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Estimated costs in treating sickle cell disease leg ulcer

Estimativa de custos no tratamento de úlcera de perna por doença falciforme

Estimativa de costos en el tratamiento de úlcera de pierna por enfermedad falciforme

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Josimare Aparecida Otoni Spira[1]
Eline Lima Borges[1]
José Ferreira Pires Júnior[1]
Dandara Soares Monteiro[1]
Karolina Yukari Kitagawa[1]

[1] Universidade Federal de Minas Gerais, Escola de Enfermagem, Belo Horizonte, MG, Brazil.

ABSTRACT

Objective: To identify the costs of treating leg ulcers due to sickle cell disease from the perspective of the Unified Health System. **Method:** An observational, descriptive, cost-effective economic assessment study conducted in a single center with ulcer patients. The data collected were extracted from the participant's medical records and recorded in a form prepared for this purpose. The cost of the products used in ulcer treatment was provided by the Solicitation/Purchasing Section and Pharmacy Sector of the study institution. The variables studied were ulcer area, number and interval between visits, patient's length of stay in the service, materials used in each visit, and the number of nurse appointments. **Results:** The sample consisted of 29 patients. The average initial area of ulcers was 14.47 cm^2, 79% of the cases had complete epithelialization in an average time of 8.02 months, with an average cost of R$ 1,288.06. The average cost to reduce 1 cm^2 of the lesion area was R$ 102.20. Silver activated carbon coating was the most cost-effective treatment. **Conclusion:** The average cost for complete healing of a sickle cell ulcer with an average area of 14.95 cm^2 was R$ 1,288.06.

DESCRIPTORS

Anemia, Sickle Cell; Leg Ulcer; Costs and Cost Analysis; Unified Health System; Health Care Costs.

Corresponding author:
Josimare Aparecida Otoni Spira
Av. Professor Alfredo Balena, número 190, Sala 206, Santa Efigênia
CEP 30130-100 – Belo Horizonte, MG, Brazil
j.otoni@yahoo.com.br

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INTRODUCTION

Leg ulcers, especially those of venous etiology, are characterized by recurrence. It already demands economic resources from its first occurrence, including removing the patient from work and social activities. About 1% of the health budget in Western countries is for the management of leg ulcers. The average annual cost of leg ulcer treatment in Germany was estimated at €9,060.00 per patient, corresponding to approximately R$ 39,300.00 (Brazilian *Reais* R$) at the exchange rate of December 3, 2018[1]. However, this data in Brazil is unknown.

Leg ulcers affect the general population, thus constituting a serious public health problem. In this regard, one highlights leg ulcers resulting from sickle cell disease which requires outpatient follow-up due to the variable therapeutic response and a slower healing process than other injuries, and consequently the use of advanced therapeutic resources and specialized labor[2]. Such situations generate increasing costs for health institutions.

Sickle cell disease is one of the most common genetic disorders in Brazil. It is estimated that there are around 25 to 30 thousand people with the disease and 3,500 new cases appear annually. The disease has a higher prevalence in states with the highest concentration of people of African descent, being 1:650, 1:1,200 and 1:1,400 live births in the states of Bahia, Rio de Janeiro and Minas Gerais, respectively[3].

Leg ulcers stand out among the clinical manifestations presented by individuals with sickle cell disease, as it is estimated that 8% to 10% of this population develop this lesion[4]. A study conducted in Nigeria identified an incidence of 0.45% and a 3.1% prevalence of leg ulcers in people with sickle cell disease[5]. A study conducted in Divinópolis, Minas Gerais in Brazil with 65 people with sickle cell anemia, highlighted that the prevalence of leg ulcers "was 5%, although 17% reported ulcers at some point in their lives"[6].

