and the conventional primary healthcare were quantified manually. The annuitization of capital outlays and Incremental Cost Effectiveness Ratio (ICER) and Marginal Cost Effectiveness Ratio (MCER) calculations were also done with the assistance of CEA specific software. Sensitivity analysis was performed to assess robustness of the model.

Annualized total costs of $305,042.93 and $227,006.90 were associated with the provision of primary healthcare via the conventional mode and telemedicine respectively. Telemedicine was both cost-effective and cost saving with an ICER -$351.75. With an assumption of 50% utilization of telemedicine services showed a MCER of $293.26; indicating a 77.78% reduction in cost per effectiveness.

The pilot telemedicine project in the Amansie-West District is cost-effective cost saving and worth expanding to cover the entire District.

Keywords: Telemedicine, Conventional Primary Healthcare, cost-effectiveness, annuitization

Introduction

The World Health Organization (WHO) in various forums has expressed the need to uphold the rights of individuals to have access to healthcare. Prior to the recent global financial and economic crisis, the average per capita growth rate of healthcare expenditure in the Organization for Economic Cooperation and Development (OECD) countries was 4% per annum [1]. In spite of this, many people are still unable to access healthcare because of factors such as geographical barriers, inadequate health professionals and socio-economic conditions; sharp contrast to healthcare expenditures which averaged 4% of Gross Domestic Product (GDP) per annum in OECD countries [2].

The Conventional Primary Healthcare (CPHc) in Ghana refers to primary healthcare through the Community-based Health Planning and Services (CHPS) compound, health post and health center. This usual mode of delivery is fraught with a number of challenges. These health facilities find it difficult to employ enough trained health professionals to manage the number of people needing care. Sub-Saharan Africa averages 1.15 health workers for every 1,000 of its citizens [3]. According to the Ghana Statistical Service, over 45% of the country's population is rural dwellers. Unfortunately, this section of the population is the worst affected in terms of the inequitable distribution of healthcare resources. The Ghana Shared Growth and Development (2010-2013) revealed that the doctor and nurse population ratio is one doctor to 10,425 and one nurse to 1.251 [4], a situation which impacts most severely on rural healthcare delivery.

As part of efforts to bridge the gap between rural and urban in terms of access to healthcare, the Government of Ghana in 2010 in collaboration with the Millennium Villages Project (MVP), and Norvatis Foundation for Sustainable Development (NFSD) began preparations to pilot Telemedicine programme in the Bonsaaso Cluster in Amansie West District. The Telemedicine service involves the use of mobile phones, trained personnel and communication lines which allows for transfer of information from the local sites to a central Teleconsultation centre. The telemedicine project is to augment the Community-based Health Planning Services (CHPS) which is the conventional mode of primary healthcare in rural Ghana. The limited nature of resources demands that allocation must be done to maximize the health benefit for the population served. This study, thus, sought to determine the cost effectiveness of the telemedicine which was piloted in the Amansie West District in Ashanti Region compared to the conventional mode of primary health care.

Methods

Settings & Intervention

Amansie-West District is one among the thirty others in the Ashanti Region. It was carved out of the then Amansie District in 1978 and has Manso Nkwanta as the district capital. This district covers an area of 1,364 sq km with major rivers such as Offin, Oda and Nwine. The major towns in the district are Manso Nkwanta, Manso Abore, Manso Atwere and Manso Edubia. The projected population for the year 2014 with reference to the 2010 population census was 149, 437 and an annual growth rate of 2.7%. The district has seven [7] sub-districts namely Agroyesum, Antoakrom, Edubia, Essuowin, Keniago, Manso Nkwanta and Tontokrom; 21 health facilities, 54 but 12 functional CHPS compounds, and 160 communities. The district has a total of 350 health workers including 3 Medical Officers, 6 Physician Assistants, 22 Midwives, 32 General Nurses, 22 Enrolled Nurses, 84 Community Health Nurses (CHNs), and 181 Community Health Workers (CHWs). The health services offered by the health system included immunization, health promotion, medical, surgical, obstetrics/gynaecological services, ophthalmologic and rehabilitative services for buruli ulcer patients.

