

Estimating the Cost of Treating Pressure Injury, How to Prevent and Save Resources
Estimativa do Custo do Tratamento da Lesão por Pressão, Como Prevenir e Economizar Recursos

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Abstract

The aim is to estimate the hospital costs of pressure-wound treatment and to review the literature regarding the injuries prevention. Descriptive and retrospective study, from March to December 2015, including 58 patients, with a total of 87 pressure injuries, in a hospital unit in Niterói, Rio de Janeiro. Visits were made to the sectors identifying patients with pressure injury and the used technologies, and elaboration of a cost sheet and we reviewed the pressure injure prevention methods. An average daily cost per patient of \$ 14.24 was found and a total cost of \$ 2992.03 for these treatments. The pressure lesion treatment had a high cost and demanded an increase in the hospitalization time. The literature review showed possible models to be adopted to act in the pressure injuries prevention, which can reduce hospitalization time and save resources.

Keywords: Pressure Ulcer; Costs and Cost Analysis; Disease Prevention.

Resumo

O objetivo é estimar o custo hospitalar do tratamento da lesão por pressão e rever a literatura a respeito da prevenção de tais lesões. Estudo descritivo, retrospectivo, de março a dezembro de 2015, incluindo 58 pacientes, com um total de 87 lesões por pressão, em uma unidade hospitalar de Niterói, Rio de Janeiro. Foram realizadas visitas aos setores identificando pacientes com lesão por pressão e as tecnologias utilizadas, e elaboração de planilha de custos e revisamos os métodos de prevenção à lesão por pressão. Foi encontrado um custo médio diário por paciente de \$ 14,24 e um custo total de \$ 2992,03 para estes tratamentos. O tratamento da lesão por pressão teve um alto custo e exigiu aumento no tempo de internação. A revisão da literatura evidenciou modelos possíveis de serem adotados para atuar na prevenção das lesões por pressão, os quais podem diminuir o tempo de internação e economizar recursos.

Palavras-chave: Lesão por Pressão; Custos e Análise de Custo; Prevenção de Doenças.

Introduction

The National Pressure Ulcer Advisory Panel (NPUAP), along with other international governmental and private organizations, is responsible for the development and dissemination of international guidelines for the pressure injuries' prevention and treatment, adapted for use in accordance with the reality of different countries. In April 2016, the terminology of Pressure Ulcer (PU) and for Pressure Injury (PI) was changed, in the definition of the term, in addition to updating the classification system and PI stages⁽¹⁾.

PI is defined as tissue damage in whole or ulcerated skin, underlying soft tissues and/or mucous membrane, usually located on bone prominence, which can cause pain. The PI occurrence is related to the hospital products' use and/or as a result of intense or prolonged tissues pressure associated with exposure to shear forces. The tissue tolerance to exposure to extrinsic factors may be affected by the patient's clinical conditions such as: body temperature, nutritional status, tissue perfusion, comorbidities, among others⁽¹⁾.

Extrinsic factors may or may not be associated with intrinsic factors in the pressure injury development, however, their occurrence is considered an adverse event that can cause irreversible damage to the patient⁽²⁾. The provision of safe and quality care is directly related to the systematized care management actions implementation, which require planning, organization, execution and continuous evaluation of the care given to hospitalized patients.

Pressure injuries are a health problem that requires comprehensive care and coordination of care at all complexity levels, which involves the commitment of managers and professionals in the implementation of an Institutional Program of Permanent Education aimed at training the health team and nursing services to provide safe and quality care to patients with lesions and/or those at risk of developing skin lesions⁽³⁾.

The pressure injuries' incidence and prevalence are indicators used by the World Health Organization (WHO) to determine the quality of care provided. Approximately 95% of PIs are preventable, so it is essential to use all available

means to perform effective care, implementing measures for prevention and treatment of already established pressure injuries⁽⁴⁾.

Among the treatments that generate high costs for health institutions, there are those for skin lesions, especially those caused by pressure⁽⁵⁾. Hospitalized patients with PI present an epidemiological potential to increase hospitalization time and, consequently, increase the final cost of the provided care, due to the high risk of hospital infections, besides physical impairment which can lead to psychosocial disorders.