Patients may be debilitated and incapacitated due to the presence of an ulcer, which has the characteristic of being painful, difficult to heal, with an evolution lasting for months and even years[7]. Although 75% to 80% of patients can heal, ulcers can persist for more than 20 years in some patients and/or never heal. Recurrences may occur after healing, which recur between 6 and 12 months. This relapse pattern can last for many years[8]. They are resistant to therapy, tend to be recurrent and cause physical, psychological and social disability. The pain may be severe, excruciating, penetrating, acute and burning[7]. Health care costs generated in treating skin lesions are directly related to the dressing type used, the usage period, the exchange pattern, the wound healing time, the use of resources and adjuvant therapies, and the type of professional responsible for the treatment[9].

Underfunding of the Unified Health System (*SUS – Sistema Único de Saúde*) associated with rising health care spending in Brazil requires using results from studies with economic foundations for managing financial resources which are scarce, without neglecting the ethical issues and those related to efficacy/effectiveness and safety[10]. However, it is not yet common to find studies in the national literature which measure the economic impact of treating leg ulcer healing, including those resulting from sickle cell disease.

Monitoring and cost control in primary and secondary health care institutions is useful for managing and adopting measures which improve unit performance based on prioritization, rationalization, and increased care productivity. Moreover, it is clear that studies are needed to estimate the costs invested in managing care for sickle cell leg ulcers, as these patients are mainly attended by referral services (specialized), and professionals and managers are not fully aware about this cost. Thus, this study aims to identify the costs of treating leg ulcers due to sickle cell disease in the context of SUS.

METHOD

Study design

This is an observational, retrospective, descriptive, cost-effective economic evaluation study conducted in a single center.

Scenario

The research was conducted in an outpatient dermatology service of a university hospital in Belo Horizonte, Minas Gerais state, Brazil, whose clientele comes from the SUS and are treated under the recommendations of an institutional protocol.

Population

The following inclusion criteria were established for the sample: complete records on ulcer area, the use of Unna boot, type of topical treatment implemented and number of ulcer dressing changes between 20 and 80. This last criterion aimed to maintain the sample uniformity and reliability of mathematical calculations.

The population treated at the outpatient clinic between 1998 and 2016 was considered as the population for this study. The medical records of 67 patients with sickle cell ulcer treated during this period were first identified. Patients who met the inclusion criteria and presented all data regarding the research registered in the medical record were selected to compose the sample. Thus, 29 patients were selected in this stage. These patients used an Unna boot and one of the dressing types: hydrocolloid, non-silver calcium alginate (Ag^+), Ag^+ charcoal or Ag^+ foam during treatment because they were made available by the institution during the research period.

Data collection

A clinical protocol was established in 1994 at the institution where the study was conducted to treat chronic wound patients on an outpatient basis. This document guides the care activities developed by health professionals and the way in which data should be collected and recorded in the medical record and defines the indicators for evaluating the care quality. Nurses also began using Unna boot and hydrocolloid dressings, non-silver calcium alginate (Ag^+), Ag^+ charcoal or

Ag^+ foam for treating leg ulcer patients at about the same time. Other dressings were aggregated over time, however the former were maintained until the data collection period.

The collection was performed from September to October 2017 by one of the researchers and included records of 29 patients who were part of the sample. The study variables were ulcer area, number and interval between visits, patient's length of stay in the service, materials used in each visit, and number of consultations performed by the nurse.

The direct values which are composed of direct labor and inputs used directly in the care process in the outpatient context were identified and quantified to obtain the costs. However, direct costs related to transportation, food, medical appointments or those directly related to the disease such as tests, medications and medical procedures were not included. Indirect costs related to loss of income and/or productivity resulting from the disease were also not included. For this study, one considered the value of the nursing consultation of R$ 6.30, referring to the procedure "consultation of higher-level professionals in specialized care (except doctor)" – SUS code 03.01.01.004-8, available at SUS Ambulatory Information System through the SUS Procedures, Drugs, Orthoses, Prostheses and Special Materials Table. It is noteworthy that care for the patient with injury in the aforementioned service is performed exclusively by the nurse.

