

## COST SURVEY OF PROCEDURE WITH UNNA BOOT IN PATIENTS WITH VENOUS ULCER<sup>1</sup>

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*Aims was to identify the social-demographic characteristics and the lesions of patients with venous ulcer (VU), as well as to estimate the total direct cost of materials and nursing personnel necessary for the procedure with unna boot, by the average total direct cost (ATDC) and the observed cost (OTDC). The theoretical referential adopted for cost calculation was the costing system by absorption of procedure or product. This study was conducted at the University Hospital of Sao Paulo University (HU) Ambulatory. The sample was constituted by 65 procedures in nine patients with VU. The results show that the predominant age groups were 49 to 56 years (33,33%) and 65 to 72 years (33,33%), in female patients (77,78%). Regarding associated diseases, there was a predominance of Systemic Arterial Hypertension (33,33%) and Diabetes Mellitus (22,22%). The ATDC was R\$ 107,99 and the OTDC was R\$ 96,47.*

*DESCRIPTORS: occlusive dressings; varicose ulcer; costs and cost analysis*

## LEVANTAMIENTO DEL COSTO DEL PROCEDIMIENTO COM BOTA DE UNNA EN PACIENTES COM ÚLCERA VENOSA (UV)

*El objetivo fue identificar características sócio-demográficas y de las lesiones de los pacientes con úlcera venosa (UV), y calcular el costo total directo de los materiales y de personal de enfermería utilizados en del procedimiento con bota de unna, por el costo total directo medio (CTDM) y por lo observado (CTDO). El referencial teórico adoptado para la medición de los costos fue el sistema de costeo por absorción por procedimiento o producto. El estudio fue realizado en el Consultorio Externo el Hospital Universitario de la Universidad de Sao Paulo (HUUSP). La muestra fue constituida por 65 procedimientos en nueve pacientes con UV. Los resultados muestran que la faja etária predominante fue 49 a 56 años (33,33%) y de 65 a 72 años (33,33%) y del sexo femenino (77,78%). Cuanto a la enfermedad asociada, hubo predominio de Hipertensión Arterial Sistemática (33,33%) y Diabetes Mellitus (22,22%). El CTDM fue de R\$ 107,99 y el CTDO fue de R\$ 96,47.*

*DESCRIPTORES: apósitos oclusivos; úlcera varicose; costos y análisis de costo*

## LEVANTAMENTO DO CUSTO DO PROCEDIMENTO COM BOTA DE UNNA EM PACIENTES COM ÚLCERA VENOSA

*O objetivo foi identificar características sociodemográficas e das lesões dos pacientes com úlcera venosa (UV) e calcular o custo total direto dos materiais e de pessoal de enfermagem utilizados no procedimento com bota de Unna, pelo custo total direto médio (CTDM) e pelo observado (CTDO). O referencial teórico adotado para aferição dos custos foi o sistema de custeio por absorção por procedimento ou produto. O estudo foi realizado no Ambulatório do Hospital Universitário da Universidade de São Paulo (HU). A amostra foi constituída de 65 procedimentos em nove pacientes com UV. Os resultados mostraram predominância das faixas etárias de 49 a 56 anos (33,33%) e de 65 a 72 anos (33,33%), e do sexo feminino (77,78%). Quanto à doença associada, houve predominio de hipertensão arterial sistêmica (33,33%) e diabetes mellitus (22,22%). O CTDM foi de R\$ 107,99 e o CTDO foi de R\$ 96,47.*

*DESCRIPTORES: curativos oclusivos; úlcera varicosa; custos e análise de custo*

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## INTRODUCTION

In view of the population's increased demand for health service and due to the lack of mainly financial resources, it is fundamental for service management that health professionals, in public as well as private institutions, know about the costs of the procedures they perform.

Procedures directly related to nursing actions which involve human and material resources include wound treatment.

Nurses play an important role in wound treatment and need to be aware of their responsibilities, both in terms of technical knowledge for permanent wound assessment and the quality and quantity of the inputs used. Moreover, knowing about the cost of the adopted treatment makes it possible to obtain solid arguments in favor of its continuity by obtaining the necessary resources.

International literature shows high spending on wound treatment in the United States, amounting to 1,335 billion dollars per year, without considering spending on antibiotics therapy and other pharmacological agents<sup>(1-3)</sup>. In Brazil, there is no information available about how much is spent on these treatments.