Study Population

The estimated study population included four primary healthcare sites in the Amansie West District namely Keniago,Tontokrom, Manso Ankam and Manso Abore.

Method of Sampling

This study focused on the two facilities for telemedicine and the two for the conventional primary health care. The healthcare facilities were purposively sampled based on the advice of the District Health Director and the E-health specialist with the Millennium Villages Project. It was established that these facilities truly represented the two alternative interventions bearing in mind the different healthcare facilities in the District, budgetary and time constraints for the research study

Interventions

Telemedicine (TM)

The Primary Healthcare system in the Amansie-West District is such that a person in need of healthcare first of all might either meet a Community Health Worker (CHW) or visit Community-Based Health Planning and Services (CHPS) facility for treatment. In cases where a

CHW is unable to provide care, the patient is referred to the District Hospital. However, with the introduction of TM, the Community Health Worker/CHPS facility first of all calls the Tele-Consultation Centre (TCC) for assistance as and when necessary in the provision of care. The TCC has some nurses and doctors on standby to readily respond to calls for help. Care is either given through the phone call or the patient is referred to the St. Martins Hospital at Agroyesum, which serves as the District Hospital for care. The Telemedicine (TM) activities were based on telephones, telecommunications network, mobile phones and a Tele-Consultation Center (TCC). Tontokrom and Keniago health centers served as pilot facilities while the St. Martins Hospital hosted the TCC.

Conventional Primary Healthcare (CPHc)

The Manso Ankam Community-Based Health Planning and Services (CHPS) compound and Manso Abore Health Center served as the Conventional Primary Healthcare (CPHc).

Outcome Measures

The intermediate primary measure of effectiveness was averted unnecessary referrals from the health facilities. Other secondary measures considered in the study were the number of patients who received care at the Out-Patient Departments and the number of babies delivered at these health facilities.

Costing

The American Dollar (USD) to Ghana cedi exchange rate in the year 2012 averaged US $1=GH₵ 1.8 according to the Bank of Ghana [5]. Costing was done from the healthcare provider's perspective, focusing on the direct and indirect costs and a discount rate of 3% was utilized as 3% discount as recommended by the U.S. Panel on Cost-Effectiveness in Health and Medicine [6].

Annuitization

The annuitization method was employed to account for depreciation of the capital cost items.

A discount rate of 3% was used as proposed by the U.S. Panel on Cost Effectiveness in Health Medicine. The formula below was utilized to calculate the annuitized values for the capital assets.

First the Annuity Factor (AF) was calculated.

$$\mathrm{AF} = \frac{1 - \frac{1}{(1+\mathrm{i})^{\mathrm{n}}}}{\mathrm{i}}$$

n = length of item's useful years
i = discount rate

Buildings in both interventions were annuitized for fifty (50) years [7]. For the CPHc, primary healthcare equipments, that is, items 2-6 on Table 1 were annuitized for two years (2) while items 7-40 were assumed to have ten (10) years life of usefulness [7]. Telemedicine equipment as shown on Table 2 were annuitized for seven (7) years. Items 7-12 and 13-41 were considered for 2 and 10-year life span respectively.

Ethical Consideration

Ethical approval dated 29th May, 2015 and referenced CHRPE/AP/232/15 was issued by the Committee on Human Research Publication and Ethics of the School of Medical Sciences, Kwame Nkrumah University of Science & Technology, Kumasi, after it had reviewed all relevant documents.

Limitations of Study

The study was retrospective hence data collected may not be as precise as it would be if the study was conducted at the beginning of the telemedicine implementation. There was difficulty in accessing comprehensive data on the cost of the telemedicine programme. The poor state of the roads in the Amansie-West District coupled with budgetary constraints denied the researcher access to other healthcare facilities which could have been considered for the study. The purposive sampling technique employed for the study also limits the generalizability of the findings.

Results

A review of available records revealed that averted unnecessary referral was zero for CPHc and 172 for TM for the period January-December 2013. The secondary measures namely OPD attendants and deliveries were 7335 and 6256; 145 and 194 for CPHc and TM respectively.