Prices of materials and solutions used in dressings were provided by the Solicitation and Purchasing Section and Pharmacy Section of the university hospital. The values of consumables for the ulcer cleansing and skin care process, the dressings and adjuvants for its treatment and the inelastic compression therapy (Unna boot) were included in order to obtain the cost of inputs used directly in the care process for the control of lower limb edema.

In order to facilitate cost estimation, the materials used in each service were grouped as follows: R$ 10.16 dressing and skin care kit, containing three sterile gauze packages, a 0.9% physiological solution bottle with a weight of 100 ml, a 0.8x25 mm gauge needle, two sterile surgical pads, a 15 cm crepe bandage, a pair of sterile gloves, two pairs of procedure gloves, 1 ml skin protector and 10 g of urea moisturizing cream; interactive dressing: 20x20 cm calcium alginate (R$ 22.00), activated carbon and silver (Ag^+) 10x20 cm (R$ 9.00), silver foam (Ag^+) 15x15 cm (R$ 17.20) and hydrocolloid 20x20 cm (R$25.00); and an Unna boot bandage (R$ 14.42).

Data analysis and processing

The collected data were entered in Excel spreadsheets (version 14.7.7) in order to submit them to descriptive statistical analysis.

The ulcer area was not measured in all dressing changes. However, it was necessary to estimate the ulcer area in these changes given the need to obtain these measures to calculate the amount of dressing used in each service. The gaps were filled by linear interpolation, assuming that ulcer reduction or enlargement occur at equal intervals.

To obtain the area of dressing used for each dressing change, it was assumed that the ulcer was square and that the dressing used consisted of a square which covered the ulcer plus two centimeters beyond the border, i.e. if the ulcer had area A so the area of dressing used was $A+8\sqrt{A}+16$. The cost of this dressing was obtained by multiplying the value/cm^2 of the type of dressing used by the previously calculated coverage area.

The value of the nurse's consultation, the inelastic compression therapy, the cleaning kit and the cost of the dressing used were added to obtain the cost of ulcer treatment in each service. Thus, the average cost of care was calculated directly from these costs, the average costs of treating an ulcer for consecutive periods of 2 months to the limit of 10 months, and the average cost for a period of any 2 months.

The average cost of 1 cm^2 ulcer reduction was obtained by the formula

$$\frac{C}{I\text{-}F}$$

where C denotes the cost of all consultations, I the sum of the initial areas and F the sum of the final areas of all ulcers.

Cost-effectiveness assessment was considered for this study according to the Terminology Descriptors in Health Sciences as a process which aims to systematically and objectively determine the relationship between spending and benefits arising from preventive interventions. The cost-effectiveness of ulcer treatment dressing was calculated over a period of 15 consecutive days of use of a given dressing, and took into account the average variation in ulcer area and the average cost of dressing. The periods in which the same dressing was used for less than 15 consecutive days were discarded for these last calculations. This decision is supported by pertinent venous ulcer data, where a reduction of ≥ 30% of the injured area is expected within 2 weeks of correct topical and compressive therapy[11].

Ethical aspects

The project of this research was elaborated from Resolution 466 of December 12, 2012 of the National Health Council, which establishes ethical criteria for research with human beings. The study project was approved under opinion no. 1.921.560/2017 by the Research Ethics Committee of the Universidade Federal de Minas Gerais. An informed consent waiver was requested as this was an observational study and data were extracted from a secondary source.

RESULTS

The sample consisted of 29 patients with ulcers due to sickle cell disease, with an average initial area of 14.47 cm^2. Complete epithelialization was achieved by 79% of ulcers in an average time of 8.02 months. However, patients representing 21% of the remaining ulcers abandoned treatment or were transferred to other services without complete ulcer epithelialization in the same reference period. Other data regarding the sample can be found in Table 1.

Table 1 – Presentation of study variables: ulcer area, length of stay, number of changes by type of dressing – Belo Horizonte, MG, Brazil, 2018.