With respect to venous leg ulcers, it is estimated that they affect 580,000 persons in the United Kingdom, and treatment costs range between 300 and 600 thousand pounds per year<sup>(4)</sup>.

Seventy percent of leg ulcers are venous and, in this total, 47% of individuals have already suffered two or more episodes of ulceration, while 21% had six or more<sup>(5)</sup>.

Approximately five million people in the United States have some evidence of chronic venous insufficiency, and between 400 and 599 thousand of them have already or will develop venous ulcer in the coming months or years<sup>(6)</sup>.

Venous ulcer, a chronic leg injury with high clinical incidence levels, does not only cause physical suffering to patients, but also prevents them from working, as the injury often continues open for months or years. This causes socioeconomic problems for patients as well as health organizations and society. The most common cause of its development is venous insufficiency, which is precipitated by venous hypertension.

These ulcers affect 0.1 to 0.5 % of the productive adult population, with increasing incidence

levels over the years. Ulcers are prevalent among women, at a proportion of 2.6:1<sup>(6-7)</sup>.

In Brazil, we have not found research about the cost of treating these injuries. However, we believe that the cost of the Unna boot procedure is high in comparison with other options, merely considering material and human resource costs needed to perform it. However, wound dressing frequency can compensate for these costs.

In view of the scarce literature about the subject, in this research, we intend to verify the cost of the Unna boot procedure for VU treatment, with a view to starting the study about a costing methodology for this procedure, which will support future analyses about the cost-effectiveness of venous ulcer treatments. Another objective is to obtain data that can help in cost management of this procedure.

Thus, this research aimed to identify the sociodemographic and clinical characteristics of patients suffering from VU of the injuries themselves; as well as to calculate the total direct cost (TDC) of materials and nursing staff used to perform the Unna boot procedure by two methods, one based on means (ATDC) and the other on observations (OTDC).

## CASUISTICS AND METHOD

This exploratory and descriptive research adopted a quantitative approach and analyzed the direct cost of material and staff used to perform the Unna boot procedure in VU patients attended in the Outpatient Clinic of the University Hospital at the University of São Paulo (HU-USP), which is one of the sections in the division that attends external patients. The Clinic offers 59 consultation rooms for medical, nursing, nutrition, speech and hearing science, psychological and psychiatric care, where an average of 10,000 outpatient consultations occur every month.

The target population consisted of procedures performed in male and female VU patients for whom topical therapy with Unna boot was indicated. The sample comprised 65 procedures, carried out on nine VU patients.

We used the absorption costing system per product to verify procedure costs<sup>(8)</sup>. However, we only surveyed the direct costs (material and staff) of the procedure, as it is not clear at the study site what cost allocation forms are used, which makes it difficult to distribute indirect costs. For the cost survey, we

followed the steps adopted in procedure cost research<sup>(9-10)</sup>, which are: construction of a worksheet with a list of inputs in groups, determination of the data collection period, sample definition, choice of data collection sources and realization of calculi to find a mean value.

This research project was assessed and approved by the Research Ethics Committee and by the institution's Teaching and Research Group.

Before the start of data collection, we invited three nurses with previous experience in skin assessment and wound dressing to collaborate. The researcher and the nurse who led the institution's Stomal Therapy Group provided training, including a theoretical-practical approach about the physiopathology of VU and the Unna boot technique, after which data collection started.

The following technique was adopted to perform the procedure:

- placement of client with the lower member raised on a support (to facilitate venous return);
- removal of previous dressing and exposure of injury;
- washing of the lower member with water and neutral soap;
- measurement of ankle circumference and below the knee;
- measurement of injury;
- washing of ulcer with physiological serum 0.9%;
- placement of rayon<sup>®</sup> on the injury;
- application of Unna boot;
- placement of adhesive paper bandage and fixing with adhesive paper tape;
- secondary dressing with gauze or zobec<sup>®</sup> according to the quantity of exudate secretion;
- fixation of secondary dressing with adhesive paper bandage and tape;
- placement of elastic bandage and fixation with adhesive tape;
- removal of patient from the bed;
- supply of material for home use.

Data were collected by the researcher and her collaborators between January 21st and May 5th 2002 and procedures were performed once per week, on Wednesdays or Thursdays, depending on the day treatment had started. The nurse who performed the procedure registered data, writing down the beginning and end time of the procedure.