Table 1: Cost of Conventional Primary healthcare

No.	Item	Quantity	Unit Price ₵	Period/Months	Total ₵	Total $
	Capital Cost					
1.	Building	1	621000.00	1	621000.00	343093.92
	Primary Healthcare Equipment					
2.	Thermometer	8	12.00	1	96.00	53.04
3.	Sphygmanometer	5	250.00	1	1250.00	690.61
4.	Adult Weighing Scale	3	300.00	1	900.00	497.24
5.	Baby Scale	2	300.00	1	600.00	331.49
6.	Stethoscope	4	100.00	1	400.00	220.99
	Sub-total					1793.37
7.	Desktop Computers	2	1300.00	1	2600.00	1436.46
8.	Printer(3 in 1)	1	498.00	1	498.00	275.14
9.	Bed	21	1200.00	1	25200.00	13922.65
10.	Tables	12	350.00	1	4200.00	2320.44
11.	Baby's Cot	2	400.00	1	800.00	441.99
12.	Microscope	2	2460.00	1	4920.00	2718.23
13.	Trolley	5	800.00	1	4000.00	2209.94
14.	Delivery Beds	2	1800.00	1	3600.00	1988.95
15.	Benches	24	50.00	1	1200.00	662.98
16.	Veronica Bucket	5	90.00	1	450.00	248.62
17.	Gas stove	1	300.00	1	300.00	165.75
18.	Treatment Instrument	2	950.00	1	1900.00	1049.72
19.	Delivery Instruments Set	2	1100.00	1	2200.00	1215.47
20.	Bathroom Scale	1	150.00	1	150.00	82.87
21.	Vaccine Carriers	7	100.00	1	700.00	386.74
22.	Glucometer	2	230.00	1	460.00	254.14
23.	Autoclave	2	1200.00	1	2400.00	1325.97
24.	Drip Stand	10	100.00	1	1000.00	552.49
25.	Wheel Chair	4	276.00	1	1104.00	609.94
26.	Delivery boots	2	85.00	1	170.00	93.92
27.	Generator	1	2700.00	1	2700.00	1491.71
28.	Dustbins	7	160.00	1	1120.00	618.78
29.	Chairs	36	150.00	1	5400.00	2983.43
30.	Ceiling Fan	20	120.00	1	2400.00	1325.97
31.	Lockers `	6	1500.00	1	9000.00	4972.38
32.	Refrigerators	2	1480.00	1	2960.00	1635.36
33.	Screens	5	700.00	1	3500.00	1933.70
34.	Mattress	18	373.00	1	6714.00	3709.39
35.	Air conditioner	1	2750.00	1	2750.00	1519.34
36.	Monitor	1	10000.00	1	10000.00	5524.86
37.	Centrifuge	1	950.00	1	950.00	524.86

Source: Field Data, 2015

Table 1 Cont'd

No.	Item	Quantity	Unit Price ₵	Period/Months	Total ₵	Total $
	Capital Cost					
38.	Colorimeter	1	1000.00	1	1000.00	552.49
39.	Poly-tank	4	765.00	1	3060.00	1690.61
40.	Borehole	1	10000.00	1	10000.00	5524.86
	Sub-total					65970.17
	Total Capital Coast					410857.46
	Variable					
	Salary					
41.	Physician Assistant	1	2027.68	12	24332.16	13443.18
42.	Staff Nurse	2	1651.10	12	39626.40	21893.04
43.	Enrolled Nurse	11	1033.15	12	136375.80	75345.75
44.	Staff Midwife	1	1601.43	12	19217.16	10617.22
45.	Community Health Nurse	6	1033.15	12	74386.80	41097.68
46.	Laboratory Technician	1	1651.10	12	19813.20	10946.52
47.	Dispensary Assistant	1	1656.00	12	19872.00	10979.01
48.	Senior Ward Assistant	1	1065.19	12	12782.28	7062.03
49.	Ward assistant	1	634.81	12	7617.72	4208.69
50.	Orderly	2	634.81	12	15235.44	8417.37
51.	Security Men	2	634.81	12	15235.44	8417.37
52.	Drugs	1	55438.20	1	55438.20	30628.84
53.	Non-Drugs	1	45447.78	1	45447.78	25109.27
54.	Maintenance	1	19447.64	1	19477.64	10761.13
	Utilities					
55.	Water	1	1440.00	1	1440.00	795.58
56.	Electricity	1	6000.00	1	6000.00	3314.92
	Total Variable Cost					**283037.58**
	Total Cost					**693895.04**