*N	Initial area (cm^2)	Final area (cm^2)	Permanence (days)	No. of changes/Dressing type				Total no. of changes
				*C1	*C2	*C3	*C4	
L01	6.00	0	217	40	3	14	0	54
L02	6.68	0	350	35	3	35	0	73
L03	3.78	0	441	31	0	48	0	79
L04	9.61	0.80	563	18	0	43	1	62
L05	2.5	0	119	8	0	6	8	22
L06	28	0	483	49	0	8	26	81
L07	2.52	0	101	20	0	0	3	23
L08	0.48	2.08	147	30	0	0	0	30
L09	3.36	7.14	336	66	5	3	0	74
L10	61.11	0	421	50	2	13	4	69
L11	14.40	0	143	11	1	0	9	21
L12	14.10	0	219	16	13	5	0	34
L13	14.40	0	375	0	48	17	0	61
L14	1.82	0	214	27	14	10	0	51
L15	1.21	0	368	37	0	24	0	61
L16	6.09	0	287	37	0	6	0	43
L17	61.38	0	98	9	0	13	0	22
L18	13.92	0	158	18	3	12	3	36
L19	7.00	0	136	19	0	3	8	30
L20	6.08	0	80	17	0	1	2	20
L21	29.40	0	136	21	0	2	7	30
L22	5.28	0	441	26	37	1	0	64
L23	1.32	0	126	5	0	8	14	27
L24	9.60	0	137	1	4	27	0	32
L25	7.5	9.9	154	10	23	9	0	42
L26	54.6	54	154	0	29	13	0	42
L27	8.10	0	122	18	2	6	0	26
L28	31.20	0	360	23	13	5	22	63
L29	0.30	0.25	238	21	40	2	0	63
Total	1331	208	7124	663	240	334	107	1335
Mean	14.47	2.56	245.66	22.86	8.28	11.52	3.69	46

Legend: C1 – hydrocolloid, C2 – Ag^+ foam, C3 – Ca^+ Alginate, C4 – Carbon, N – Sample

An average of 46 dressing changes per ulcer were performed, and the most commonly used dressing was hydrocolloid, followed by silver foam, calcium alginate, and finally silver activated charcoal. The average length of stay in the service was 8.19 months.

The average cost for complete healing of an ulcer with an average area of 14.95 cm^2 was 1.288,06. The average cost to reduce 1 cm^2 of the lesion area was R$ 102.20. Each dressing change, including the value of the nurse consultation, had the average cost of R$ 28.33.

Figure 1 denotes the bimonthly average cost of treating sickle cell ulcers, with the cost decreasing over the length of service. The average cost in the first bimester was R$ 424,23, in the second it was R$ 363.23, in the third R$ 341.95, in the fourth R$ 290.49, and in the fifth R$ 243.32.

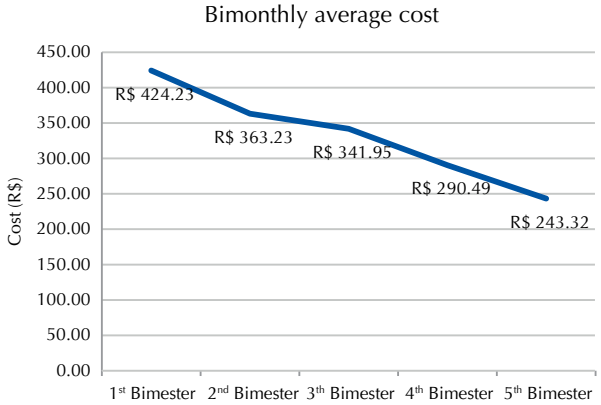

Figure 1 – Bimonthly average cost of sickle cell ulcer treatment – Belo Horizonte, MG, Brazil, 2018.

One considered a period of 15 consecutive days of using each dressing in the treatment of ulcers for their cost-effectiveness, as shown in Table 2.

