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Health Facility Cost of Buruli Ulcer Wound Treatment in Ghana: A Case Study

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ABSTRACT

Objective: To estimate the wound treatment cost borne by the Buruli Ulcer Treatment Centre of the Amasaman Government Hospital, Ghana. **Methods:** Three different types of data collection approaches were used, namely, 1) observation checklist, 2) in-depth interviews, and 3) expenditure data review. Wound dressing processes were observed. Retrospective health facility cost data of Buruli ulcer (BU) wound treatment for the year 2011 were used. Cost data gathered covered medical and nonmedical items. Cost analyses were carried out to determine the health facility's financial and economic costs. **Results:** The total annual financial cost was US \$121,189.16, of which 99% was recurrent cost. This constitutes about 13% of the expenditure by the Amasaman Government Hospital for the year 2011. The total annual economic cost was US \$143,609.22, of which 93% was recurrent cost. The main cost driver for both financial and economic costs was

personnel. The annual BU wound treatment costs per capita were US \$1615.86 for financial cost and US \$1914.79 for economic cost, respectively. The study did not cover household patient costs. **Conclusions:** The cost of BU wound treatment takes a considerable amount of the hospital's expenditure. This shows the importance of health facility cost as one of the decision-making tools for both resource allocation and mobilization. Hospital management must therefore constantly examine its staffing norms and the associated cost to improve the hospital's resource allocation.

Keywords: Buruli ulcer, economic cost, financial cost, Ghana, wound care.

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Introduction

Buruli ulcer (BU) affects skin, and usually starts as a painless nodule, papule, plaque, or edema. It then commonly advances into a painless ulcer [1]. But BU can result in severe destruction of the skin and soft tissues. This leads to the formation of extensive ulcers, especially on the arms and legs. Affected persons who are not treated can develop lifelong deformities. Management of BU is dependent on the stage of the disease. Antibiotics such as rifampicine and streptomycin are usually used for its management. In complicated ulcers, surgery, which may or may not involve skin grafting, is done [2].

The first case of BU in Ghana was reported in 1971 [3,4] and was brought to public attention in 1993 [5]. Currently, Ghana is the second most endemic BU country with about 17% of the cases globally [6]. The BU burden has both social and economic dimensions [4]. Studies have shown that BU has a strong economic burden on the community and health facilities [7]. In Cameroon, households spend about 25% of their annual earnings on BU treatment [8] and in Ghana 16% of the households borrow money and 27% sell off their assets as medical cost for the treatment of BU [4] while health facility cost was estimated to be about US \$80,000 on BU treatment [9].

In Ghana, the National Buruli Ulcer Control Programme leads and coordinates the control of BU. One of the key strategies in controlling the disease is early detection and treatment [10]. It has been observed that achievement of this strategy would have a great effect on the control of the disease in Ghana [11]. Further development also indicates that African countries affected by the BU endemic, including Ghana, signed the Cotonou Declaration to fight BU by several measures including mobilizing additional resources for its control [12].

Cost data, when available, provide policymakers and management an essential and vital tool but are rare in Ghana [13]. Aboagye et al. [14] also noted that this scarcity in information is because costing studies are not well established in Ghana and Africa as a whole. Amofah [13] further explains that this is so because in Ghana, for example, most health facilities have poor data capturing methods.

Cost have been noted to aid in assessing efficiency; provide indications of cost savings areas; support strategic planning and budgeting; form an essential ingredient for cost projections and setting prices; aid in assessing priorities; provide input in design of financing schemes; aid in determining distribution of the cost burden; and keep track of spending. As Scott et al. [15] observed, however, economic analysis is based on the fundamental notion of efficient use

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of available resources. The two basic points are, first, economics is about resource allocation, and second, efficient use of resources, that is, getting the most from available resources [15]. Thus, a hospital administrator, for example, is faced with the challenge of organizing resources to meet the organization’s goals [15]. But the paucity of cost data in developing countries suggests that health economic analysis is not currently being used by a large proportion of the public health researchers and practitioners, which could in part explain the dearth of economic analysis that currently exists in the field [16].

Wound burden is a new concept [17] and currently gaining prominence in public health. Chronic wounds are classified as wounds that fail to heal within 3 months [18]. The World Alliance for Wounds and Lymphedema Care recognizes BU as one of the etiologies of chronic wounds [19]. The worldwide burden of chronic wounds, however, is not known. But the developed world has good records of its economic burden [20]. For instance, in North America, about 6 million chronic wounds occur each year [12]. Furthermore, chronic wounds are a major health burden and their management leads to an enormous drain on health care resources [20–23]. An earlier study in Ghana has also attested to this fact [9]. According to the National Buruli Ulcer Control Programme, more than 60% of the new cases detected in early 2008 were in the ulcerative stages [10]. Wound treatment is thus an essential part of BU case management. Wounds are acknowledged to be a very significant source of cost to both the patient and health care providers [9,24]. Even though wound treatment is a significant source of cost to health facilities, the cost of BU wound treatment to health facilities in Ghana is not known. This article estimated the wound treatment cost borne by the Buruli Ulcer Treatment Centre of the Amasaman Government Hospital, Ghana, one of the few BU wounds management centers in the country.