The study development justification was anchored in the fact that despite the case that pressure injuries are considered avoidable incidents, studies focused on the cost analysis of the technologies used to treat this injury type show that Brazilian hospitals in different country regions show a high incidence of PI, ranging from 6% to 66.6% according to the hospitalization care profile units and the epidemiological profile of the patients⁽⁶⁾.

The present study becomes relevant to the debate on the methods and materials' suitable use for the pressure injury prevention and treatment. This is because this discussion type is still incipient, with few high quality studies that support a scientific recommendation⁽⁷⁾.

Based on the foregoing, the objective of this study was to estimate the hospital treatment cost of pressure lesions and to review the literature regarding the lesions prevention.

Method

A descriptive, retrospective study was carried out on visits to the hospitalization sectors of the Carlos Tortelly Municipal Hospital of the Municipal Health Foundation of Niterói (MHF/Niterói), Rio de Janeiro. It is a Porte II Hospital, classified as a Medium Complexity Care characterized by presenting a set of actions and outpatient and hospital services that aim to address the main health problems of the host city population, as is the Niterói municipality case and the attached municipalities. Data collection took place from March to December 2015, twice a week

by three researchers and one scholar, with treatments follow-up of and data collection of medical records.

The visits made possible the operationalization of four stages adapted from the ABC - Activity-Based Costing methodology⁽⁸⁾: I - Identification of patients with PI; II - Lesion characteristics mapping - classification according to staging defined by NPUAP⁽¹⁾; III - Health products identification, including type of technology, used for the PI treatment; IV - Preparation of minimum and maximum expenses and costs sheet for PI treatment according to mapped characteristics.

The study included patients hospitalized in three clinical wards (W1, W2, W3); Intensive Care Center (ICC); AIDS ward; green, yellow and red (emergency) rooms, which presented pressure injuries at hospital admission or that they acquired during hospitalization, regardless of sex and age. Patients with any lesion type or no pressure lesion were excluded. Thus, the study sample consisted of 58 patients, with a total of 87 pressure lesions.

It was estimated the individual cost of each patient regarding the values by means of the product of the quantity and its purchase price. This evaluation was based on the values used by the

hospital institution. We statistically analyzed the data from the mean values and standard deviation calculation. We review the literature on methods and materials that propose the pressure injuries prevention.

The study development is a research part/extension of the project, developed since 2010 in the Health Network of the Niterói City, entitled "Management of Nursing Care for Patients with Skin Lesions", and based on the principles of Resolution No. 466/2012 of the National Health Council for Research on Human Beings, approved by the Research Ethics Committee of the Antônio Pedro University Hospital CAAE No. 2892.0.000.258-10-08.

Results

In a nine-month period, 95 patients with cutaneous lesions were collected, with a total of 128 (100%) cutaneous lesions, of which 87 (68%) presented pressure lesions at hospital admission or developed during hospitalization and, 41 (32%) patients presented other types of lesions (venous ulcers, diabetic foot, among others), being excluded from the study sample as shown in Table 1.

Table 1. Patients with skin lesions. Niterói, RJ, Brazil, 2016.

Ward	Patients with skin lesions	Pressure Injury	Venous ulcer	Diabetic foot	Others
Ward 1	26	22	07	02	0
Ward 2	21	16	03	04	04
Ward 3	25	15	05	03	08
SIDA	01	01	0	0	0
ICC	06	08	0	0	0
Green room	12	16	01	01	03
Yellow room	02	05	0	0	0
Red room	02	04	0	0	0
Total	95	87	16	10	15

Source: survey data.

In all hospital sectors, the following technologies were used for the patients with

pressure injury, their cost and healing result, shown in Table 2.

Table 2. Used technologies, costs and healing. Niterói, RJ, Brazil, 2016.

Patients N (%)	Used technology (Unit cost)	Healing (9 months)
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34 (39%)	Collagenase (\$ 6,99)	There was no result
23 (26%)	EFA (\$ 9,57)	There was no result
20 (23%)	Hydrogel (\$ 43,70)	There was no result
10 (12%)	Silver Sulfadiazine 1% (\$ 8,20)	There was no result

Source: survey data.

As for the used technologies' cost, they were calculated in two moments: first the total value of each one per day for each patient, and in the second moment the total long-term cost, a

nine months' period, being the study sample time, for each patient, the results are presented in Table 3.

Table 3. Cost-related variables. Niterói, RJ, Brazil, 2016.