Source: Field Data, 2015

Cost of Conventional Primary Healthcare Telemedicine

Table 1 shows detailed explanation of the capital and variable cost of the telemedicine programme. The Building is a composite of the facilities at Manso Ankam and Manso Abore. I realized from the District Health Directorate that a plot of land was estimated to cost GH₵6,000.00 equivalent to $3,658.54 assuming exchange rate of $1=GH₵1.81 as stated in the methodology. Additionally, a CHPS compound was valued to cost GH₵250,000.00 while a Health Centre was valued at GH₵350,000.00. Table 2 therefore shows detailed explanation of the capital and recurrent cost of the conventional primary healthcare.

Cost of Telemedicine

Table 2 shows detailed explanation of the capital and variable cost of the telemedicine programme. The Building is a composite of the Tele-consultation centre which was located at the St. Martins Catholic Hospital, Keniago and Tontokrom Health Centres. As stated earlier, a plot of land was estimated to cost GH₵6,000.00 equivalent to $3,658.54 assuming exchange rate of $1=GH₵1.81. Additionally, a CHPS compound was valued to cost GH₵250,000.00 while a Health Centre was valued at GH₵350,000.00.

Table 2: Cost of Telemedicine

No.	Item	Quantity	Unit Price ₵	Period/Months	Total ₵	Total $
	Capital Cost					
1.	Building	1	770000.00	1	770000.00	425414.40
	Telemedicine Equipment					
2.	Tele-Consultation Equipment	1	18100.00	1	18100.00	10000.00
3.	Mobile Phones	215	300.00	1	64500.00	35635.36
4.	Installation Cost	1	9050.00	1	9050.00	5000.00
5.	Furniture	1	5000.00	1	5000.00	2762.43
6.	Solar Backup	1	5430.00	1	5430.00	3000.00
	Sub-total					56397.79
	Primary Healthcare Equipment					
7.	Adult Weighing Scale	4	300.00	1	1200.00	662.98
8.	Thermometer	6	12.00	1	72.00	39.78
9.	Shygmanometer	4	250.00	1	1000.00	552.49
10.	Plastic Chairs	4	50.00	1	200.00	110.50
11.	Baby Weighing Scale	4	300.00	1	1200.00	662.98
12.	Stethoscope	5	100.00	1	500.00	276.24
	Sub-total					2304.97
13.	Table	15	350.00	1	5250.00	2900.55
14.	Cupboard	7	450.00	1	3150.00	1740.33
15.	Drug Shelve	10	350.00	1	3500.00	1933.70
16.	Chair	14	150.00	1	2100.00	1160.22
17.	Patient Bed	21	1200.00	1	25200.00	13922.65
18.	Mattress	21	373.00	1	7833.00	4327.62
19.	Bench	15	50.00	1	750.00	414.36
20.	Small & Needle Bin	20	40.00	1	800.00	441.99
21.	Stadiometer	1	200.00	1	200.00	110.50
22.	Refrigerator	1	1650.00	1	1650.00	911.60
23.	Vaccine Carriers	5	100.00	1	500.00	276.24
24.	Printer	1	498.00	1	498.00	275.14
25.	Fan	12	120.00	1	1440.00	795.58
26.	Swivel Chair	3	280.00	1	840.00	464.09
27.	Drip Stand	16	100.00	1	1600.00	883.98
28.	Delivery Bed	4	1800.00	1	7200.00	3977.90
29.	Baby Scot	3	400.00	1	1200.00	662.98
30.	Delivery Boot	2	80.00	1	160.00	88.40
31.	Veronica Bucket	3	90.00	1	270.00	149.17
32.	Delivery Instrument Set	2	1100.00	1	2200.00	1215.45
33.	Treatment Instruments	2	950.00	1	1900.00	1049.72
34.	Laminator	1	135.00	1	135.00	74.59
35.	Screens	4	700.00	1	2800.00	1546.96