Conceptual Framework

Health facility cost of BU wound treatment is made up of recurrent and capital expenditure. These costs can be further classified as financial and economic costs. The economic cost component additionally contains the cost of donated items and volunteer services. Fig. 1 is a diagrammatic representation of the conceptual framework for the study.

Methods

Study Area

The study was a cross-sectional cost-of-illness study from the perspective of the health provider. The study was conducted in

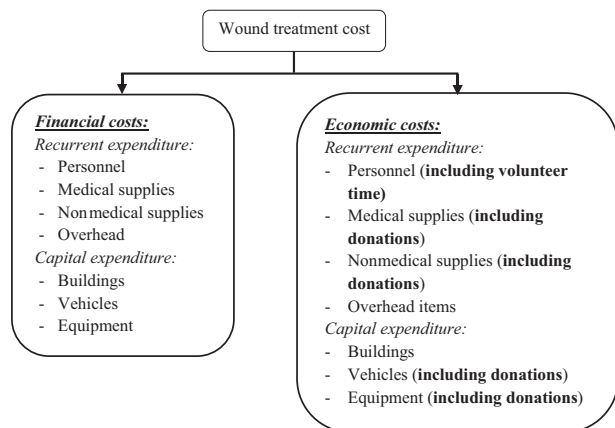


Fig. 1 – Health facility cost of BU wound treatment. BU, Buruli ulcer.

the Amasaman Government Hospital of the Ga West Municipality, Greater Accra Region, Ghana, with the main hospital having a 106-bed capacity. The Amasaman Government Hospital serves as the main municipal hospital and a referral center for the other nine government health facilities in the municipality. In addition, the hospital is one of the BU treatment centers in Ghana, with a BU ward bed capacity of 34. Patients with ulcers are admitted in the ward for daily wound treatment. The Ga West Municipality is ranked fifth in BU endemic areas in Ghana, with a prevalence of about 87.7 per 100,000 persons [4]. The municipality also has the highest number of healed and active lesions of BU countrywide [25]. The study focused on the Buruli Ulcer Treatment Centre.

Data Collection Methods

Observation checklist

A structured observation checklist was used to assess the process of wound dressing. The information collected included the categories and number of medical staff involved in the wound dressing, the type of wound cleaning/dressing agents/solutions used, and the types and numbers of instruments used in the wound dressing.

In-depth interviews

In-depth interviews were held with 1) the nurse in charge of the BU ward, 2) the hospital administrator, and 3) the hospital accountant. The interview guide covered the following areas: type of staff, staff strength of the BU ward, management of the BU ward, hospital’s overhead costs, funding sources, donations, and types and number of volunteers who work in the BU ward.

Expenditure data review

Retrospective health facility cost data for the treatment of wounds of patients with BU for the year 2011 were used. The sources of data were the Hospital’s Accounts Department, the Stores, and the Electricity Company of Ghana, Amasaman. The recurrent items covered personnel, that is, staff and volunteers, utilities, that is, water and electricity, maintenance, medical supplies and consumables, and nonmedical supplies, that is, stationary, bed, and food supplied. The capital items were building/space, vehicles, medical devices, that is, surgical instruments, stethoscopes, and wound dressing instruments, and nonmedical devices, that is, furniture, televisions, and air conditioners. The replacement costs were used to value items whose prices were not readily available. Floor spaces of the BU ward, that is, surgical and nonsurgical, BU ward kitchen, and Central Sterile Supply Department were measured and valued using the standard Municipal Land Valuation Department cost per square meter. With the assistance of the Hospital’s Accounts Department, shared-out ratios for the allocation of joint/share costs were determined.

Data Analysis

All cost data were entered and analyzed in Microsoft Excel, 2010 edition.