Table 2 – Average cost x reduction of ulcer area over a period of 15 days – Belo Horizonte, MG, Brazil, 2018.

	Mean variation in the ulcer area (cm^2)	Mean cost of the dressing (R$)	Cost of reducing the ulcer by 1 cm^2 per dressing treatment (R$)
Ag^+ foam	0.79	12.81	16.22
Ca^+ Alginate	0.74	8.39	11.34
Ag^+ carbon	1.37	9.66	7.05
Hydrocolloid	0.81	7.67	9.47

In the cost-effectiveness analysis of each dressing, it was found that the average reduction in ulcer area (cm^2) ranged from 0.74 to 1.37, with 1.37 cm^2 for silver-activated charcoal, 0.81 cm^2 for hydrocolloid 0.79 cm^2 for silver foam and 0.74 cm^2 for calcium alginate.

The biweekly average cost of these dressings ranged from R$ 7.67 to R$ 12.81, with R$ 12.81 for silver foam, R$ 9.66 for silver activated charcoal, R$ 8.39 for alginate calcium and R$ 7.67 for hydrocolloid. Silver activated charcoal was the most cost-effective treatment dressing.

DISCUSSION

When performing the literature review in the databases gaps were identified regarding the study topic. Published studies on the cost of treating sickle cell ulcer are absent in the international and national literature. This fact reinforces the importance of this study, considering that sickle cell disease represents one of the most frequent hemoglobinopathies in Brazil and worldwide. Minas Gerais is the third state with the highest concentration of patients with sickle cell disease in Brazil[3]. It is estimated that 8% to 10% of this population develop sickle cell ulcer[4].

The ulcer area is one of the factors which influence the healing process. Hemoglobin rate, injured area and topical treatment should be managed to obtain ulcer healing. However, the best topical treatment to be used is still uncertain for professionals[12]. The average initial area in this study was 14.47 cm^2, and 79% of these ulcers achieved complete healing in an average time of 8.02 months with the use of dressings and Unna boot.

Sickle cell disease ulcers can be classified regarding healing potential as curable, stagnant and non-curable. A curable ulcer must have a 30% reduction in area in the first month of treatment for healing to occur within 3 months. For non-curable ulcers, as identified by the area not reducing in the first month of treatment, the professionals should review the established care plan[13].

The cure expectancy changes according to the etiology of the lesion. For example, complete healing is expected within 3 months for venous leg ulcers classified as simple if treated correctly (interactive dressing and compression therapy). Simple venous ulcers are those with an area up to 100 cm^2, with an existence time up to 6 months and with ankle-arm pressure index between 0.8 and 1.3[1]. However, a sickle cell ulcer is classified as recalcitrant when it takes more than 6 months to obtain complete healing regardless of the injured area, existence time and hemoglobin rate[14]. Most ulcers were classified as recalcitrant in considering the data from this research, since the average time to complete healing was 8.02 months.

Management of non-curable or stagnant lesions is more complex because inability to cure may be related to inadequate blood supply or low hemoglobin rates (<8.0 g/dl). Stagnant injury is also influenced by patient behavior, including treatment refusal such as non-compliance with compressive therapy, or when the healthcare system does not provide adequate blood for the patient to reach the appropriate hemoglobin level for wound healing[13,15]. It is important to maintain levels between 8.0 g/dl and 10 g/dl to promote healing, with the latter being ideal[15]. Blood transfusion seems to benefit some patients with ulcers who are resistant to more conservative measures based on the premise that higher hemoglobin levels and subsequent better oxygenation provide better healing[7].