Source: Field Data, 2015

Table 2 Cont'd

No.	Item	Quantity	Unit Price ₵	Period/Months	Total ₵	Total $
	Capital Cost					
36.	Autoclave	2	1200.00	1	2400.00	1325.97
37.	Gas Stove	1	300.00	1	300.00	165.75
38.	Wheel chair	1	276.00	1	276.00	152.49
39.	Trolley	6	800.00	1	4800.00	2651.93
40.	Couch	2	820.00	1	1640.00	906.08
41.	Cabinet	1	700.00	1	700.00	386.74
	Sub-total					44912.71
	Total Capital Cost					**529029.83**
	Variable					
	Allowances					
42.	TCC Staff	1	3600.00	12	43200.00	23867.40
43.	Community Health Workers	1	1033.31	12	136396.90	6850.67
44.	E-health Administrator	1	2715.00	12	32580.00	18000.00
	Salaries					
45.	Senior Midwife Officer	2	2200.08	12	52801.92	29172.33
46.	Community Health Nurse	3	1033.15	12	37193.40	20548.84
47.	Enrolled Nurse	3	1033.15	12	37193.40	20548.84
48.	Senior Technical Officer	1	1651.10	12	19813.20	10946.52
49.	Security officer	2	634.81	12	15235.44	8417.37
50.	Cleaner	2	634.81	12	15235.44	8417.37
51.	Orderly	1	634.81	12	7617.72	4208.69
52.	Drugs	1	45503.20	1	45503.20	25139.89
53.	Non-drugs	1	14407.20	1	14407.20	7959.78
54.	Maintenance	1	1000.00	12	12000.00	6629.83
55.	Utilities @ TCC	1	100.00	12	1200.00	662.98
56.	Data Bundle	1	60.00	12	720.00	397.79
57.	Health Staff Airtime	1	100.00	12	1200.00	662.98
58.	TCC Airtime	1	150.00	12	1800.00	994.48
	Total variable cost					**194950.63**
	Total Cost of Telemedicine					**723980.46**

Source: Field Data, 2015

Table 3: Annualized Total Cost of Primary Healthcare Strategies

No.	Item	Conventional PHC	Telemedicine
	Capital Cost	($)	($)
1.	Building	13334.49	16533.79
2.	Telemedicine Equipment	N/A	9052.61
3.	Primary Health Equipment	8670.95	6469.74
	Variable Cost		
4.	Salaries & Allowances	212,427.85	168449.04
5.	Drugs	30,628.84	25,139.89
6.	Non-Drugs	25,109.27	7,959.78
7.	Maintenance	10761.13	6629.83
8.	Utilities	4110.5	2187.85
9.	Airtime & Data Bundle	N/A	2055.44
	Total	305,042.93	227,006.90

N/A= Not Applicable

Table 3 indicates that the annualized cost of primary healthcare through the CPHc is greater than the TM. One major item which influenced the variation was personnel emoluments. It is, however, worth mentioning that personnel remuneration averaged about 68% of the total annualized cost of implementing either of the healthcare strategies. Expenditures on drug consumables averaged 10.5% in both strategies whereas the figure for non-drug consumables in TM was more than twice of the CPHc.

Table 4: Incremental Cost-Effectiveness Ratio (ICER)

Healthcare strategy	Cost	Effects	Incremental cost	Incremental effects	ICER
CPHc	305,042.93	0	-	-	-
TM	227,006.90	172	-78036	172	-453.7

Table 4 shows that telemedicine has ICER of -$453.70. The calculated ICER means telemedicine is cost effective, assuming the WHO recommended thresholds [8] and Ghana's Gross Domestic Product per capita which was $1.668 in the year 2013 [5]. The WHO criterion uses Gross Domestic Product (GDP) per capita as a readily available indicator to derive the following three categories of cost-effectiveness: highly cost-effective (less than GDP per capita); cost-effective (between one and three times GDP per capita); and not cost-effective (more than three times GDP per capita). The negative sign means that telemedicine is also cost saving. It was found that unnecessary referrals are avoided at a reduced cost of $453.70

Marginal Cost Effectiveness Ratio (MCER)

The MCER shows changes as a result of expanding the telemedicine programme. This index is very important because of the huge initial capital expenditure involved in the telemedicine programme. Moreover, the salaries and allowances associated with the programme are not based on the amount of services provided. Hence, overall cost of the programme will not be significantly affected by increasing the number of people who have access to telemedicine.