Financial cost analysis

The financial capital cost estimation of vehicles and medical and nonmedical devices was based on their quantities multiplied by their replacement costs and divided by the respective working or useful lives of the products. Building cost was obtained by multiplying the total estimated space by the standard Municipal Land Valuation Department cost per square meter. Then, a predetermined share-out ratio was applied to vehicles (4%),

equipment (100%), and buildings (100%) to apportion the appropriate costs to BU. The total financial capital cost was obtained by summing up the individual capital costs estimated. The financial recurrent cost covered the recurrent items. Personnel costs were obtained by multiplying the types and numbers of various staff by their respective annual gross emolument or valued work in the case of volunteers. The medical and nonmedical supplies/consumables/services cost was obtained by summing all the quantities used in the year and multiplying them by their individual costs or replacement costs. Table 1 summarizes the share-out ratio estimation approach used. The individual recurrent costs were summed up to obtain the total financial recurrent cost. Finally, the total financial recurrent and total financial capital costs were summed up as the estimated total annual financial cost of BU wound treatment.

Economic cost analysis

The economic capital costs of vehicles and medical and non-medical devices including all donated items were based on the annualization of their respective costs using their useful lives and a discount rate of 3% [26] to determine each item's discounting factor. The product of the item's replacement cost and quantities used was divided by their discounting factor to obtain their annualized costs. The sum total of all the annualized item costs was the total annual economic capital cost. The estimation of the recurrent cost was similar to that of the financial cost estimation; however, economic cost included the cost of donated items and the cost of cost volunteers. The same share-out ratios in Table 1 were used to apportion cost in the economic analysis. Finally, the total annual economic recurrent and total economic capital costs were summed up to obtain the estimated total annual economic cost of BU wound treatment.

Assumptions

In both financial and economic analyses, the following assumptions were made: 1) the medical consumables and drugs supplied to the BU ward in 2011 were used by the patients with BU alone; 2) building maintenance and water costs were assumed to be the same for all wards in the hospital; and 3) all other resources allocated to the BU ward were used mainly for wound treatment, which was the main reason for hospitalization in the ward.

Sensitivity Analysis

Sensitivity analysis to test the robustness of the estimated annual financial and economic costs was conducted. The parameters used were as follows: 1) discount rate (5%–10%); 2) variation in vehicle cost allocated to the BU ward (5%–10%); and 3) variation in BU ward staff salaries and benefits (increased by 20%–50%).

Ethical consideration

Before data collection, ethical clearance was obtained from the Ethical Review Committee, Research and Development Division, Ghana Health Services, Ghana. Approval for the study was also obtained from the Municipal Director of Health Services and the management of the Amasaman Government Hospital.

Results

Annual Financial Costs of BU Wound Treatment

Table 2 presents the annual financial and economic costs of BU wound treatment. The total annual financial cost was US \$121,189.16, of which 99% was recurrent cost. This cost also

Table 1 – Estimation of cost share-out ratios used.

No.	Cost component	Estimation
1	Personnel	Calculated as a percentage of the number of days worked by staff in the BU ward in a month. BU staff worked 20 of the 28 days in a month in the BU ward, giving 71%. This was obtained from in-depth interviews.
2	Management	Calculated as a percentage of the number of management meetings held in a month. Management meetings were held once in a month. Therefore, 1 by 28 days gives 4%. This was obtained from in-depth interviews.
3	Wound medical supplies/consumables	All supplies in the BU ward were for wound treatment. Thus, 100%. This was obtained from expenditure records.
4	Vehicle maintenance	Expenditure records show that 4% of the hospital's vehicle cost was allocated to the BU ward. The same proportion was used for the vehicle maintenance.
5	Building maintenance	The share-out ratio was crudely estimated from the number of buildings in the hospital. There were a total of 20 buildings, of which 3 were used for BU activities. Thus, the same proportion of 15% was allocated to the BU ward. This was obtained from in-depth interviews.
6	Water supplies	This was calculated as a percentage of water storage points in the hospital. There were 22 water storage points, of which 3 were dedicated to the BU ward. This represents 14%. This was obtained from in-depth interviews.
7	Laundry	The estimate was based on the laundry days in the hospital. The Hospitals' Laundry Department does the laundry of the BU ward once a month, i.e., 1 of 28 days. Thus, 5% of the laundry cost was allocated to BU wound care. This was obtained from in-depth interviews.
8	Sterilization	This was based on the Central Sterile Supply Department (CSSD) of the hospital's weekly sterilization schedule. The BU materials were sterilized three times in a week; thus, 43% of the cost of CSSD was allocated to BU wound care. This was obtained from in-depth interviews.

BU, Buruli ulcer.

forms about 13% of the overall expenditure for the Amasaman Government Hospital for the year 2011.

The main recurrent cost drivers were personnel (73%) and medical supplies and consumables (11%) in total to account for 84% of the financial cost. The rest of the items in total accounted for 16% of the total financial cost. The annual BU financial wound treatment cost per capita was US \$1615.86.