A recalcitrant ulcer raises the final treatment cost due to the greater number of dressing changes and nurse consultations. The average cost for each dressing change was R$ 28.33. Approximately half of this amount was spent on inelastic compression therapy (Unna boot), but its use is essential for wound healing. This product is used to improve venous return and reduce edema. An Unna boot acts on macrocirculation by optimizing deep venous return, decreasing reflux during ambulation, increasing ejection volume during calf muscle activation, and favoring lymphatic drainage and consequently interstitial fluid resorption, decreasing leg edema[16]. Some patients with sickle cell ulcer also have venous insufficiency; thus, managing and preventing edema with compression therapy becomes indispensable[17]. Edema is often present in the legs of those with sickle cell disease, and the most recent recommendation for its management is to replace inelastic compression therapy with multicomponent elastic compression, as it is more effective in controlling edema since it also acts on microcirculation, decreasing fluid and macromolecule outflow from the capillaries and venules to the interstitium and stimulating fibrinolytic activity[18].

The use of compression therapy may not be the only factor associated with ulcer healing. This was confirmed by a study of 65 patients with venous ulcer in a specialized service in the city of Boston (Massachusetts, USA). The ulcers were treated according to the institution's protocol and included the use of compression therapy. The study follow-up was 52 months and confirmed that the risk factors associated with the ulcer not healing were deep venous disease and post-thrombotic etiology. New risk factors were identified such as depression and non-white race. However, factors related to care access did not influence achievement of ulcer healing[19].

The 10-month analysis of sickle cell ulcer treatment in this study showed that the bimonthly mean cost decreases throughout treatment, especially after the first 2 months. It is inferred that this fact is related to edema reduction through using an Unna boot, which results in decreased exudate drainage and consequently a reduction in the number

of dressing changes[20]. Another aspect which can influence cost reduction is the change in dressing type. Silver foam dressings are generally used at the beginning of treatment to reduce the bacterial load, which is later replaced by non-silver coatings. The former are more expensive because they contain antimicrobial components. The number of weekly changes is then reduced over the course of treatment, and spending on dressings is reduced both by reducing the area and not using antimicrobial dressing.

There is a strong recommendation (although only poor quality evidence) regarding the use of occlusive, semi-occlusive, absorbent or moisturizing dressings, including foams, hydrofibers, alginates, hydrocolloids and plaque hydrogel in sickle cell ulcer treatment. These dressings can keep moisture in balance and increase the healing rate[13,15].

The silver-activated carbon coating was the most cost-effective in this study. This is an antimicrobial dressing and basically consists of activated carbon tissue impregnated with 2.7 mg ionic silver/100 cm^2, and is capable of adsorbing odor particles, capturing and destroying bacteria within the dressing structure itself, without providing silver to the wound bed. This dressing is considered the first to have a commercial impact in the UK[21].

In a study on economic analysis based on clinical outcomes according to UK treatment practice and cost structure conducted to examine the cost effectiveness of using Biatain® Ag^+ Foam (A) against three other venous leg ulcer treatment protocols: Aquacel® Ag^+ (B), Actisorb Silver® (C) and Iodoflex® (D), the authors identified that protocol (A) was the treatment with the best cost-effectiveness based on the cost-effectiveness ratio[22], contrary to the present study in which Ag^+ carbon had the best cost-effectiveness, while Ag^+ foam had the worst.

The Scottish Inter-Collegiate Guideline Network[23] reports that the inappropriate use of silver dressings may represent a limitation in the care quality and care provided, considering that these dressings are more expensive when compared to non-silver dressings. Therefore, its indication should be exclusively for treating lesions with critical colonization and infection. Improper use may result in unnecessary expenses.

The multidisciplinary approach, including consultation with hematology specialists, nutrologists and infectologists to investigate the use of systemic therapies to improve the underlying disease, is essential for providing care to patients with leg ulcers in order to cure them[17]. Therefore, it is not enough to exclusively treat ulcers, even though topical treatment is the most appropriate.

Patients with leg ulcers due to sickle cell disease in the study were treated at the service at different times and all used the Unna boot as compression therapy. All nurses responsible for treating patients followed the same institutional protocol, which establishes ulcer cleansing and dressing indication according to the ulcer characteristics. This fact minimized errors regarding the treatment choice. The patients included in the study were treated during the period in which the institution had four dressing types (hydrocolloid, calcium alginate, silver charcoal and silver foam). This number was a study limitation, considering the range of dressings available in the Brazilian market.