During the first procedure, the clients' demographic and clinical data were collected, as well as injury characteristics, time spent on the

procedure and number of staff to perform it, besides the materials used and supplied for home use. During subsequent procedures, only data about injury characteristics, time, number of staff and materials used and supplied for home use were registered.

The nurse recorded the start time of the procedure as soon as the patient entered the room, and the end time after providing the material for home use.

As to adhesive tape, we established two pieces of approximately thirty centimeters to fix the elastic bandage; and two pieces of adhesive paper tape, measuring approximately twelve centimeters, to fix the adhesive paper bandage on the Unna boot and the secondary dressing.

The nursing aids who collaborated to change the dressings where the ones scheduled at the sector. After the start of the procedure, they entered the room to help washing the lower member and remained in the room until the patient was removed from the bed, staying an average of ten minutes less than the nurse.

Data about material costs were obtained from the Material Section at the HU-USP and referred to the institution's last three purchases.

To calculate cost/hour, we used the most frequent wage range for both professional categories (nurse and nursing aid) that performed the procedures, obtained from the Personnel Section.

The verification of the procedure's Total Direct Cost was based on the mean values of the 17 products used. These were, in the following order: P<sub>1</sub> sterile gauze (pouch); P<sub>2</sub> non-sterile gauze (unit); P<sub>3</sub> rayon<sup>®</sup> (unit); P<sub>4</sub> zobec<sup>®</sup> (unit); P<sub>5</sub> adhesive paper bandage10 (unit); P<sub>6</sub> adhesive paper tape (cm); P<sub>7</sub> adhesive tape (cm); P<sub>8</sub> physiological serum 09.0% (ml); P<sub>9</sub> elastic bandage (unit); P<sub>10</sub> procedure glove (unit); P<sub>11</sub> non-sterile gauze (pouch); P<sub>12</sub> zobec<sup>®</sup> (unit); P<sub>13</sub> adhesive paper bandage (unit); P<sub>14</sub> Unna boot (unit); P<sub>15</sub> gloves (pair); P<sub>16</sub> soap (ml) and P<sub>17</sub> time (min).

Non-sterile gauze (P<sub>11</sub>) and Zobec (P<sub>12</sub>) are provided to the patient to change the external dressing at home, which is why these products were verified separately from P<sub>2</sub> and P<sub>4</sub>.

To calculate the ATDC:

1. We considered the mean unit cost of the last three purchases of each of the 16 products used in the procedure. To calculate the unit cost of the time spent on the procedure (17<sup>th</sup> product), we calculated

the cost of the nurse's and the nursing aid's work hour based on the most frequent gross salary in the two categories, adding 29.5% in benefits and a monthly hour load of 150 hours. We calculated the value of the nurse's salary per minute for dressings that were only performed by this professional, and the value of the nurse's salary per minute plus the nursing aid's salary per minute for dressings performed by both professionals. Next, we calculated the mean of these values.

2. We calculated the mean consumption for each of the 17 elements used in the procedure and the ATDC, using formula No 1:

$$ATDC = c_1 \cdot P_1 + c_2 \cdot P_2 + \dots + c_{17} \cdot P_{17} \quad (1)$$

where  $c_1, c_2, \dots, c_{17}$  are the 17 unit costs mentioned above and  $P_1, P_2, \dots, P_{17}$  are the 17 mean consumptions.

To calculate the OTDC -

3. The unit cost for the 16 products was established in the same way as for the ATDC. For the unit cost of procedure time (P17), we separated the 65 dressings in two groups: group only performed by the nurse (group A) and group performed by the nurse and the nursing aid (group B). For group A, we calculated the 43 associated costs, using the cost of the nurse's work hour and, for group B, we calculated the 22 costs, adding up the cost of the nurse's and nursing aid's work hour, according to the same procedure;

4. We calculated the total cost associated with each of the 65 procedures under analysis, using the following formula:

$$CTDO_i = c_1 \cdot P_{i1} + c_2 \cdot P_{i2} + \dots + c_{17} \cdot P_{i17}, \text{ with } i = 1, \text{ two}, \dots, 65 \quad (2)$$

where  $c_1, c_2, \dots, c_{17}$  represent the 17 unit costs mentioned above and  $P_{ij}$ , with  $i = 1, 2, \dots, 65$  and  $j = 1, \dots, 17$ , the consumption of the product (order j) in the procedure (order i).

It should be observed that  $c_{17}$  (unit cost of procedure time) varies according to the group.