Variable	Average (\$)	Standard Deviation
Used treatment cost	14,24	4,81
Used treatment total cost	2992,03	1010,84

Source: survey data.

Discussion

This sample showed that patients with pressure lesions are those with higher incidence in relation to other types of lesions, requiring an increase in length of hospital stay with negative outcome, non-healing or incomplete wound healing at discharge.

It is also highlighted that the lack of clinical protocols, human capital training and discontinuity in the inputs supply were factors that directly impacted in the pressure injuries treatment.

The treatment cost average was \$ 2992.03 representing only part of the pressure injuries treatment, which starts in primary health care, sometimes drags on for months or years, goes through repeated hospital admissions and extends indefinitely with high rates of reappearance⁽⁹⁾.

Therefore, the best way is to prevent pressure injury. To this extent, the most effective measure is to adopt techniques that avoid the initial lesions on the skin, cracks, fissures, excoriations and callosities, which may, and tend to evolve to the lesions appearance⁽¹⁰⁾.

Studies have shown that costs related to the treatment of patients with pressure injuries are

significantly higher than the costs generated by basic preventive measures. The total cost of treating an inpatient pressure injury can range from \$ 2,000 to \$ 70,000 per injury. In addition, the pressure injury existence is a risk factor for death in the hospitalized patient, and increases the length of hospital stay. In the United States, between 1990 and 2001, of all deaths reported in the country, 0.4%, 114,380 deaths, were related to pressure injury⁽¹¹⁻¹²⁾.

The pressure injury prevention measures are relatively simple and inexpensive⁽¹³⁾. Preventive recommendations were instituted by some nurses in their daily practice in the early detection and to avoid the pressure injuries appearance. Nursing interventions related to prevention should address aspects, such as: skin care, use of emollients for hydration, use of devices for urinary incontinence and bladder reeducation, bed positioning, daily skin observation, hygienic care, rich diet in vitamins and proteins at the first signs of pressure injury, according to the age and clinical condition of each patient⁽¹⁴⁾.

Nursing interventions should be reinforced, such as bed mobilization,

multiprofessional staff interacting in planning educational activities, managing pain, raising the head of the bed up to 30 °, developing rehabilitation programs for clients with spinal cord injury, conducting nursing research approaching risk factors, pressure injuries prevention knowledge of the injuries' prevalence in general hospitals and use of new technologies in prevention and treatment⁽¹⁵⁾.

Studies emphasize the application of a protocol for the pressure injuries prevention it should contain information on client identification, risk assessment scale for development of pressure lesions, demonstration of areas susceptible to injuries, skin modifications registration, following the stages of pressure lesions and prevention guidelines⁽¹⁶⁾.

Predictive assessment of the pressure injury risk development allows the multidisciplinary team to identify the most susceptible individuals and to implant or intensify the necessary preventive measures. It also allows for a more effective treatment planning and reduces the possibility of complications and failures. The Braden Scale, created in 1984, consists of six subscales that evaluate sensory perception, activity level, mobility, nutritional status, presence of moisture, and exposure to shear and friction forces. For each item, notes are assigned, and the sum of the six notes constitutes a risk score for the pressure injury development⁽¹⁷⁾.

A study⁽¹⁸⁾ shows that 94.4% of patients with pressure lesions were at high risk for the pressure injury development and patients with high risk in the Braden Scale total score were 25.5 times more likely to develop pressure injury than low risk patients due to comorbidities and severity in their general state. It was observed that 40% of the pressure lesions developed on the fourth day of hospitalization and 90.4% of the total pressure injuries during the first 15 days of hospitalization, corroborating once again with the literature, which establishes the first 15 days of hospitalization as determinants for the pressure injuries development. When looking for the most important risk factors, in the establishment of the total mean scores obtained in the Braden Scale, humidity, sensory perception and mobility occupied the first, second and third places,

respectively. These results emphasize the need to reinforce specific guidelines, with a view to prioritizing care and optimizing resources⁽¹⁹⁾.

A prevention program developed at a hospital in Chile has shown that it makes it less costly to comply to prevention than to institute it than treatment with the already presented injury. In 1995, expenditures totaled US \$ 240.00, and after the installation of the program in 1997-1998, expenses were reduced to US \$ 11,000, with a cost/benefit ratio of 1/21⁽²⁰⁾.