The MCER as shown in Table 5 was calculated based on 50% increase in the averted unnecessary referrals. With this assumption, cost items such as buildings, telemedicine equipment, primary healthcare equipment and salaries and allowances remained fixed, however, all other variable cost items increased proportionately.

Table 5: Marginal Cost Effectiveness Ratio

Healthcare strategy	Cost ($)	Effect	Net cost	Net effect	MCER
Telemedicine programme	227007.9	172	-	-	-
Expanded Telemedicine	252228.4	258	25220.52	86	293.26

The value of the MCER $293.26 compared to the ACER of $1319.81 indicates that expanding the programme utilization by 50% results in a 77.78% reduction in the cost per effectiveness gained.

Sensitivity Analysis with Effectiveness of Conventional Primary Healthcare

The effectiveness of the conventional primary healthcare was varied over a range of 0 to 200 unnecessary referrals averted holding all other variables in the model constant. Figure 1 (see page 28) depicts the responsiveness of the ICER to changes in the effectiveness of the conventional primary healthcare delivery. The effectiveness of the CPHc is represented by the blue bars whereas the responses of the ICER are represented by the red bars. It can be observed from figure 1 that the ICER remains both cost effective and cost saving as long as the telemedicine was more effective than the conventional method. However, immediately the effectiveness of the conventional primary healthcare exceeded that of telemedicine, telemedicine became cost ineffective; holding all other variables constant