The protocol mentioned recommended the biweekly measurement of the ulcer area using linear measurements. However, this recommendation limited the scope of the study results, since the ulcer area was required at each dressing change for cost calculation and it was estimated when absent.

It is noteworthy that the analysis of the mentioned result should consider other aspects in addition to the financial cost of ulcer treatment. It is essential to include the indirect costs related to the loss of income and/or productivity resulting from the disease, including the presence of the ulcer and its repercussions.

CONCLUSION

The average cost for complete healing of a sickle cell ulcer with an average area of 14.95 cm^2 was R$ 1,288.06. The hydrocolloid dressing was the most used and presented the lowest cost. Silver activated charcoal was the most cost-effective dressing.

RESUMO

Objetivo: Identificar os custos despendidos com o tratamento da úlcera de perna decorrente da doença falciforme na perspectiva do Sistema Único de Saúde. **Método:** Estudo observacional, descritivo, de avaliação econômica do custo-efetividade, realizado em um centro único, com pacientes portadores de úlcera. Os dados coletados foram extraídos do prontuário do participante e registrados em formulário elaborado para esta finalidade. O custo dos produtos utilizados no tratamento da úlcera foi provido pela Seção de Licitações/Compras e Setor de Farmácia da instituição do estudo. As variáveis estudadas foram área da úlcera, número e intervalo entre os atendimentos, tempo de permanência do paciente no serviço, materiais utilizados em cada atendimento, número de consultas do enfermeiro. **Resultados:** A amostra foi composta por 29 pacientes. A área inicial média das úlceras foi 14,47 cm^2, 79% dos casos tiveram completa epitelização em tempo médio de 8,02 meses, com custo médio de R$ 1.288,06. Para reduzir 1 cm^2 da área da lesão o custo médio foi de R$ 102,20. A cobertura de carvão ativado com prata teve o melhor custo-efetividade. **Conclusão:** O custo médio para a completa cicatrização de uma úlcera por doença falciforme com área média de 14,95 cm^2 foi de R$ 1.288,06.

DESCRITORES

Anemia Falciforme; Úlcera da Perna; Custos e Análise de Custo; Sistema Único de Saúde; Custos de Cuidados de Saúde.

RESUMEN

Objetivo: Identificar los costos desembolsados con el tratamiento de la úlcera de pierna consecuente de la enfermedad de células falciformes bajo la perspectiva del Sistema Único de Salud. **Método:** Estudio observacional, descriptivo, de evaluación económica del costo-efectividad, llevado a cabo en un centro único, con pacientes portadores de úlcera. Los datos recogidos fueron extraídos de la ficha del participante y registrados en formulario confeccionado para esta finalidad. El costo de los productos utilizados en el tratamiento de la úlcera lo abonaron la Sección de Licitaciones/Compras y el Sector de Farmacia del centro del estudio. Las variables estudiadas fueron: área de la úlcera, número e intervalo entre las atenciones, tiempo de estancia del paciente en el servicio, materiales utilizados en cada atención, número de consultas del enfermero. **Resultados:** La muestra estuvo compuesta de 29 pacientes. El área inicial media

de las úlceras fue 14,47 cm², el 79% de los casos tuvieron completa epitelización en tiempo medio de 8,02 meses, con costo medio de R$ 1.288,06. Para reducir 1 cm² del área de la lesión, el costo medio fue de R$ 102,20. La cobertura de carbón activado con plata tuvo el mejor costo-efectividad. **Conclusión:** El costo medio para la completa cicatrización de una úlcera por enfermedad falciforme con área media de 14,95 cm² fue de R$ 1.288,06.

DESCRIPTORES

Anemia de Células Falciformes; Úlcera de la Pierna; Costos y Análisis de Costo; Sistema Único de Salud; Costos de la Atención em Salud.

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