Studies show that nursing care provided to patients with pressure injuries should also involve knowledge of the political aspects and financial costs of treatment for injuries, as well as psychological and emotional changes, complications resulting from infection and prolonged hospitalization.

Pressure injuries cause pain and emotional imbalances, risk of developing infections, loss of functionality, or withdrawal from work, the latter causing financial losses and treatment costs to the Government and the patient. For these reasons, the creation of preventive programs and committees with the objective of reducing the pressure injuries institutional incidence, as well as the costs of prevention and treatment⁽²⁰⁾.

Conclusion

The studied sample pointed out that the pressure lesion has a higher incidence than other types of lesions. It required an increase in hospitalization time, and the cases had a negative outcome due to non-healing or incomplete healing of the lesion at discharge. The estimated total cost of \$ 2992.03 for hospital treatment over a 9 months' period.

In evaluating the literature related to the prevention and treatment of pressure injuries performed by nurses, it was observed that the studies revealed the importance of nurses performing and implementing measures to prevent pressure injuries. The studies covered topics such as cost-benefit of treatment, preventive measures, nursing interventions, risk prediction scale such as Braden's, development of protocols to follow up patients in prevention, improving the follow-up of patients at pressure lesions' risk development.

Future research certainly deserves to be performed to better identify the most important risk factors in the development of pressure injury at different stages. Further research is needed on the establishment of Braden scale cut-off scores for specific populations, units and services, as well as on the cost/effectiveness of prevention versus pressure injuries treatment cost, still incipient in our setting. From there, it is possible that everyone can contribute to the deepening of knowledge and, above all, the delineation of nursing as a science.

References

1. European Pressure Ulcer Advisory Panel, National Pressure Ulcer Advisory Panel. Prevention and treatment of pressure ulcers: quick reference guide. Washington (DC): Pressure Ulcer Advisory Panel; 2016.
2. Santos LSF, Camacho ACLF, Nogueira GA, Tavares GS, Rosa AF, Nunes CMCF. Memory game about wounds and dressings as a teaching-learning strategy. *Rev Enferm Atual*. 2017;83(1):73-7.
3. Rocha LES, Ruas EDFG, Santos JAD, Lima CA, Carneiro JA, Costa FM. Prevention of pressure ulcers: assessment of the knowledge of nursing professionals. *Cogitare Enfermagem* [Internet]. 2015 [access in 2016 Sep 15]; 20(3):596-604. Available from: <http://www.redalyc.org/html/4836/483647680020/>.
4. Coleman S, Gorecki C, Nelson EA, Closs SJ, Defloor T, Halfens R et al. Patient risk factors for pressure ulcer development: systematic review. *International Journal of Nursing Studies* [Internet]. 2013 [access in 2014 Jul 10]; 50(7):974-1003. Available from: <http://dx.doi.org/10.1016/j.ijnurstu.2012.11.019>.
5. Tubaishat A, Aljezawi M, Al Qadire M. Nurses attitudes and perceived barriers to pressure ulcer prevention in Jordan. *Journal of wound care* [Internet]. 2013 [access in 2015 Jun 24]; 22(9):490-7. Available from: <https://doi.org/10.12968/jowc.2013.22.9.490>.
6. Rogenski NMB, Kurcgant P. Incidence of pressure ulcers after implementation of a prevention protocol. *Rev Latino-Amer Enferm* [Internet]. 2012 [access in 2012 May 23]; 20(2):333-9. Available from: http://www.scielo.br/pdf/rlae/v20n2/pt_16.
7. Black J, Clark M, Dealey C, Brindle CT, Alves P, Santamaria N, Call E. Dressings as an adjunct to pressure ulcer prevention: consensus panel recommendations. *International wound journal* [Internet]. 2015 [access in 2015 May 01]; 12(4):484-8. Available from: https://www.researchgate.net/profile/C_Brindle/publication/260484104.
8. Andrade CCD, Almeida CFSC, Pereira WE, Alemão MM, Brandão CMR, Borges EL. Costs of topical treatment of pressure ulcer patients. *Rev Esc Enferm USP* [Internet]. 2016 [access in 2017 Jun 12]; 50(2):295-301. Available from: <http://dx.doi.org/10.1590/S0080-623420160000200016>.
9. Moraz G, Silva GA, Assis EM, Santos JP, Barcellos NT, Kroeff LR. Health cost-effectiveness studies in Brazil: a systematic review. *Revista Ciência & Saúde Coletiv* [Internet]. 2015 [access in 2017 Jan 01]; 20(10):3211-29. Available from: <http://www.redalyc.org/pdf/630/63042187026.pdf>.
10. Kwong EW, Lee PH, Yeung K. Study protocol of a cluster randomized controlled trial evaluating the efficacy of a comprehensive pressure ulcer prevention program for private for-profit nursing homes. *BMC geriatrics* [Internet]. 2016 [access in 2016 Jan 18]; 16(1):20. Available from: <https://doi.org/10.1186/s12877-016-0189-2>.
11. Verheyden GS, Weerdesteyn V, Pickering RM, Kunkel D, Lennon S, Geurts AC, Ashburn A. Interventions for preventing falls in people after stroke. *Cochrane Database Syst Rev* [Internet]. 2013 [access in 2015 Oct 06]; 5(1). Available from: <https://doi.org/10.1002/14651858.CD008728>.