Annual Economic Costs of BU Wound Treatment

The total annual economic cost was US \$143,609.22, of which 93% was recurrent cost and 7% was capital cost. The main cost driver in the economic cost again was personnel (70%). The rest of the items in the total economic cost accounted for 30% of the total economic cost. Overall, differences in cost profiles of financial and economic costs were the valuations of donations and volunteer times, which was taken into consideration in the case of economic cost. The annual BU economic wound treatment cost per capita was US \$1914.79. Sensitivity analyses showed a significant difference in recurrent and capital costs of both financial and economic costs, with about 33% increase in financial costs.

Discussion

In sum, the total annual financial and economic cost was US \$121,189 and US \$143,609, respectively, with the main cost driver in both cases being personnel. Furthermore, annual BU wound treatment costs per capita were US \$1616 for financial cost and US\$1915 for economic cost. This provides a considerably high cost per patient. Other studies have also shown that wound treatment cost is significant [20]. For instance, studies in the United Kingdom [20,22], in the United States [21,23], and then in Ghana [9] have all attested to this high cost of wound treatment. The cost profiles of most of these studies show that recurrent costs constituted a large proportion of the cost as has also been shown in this study. Of this recurrent expenditure, personnel cost has been shown to be most significant in most studies [14,27] (T. Tsilaajav, unpublished data, 2009). Dressing materials cost has also been found to be considerable [24]. The World Health Organization has observed that these costs can be reduced in the case of BU by early detection and treatment (i.e., preulcerative stages) [28]. It further suggests that the average cost of treating BU disease in 1994-1996 was about US \$780. This study shows

that currently the estimated cost of BU wound treatment ranges from US \$1616 to US \$1915. This increase in BU wound treatment cost may be due to medical inflation, primarily from the substantial increase in staff remuneration over the period. Other contributory factors are general inflation of goods and services and introduction of new treatment therapies in the past decade between the two studies.

As Macdonald and Asiedu [20] indicated, however, “globalization of modern wound and lymphedema management is beginning to take a giant step” [20]. They are hopeful that continuous “spread of knowledge of the basic principles of wound and lymphedema management, application techniques, and the teamwork of both national and international medical teams” will be the panacea to wound treatment. But all these proposals have resource allocation and mobilization implications, and thus especially developing countries need to start gathering some cost data to inform these decisions.

Our findings have shown that wound treatment is costly and labor intensive. The sensitivity analysis also indicates that changes in staff remunerations substantially increase the cost. The hospital management should take a critical look at issues of resource allocation and efficiency. One way of improving resource allocation is for the management to introduce comprehensive wound care management training for all nursing staff not only to improve their skills but also to make staff rotations easier and minimize wastage. As other studies [5,25] in Ghana show that reported BU cases at modern health facilities are usually late and bad ulcers, wound treatment will continuously form an important integral part of BU case management, which has already been noted to be labor intensive; this may invariably affect staff utilization elsewhere in the hospital, resulting in acute shortages in some departments. Hospital management must therefore constantly examine its staffing norms and its associated cost to improve the hospital’s resource allocation.

As most developing countries strive to institute universal coverage of health services, which implies a change in service payment systems, having the requisite cost data to justify the resources necessary to allow facilities to continue to care for the most highly wound burdened patient will become increasingly important [17]. Health managers are therefore entreated to undertake periodic assessment of cost-of-services provision in their respective facilities to inform policy and management decisions [13].

Table 2 – Annual health facility financial and economic costs of Buruli ulcer wound treatment.

Items	Type of resources	Financial cost (US \$)	Cost profile (%)	Economic cost (US \$)	Cost profile (%)
Capital items	Buildings/space	54.01	–	6,040.90	4
	Vehicle	254.86	–	278.25	–
	Medical devices	605.67	–	3,067.57	2
	Nonmedical devices	142.85	–	633.88	–
	Subtotal	1,057.38	1	10,020.60	7
Recurrent items	Personnel	88,334.02	73	100,957.84	70
	Utilities	4,139.53	3	4,139.53	3
	Maintenance	8,603.96	7	8,603.96	6
	Medical supplies & consumables	13,379.16	11	13,379.16	9
	Nonmedical supplies	3,082.51	3	3,082.51	2
	Bed & feeding	2,592.59	2	3,425.62	2
	Subtotal	120,131.78	99	133,588.62	93
	Total cost	121,189.16	100	143,609.22	100

Currency conversion rate: US \$1 = Ghana cedis (GH¢) 1.62.

Conclusions

The cost of BU wound treatment makes a considerable amount of the hospitals' expenditure. This shows the importance of cost as one of the decision-making input to be used for both resource allocation and mobilization. Hospitals' management must therefore constantly examine their staffing norms and the associated cost to improve the hospitals' resource allocation.

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