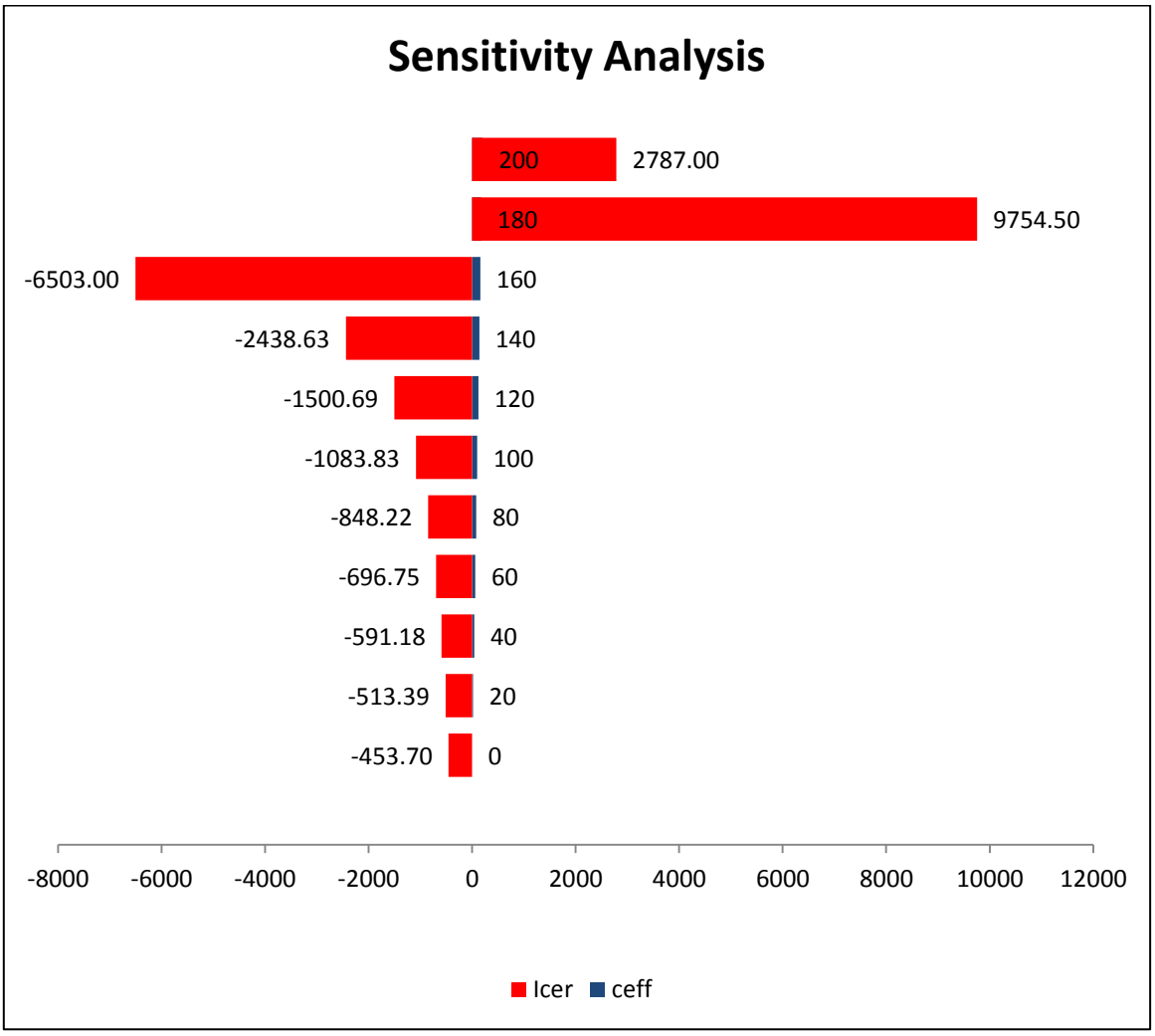

Figure 1: Sensitivity Analysis with Changes in the Effectiveness of the Conventional Primary Healthcare

Sensitivity Analysis with 5% Discount Rate

The second parameter was the assumption of a new discount rate of 5%. This resulted in changes in the total cost of both healthcare strategies. Table 6 (see page) shows that changes in the discount rate from 3% to 5% caused the annualized cost of both strategies to increase to $311,346.78 and $235,058.5 for CPHc and TM respectively.

Consequently, incremental cost of the two strategies changed from the original -$453.70 to -$443.54 holding all the variables in the model constant.

Table 6: Sensitivity Analysis with 3% and 5% Discount Rate

Item	Conventional		Telemedicine	
	3%	5%	3%	5%
Capital				
Building	13334.39	18799.67	16533.79	23310.38
Telemedicine Equipment	N/A	N/A	9052.61	9740.55
Primary Health Equipment	8670.95	9509.54	6469.87	7056.94
Recurrent				
Salaries & Allowances	212,427.85	212,427.85	150978	168449
Drugs	30,628.84	30,628.84	25,139.89	25,139.89
Non-Drugs	25,109.27	25,109.27	7,959.78	7,959.78
Maintenance	10761.13	10761.13	6629.83	6629.83
Utilities	4110.5	4110.5	2187.85	2187.85
Airtime & Data Bundle	N/A	N/A	2055.44	2055.44
Total	305042.93	311346.78	227007.9	235058.5

Source: Field Data

Figure 2 on page 30 graphically shows the sensitivity of the ICER to changes in the discount rate. Changes in discount rate from 3% to 5% resulted in change in incremental cost from -$76,035 to -$76,288.28. The change in discount rate is represented by the blue bar while the change in ICER is represented by the red bar.

It is evident from Figure 3 that telemedicine remains cost effective and cost saving notwithstanding changes in the discount rate; holding all other variables in the model constant.