5. After calculating each of the 65 total costs through the established formula, we assessed the total cost, using the mean value of the 65 cost, as well as Standard Deviation and interval estimated of the total real cost.

We calculated the mean procedure cost in real and dollar. Considering the dollar rate (purchase) between 01/22/2002 and 05/06/2002, i.e. the data collection period, we applied the Kolmogorov-Smirnov

Normality Test and found that these values followed a normal distribution, with a mean of R\$ 2.36 (SD = 0.04) and variation between R\$ 2.27 and 2.47.

Descriptive analysis of all study variables was realized, adopting distributions and frequencies, mean descriptive measures, standard deviation and variation (minimum and maximum) in the production of punctual estimates and 95% confidence intervals, in the production of interval estimates.

Inferential analysis basically involved correlation analyses between the variables of interest.

## RESULTS

### Sociodemographic and Clinical Characterization of Patients

Table 1 - Patients with VU, according to sociodemographic and clinical variables. São Paulo, 2002

Variable	Distribution	
Age (years)	N	%
49 to 56	3	33.33
57 to 64	2	22.22
65 to 72	3	33.33
73 to 80	1	11.11
Total	9	100.00
Mean(SD)	61.89(9.89)	
Variation	49 to 80	
CI 95% for Mean	61.89±7.60	
<b>Gender</b>		
Male	2	22.22
Female	7	77.78
Total	9	100.00
<b>Associated Pathology</b>		
Arterial Hypertension	3	33.33
Diabetes Mellitus	2	22.22
Infarction	1	11.11
High Cholesterol	1	11.11
Cellulitis	1	11.11
Arterial Fibrillation	1	11.11
<b>Total</b>	<b>9</b>	<b>100.00</b>

Venous ulcers are more common as age advances, in accordance with other studies<sup>(11-13)</sup>. The predominant age range is between 60 and 80 years old. These studies report that 72% of VU patients had their first ulcer before they were 60 years old, 22% before the age of 40 and 13% before 30.

We found no difference in terms of age and gender between our research and other studies<sup>(11-12)</sup>.

Associated diseases, such as diabetes mellitus, hypertension and cardiovascular diseases,

among others, exert a negative impact on the healing process of the injuries, mainly on angiogenesis. Moreover, diabetes patients with unbalanced glucose levels are more predisposed to infection, which delays healing<sup>(13-15)</sup>.

One patient presented more than one and five (55.55%) patients did not present any associated pathology.

Table 2 - Existence time and location of VU. São Paulo, 2002

Variable	Distribution		
	VU time (year)	n	%
< 2	4	44.44	
2 to 5	1	11.11	
>5	4	44.44	
TOTAL	9	100.00	
Mean(SD)	13.05(16.41)		
Variation	0.06 to 40		
CI 95% for Mean	13.04±12.61		
<b>VU location</b>			
Malleolus I	3	33.33	
Malleolus E	2	22.22	
Malleolus VE	1	11.11	
Malleolus E until I	1	11.11	
Internal Shin D	1	11.11	
Dorsal foot D	1	11.11	
<b>Total</b>	<b>9</b>	<b>100.00</b>	

Studies have shown that 34% of VU patients had this problem for more than five years, and that the probability of recurrence is higher in patients whose VU appeared at an early age, that is, in younger individuals<sup>(6)</sup>.

Other studies<sup>(13-14)</sup> have evidenced that the highest incidence levels of venous ulcers are found in the Malleolus region, followed by other leg or foot regions. These data are compatible with our findings.

#### Verification of ATDC and OTDC

We found that the total cost of the nurses' and the nursing aids' work hour was R\$ 19.22 and R\$ 9.46, respectively. On the average, the aids spend 50 minutes per procedure. Hence, the cost of the aid's work time decreases to R\$ 7.88. Thus, the nurse and the nursing aid's work time spent on the procedure costs an average of R\$ 27.10 per hour.

To calculate the ADTC, we considered the unit cost of procedure time, the mean unit cost of the nurse's work time plus the nursing aid's work time, resulting in a unit cost of R\$ 23.16 per hour or R\$ 0.39 per minute.