12. Rafiei H, Abdar ME, Iranmanesh S, Lalegani H, Safdari A, Dehkordi AH. Knowledge about pressure ulcer prevention, classification and management: A survey of registered nurses working with trauma patients in the emergency department. *International Journal of Orthopedic and Trauma Nursing* [Internet]. 2014 [access in 2014 Aug 03]; 18(3):135-42. Available from: <https://doi.org/10.1016/j.ijotn.2014.03.004>.
13. Tran JP, McLaughlin JM, Li RT, Phillips LG. Prevention of pressure ulcers in the acute care setting: new innovations and technologies. *Plastic and reconstructive surgery* [Internet]. 2016 [access in 2016 Sep 08]; 138(3):232-40. Available from: <https://doi.org/10.1097/PRS.0000000000002644>.
14. Demarre L, Verhaeghe S, Van Hecke A, Clays E, Grypdonck M, Beeckman D. Factors predicting the development of pressure ulcers in an at-risk population who receive standardized preventive care: secondary analyses of a multicentre randomised controlled trial. *Journal of advanced nursing* [Internet]. 2015 [access in 2014 Aug 19]; 71(2):391-403. Available from: <https://doi.org/10.1111/jan.12497>.
15. Anderson M, Guthrie PF, Kraft W, Reicks P, Skay C, Beal AL. Universal pressure ulcer prevention bundle with WOC nurse support. *Journal of Wound Ostomy & Continence Nursing* [Internet] 2015 [access in 2015 Jun 02]; 42(3):217-25. Available from: <https://doi.org/10.1097/WON.0000000000000109>.
16. Almeida RA, Bastos RAA, Almeida FDCA, Pequeno GA, Vasconcelos JDMB, Araújo RF. Evaluation of the use of protocols in the prevention of pressure ulcers. *Ciência & Saúde* [Internet]. 2012 [access in 2015 Jun 02]; 5(2):125-33. Available from: <https://doi.org/10.154481983-652X.2012.2.10457>.
17. Choi J, Choi J, Kim H. Nurses' interpretation of patient status descriptions on the Braden Scale. *Clinical Nursing Research* [Internet]. 2014 [access in 2015 May 03]; 23(3):336-46. Available from: <https://doi.org/10.1177/1054773813486477>.
18. Júnior BSS, Silva CC, Duarte FHS, Mendonça AEO, Dantas DV. Analysis of the preventive actions of pressure ulcers through the Braden Scale. *Rev Estima* [Internet]. 2017 [access in 2017 Sep 24]; 15(1):336-346. Available from: <https://doi.org/10.5327/Z1806-3144201700010003>.
19. Albuquerque AM, Souza MA, Torres VS, Porto VA, Soares MJ, Torquato IM. Evaluation and prevention of pressure ulcers by intensive care nurses: knowledge and practice. *Rev Enferm UFPE* [Internet]. 2014 [access in 2015 Apr 30]; 8(2). Available from: http://www.revista.ufpe.br/revistaenfermagem/index.php/revista/article/view/4688/pdf_450.
20. Pott FS, Ribas JD, Silva OBM, Souza TS, Danski MTR, Marineli MJ. Algorithm for prevention and treatment of pressure ulcer. *Cogitare Enfermagem* [Internet]. 2013 [access in 2016 Oct 19]; 18(2). Available from: <http://www.redalyc.org/html/4836/483649271005/>.