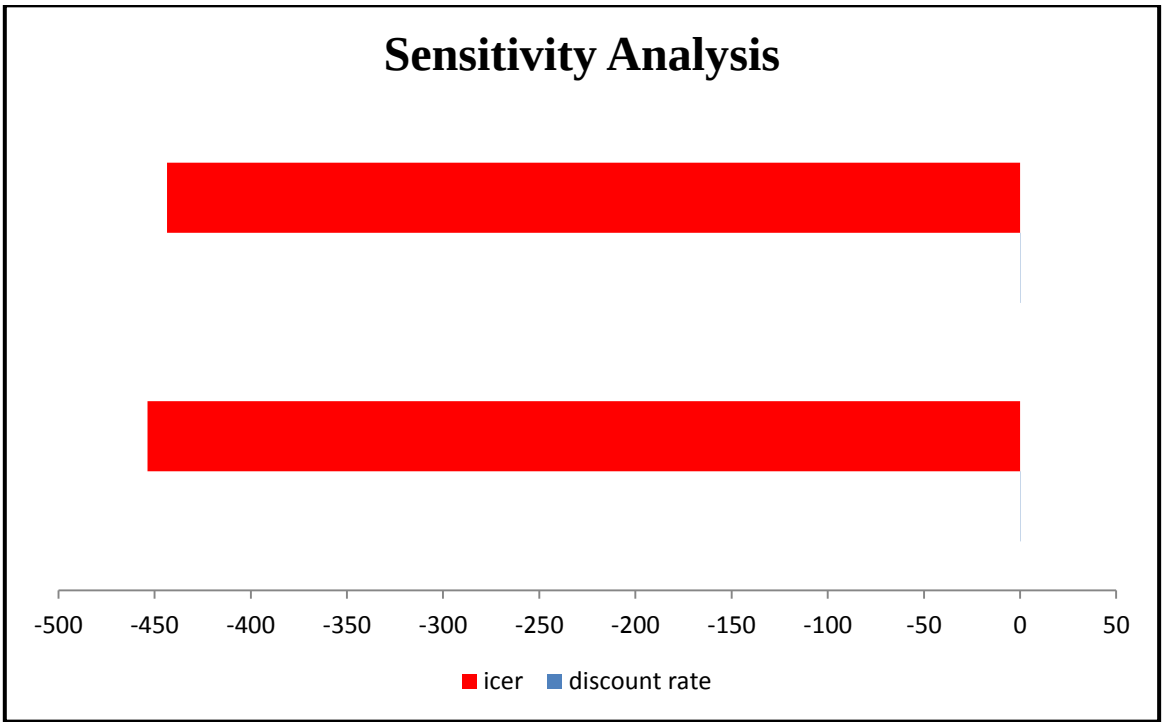

Figure 2: Sensitivity Analysis with 3% and 5% Discount rate

Discussions

The study highlights the significance of the healthcare staff emoluments. Salaries constituted an average 69% of the total annualized cost of both interventions. A similar observation was made of about staff compensation in study carried out in Ghana. It was noted that salaries ranged between 40% and 60% of the total cost providing healthcare [9]. Studies in Northern India have also shown that salaries to represent about 62% of the total cost of providing primary healthcare [10]. The pilot Telemedicine project in the Amansie-West District clearly demonstrates the use of telemedicine to facilitate the provision of primary healthcare to rural patients. It reduces the travel for patients, health professionals and also reduces inter hospital transfer [11]. However, there are setbacks which include over dependence on technology.

The results of the study show that telemedicine is cost effective and cost saving with an ICER of -$453.70 per unnecessary referral avoided. This is comparable to the Home Model Telemedicine developed by the Johns Hopkins University Schools of Medicine and Public Health [12]. The cost-effectiveness or otherwise of telemedicine depends on several interdependent factors [13]. The most crucial ones are the measure of effectiveness, the prices of equipment, the cost of the alternative method and the assumptions [14].

A one-way sensitivity analysis was performed on two parameters to test the robustness of the ICER. It was observed that that improvement in the effectiveness of the alternative strategy could impact negatively on the cost-effectiveness of telemedicine with an ICER of $2787.00 holding other variables constant. On the contrary, changes in the discount rate from 3% to 5% did not affect the cost-ineffectiveness of telemedicine but only changed the ICER from -$76,035 to -$76,288.28.

Conclusion

In conclusion, the Telemedicine project is both cost effective and cost saving for healthcare providers while providing healthcare to rural patients. The main causes of the net savings are the low expenditure incurred on the personnel emoluments and non-drug items.

Declaration of Interest

No competing interest.

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