Table 3 - Average total direct cost of Unna boot procedure. São Paulo, 2002

Product	Mean Consumption	Unit Cost (R\$)	Cost (R\$)
P.1 - sterile gauze (pouch)	1.98	0.22	0.44
P.2 - non-sterile gauze (unit)	28.08	0.0115	0.32
P.3 - rayon (unit)	1.89	1.85	3.49
P.4 - zobec (unit)	1.32	0.87	1.15
P.5 - adhesive paper bandage 10 (unit)	2.78	0.23	0.64
P.6 - adhesive paper tape (cm)	83.54	0.0009	0.08
P.7 - adhesive tape (cm)	58.5	0.0047	0.27
P.8 - physiological serum 09,0% (ml)	88.46	0.0027	0.24
P.9 - elastic band (unit)	1.38	29	39.33
P.10 - procedure glove (unit)	2.65	0.407	1.08
P.11 - sterile gauze (pouch)*	13.65	0.22	3.00
P.12 - zobec (unit)*	8	0.87	6.96
P.13 - adhesive paper tape (unit)	6.72	0.23	1.55
P.14 - unna boot (unit)	1	31.85	31.85
P.15 - sterile glove (pair)	1	0.06	0.06
P.16 - soap (ml)	50	0.01285	0.64
P.17 - Time	43.31	0.39	16.89
<b>Total Cost</b>			<b>107.99</b>

\* Sterile gauze (P<sub>11</sub>) and Zobec (P<sub>12</sub>) are materials provided to the patient to change the external dressing at home.

Table 3 shows an estimated ADTC of R\$ 107.99. According to the mean dollar rate for the study period, the estimated ADTC is US\$ 45.76.

The material with the highest average cost was the elastic bandage, followed by the Unna boot and staff time.

To calculate the ODT, we considered the same unit costs as in Table 3. As for procedure time, we separated the 65 wound dressings in two groups (A and B). Group A consisted of the 43 dressings realized by nurses only at a unit cost of R\$ 0.32 per minute (19.22/60 = 0.32), while group B included the 22 dressings performed by the nurse and nursing aid, at a unit cost of R\$ 0.45 per minute (27.10/60 = 0.45).

Table 4 - Distribution of Unna boot procedure cost. São Paulo, 2002

Cost	Group A		Group B		Group A + B	
	n	%	n	%	n	%
43.00 to 65.02	26	60.47	13	59.09	39	60.00
65.03 to 87.05	15	34.88	7	31.82	22	33.85
87.06 to 109.08	1	2.33	1	4.55	2	3.08
109.09 to 131.11	1	2.33	0	0.00	1	1.54
131.12 to 153.14	0	0.00	0	0.00	0	0.00
153.15 to 153.17	0	0.00	1	4.55	1	1.54
Total	43	100.00	22	100.00	65	100.00
Mean	63.68		67.54		64.99	
SD	13.00		21.30		16.22	
Minimum	45.35		49.73		45.35	
Maximum	116.63		153.17		153.17	
CI95% for mean	63.67	±3.99	67.54	±9.44	64.98	±4.02

Table 4 shows that there are no statistically significant differences in mean ODT between groups A, B and A + B.

In US dollars, the mean ODTC of Group A+B varies between US\$ 25.83 and US\$ 29.83.

## FINAL CONSIDERATIONS

The direct total cost was verified by two costing methods in order to check for significant differences between them. We found that, although the mean consumption method produces an apparently overestimated cost, it is a more simplified method of finding the procedure cost. The verification of the observed direct total cost allowed us to infer about the actual variation in procedure cost. Thus, we conclude that the best cost verification method depends on what data will be used for.

One important aspect is that this study helped to get to know the consumption pattern and material cost used in the Unna boot procedure. However, it did not clarify whether the cost is high or not. This requires a cost survey of alternative procedures for these patients and cost-effectiveness studies.

On the average, four procedures are performed per patient per month. Using the mean ODTC for group A + B, this results in a cost of R\$

259.96 for the hospital. According to a pre-established table, the Single Health System (SUS) transfers R\$ 0.51 per procedure, which obliges the hospital to assume R\$ 257.92 per patient. It should be reminded that we only verified direct costs.

Institutes need to develop studies about the costs of their procedures as quickly as possible, as this is the only way for them to fight for better transfers from the SUS and make their employees aware about the need to rationalize material resources, avoiding cost-increasing waste.

Nurses play a relevant role in managing materials and their costs in hospital units, providing knowledge and means for decision making, based on scientific evidence about care delivery. This will support their arguments to hospital management about spending needs in view of different wound treatment product types, as well as their justifications about the allocation of human resources to different activities.

We also highlight that this study is not conclusive. There is a need for a larger sample and replication in other institutions, as we found no similar studies for data comparison, which impaired the realization of this research.

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