

# Cost-effectiveness of two types of dressing for prevention of pressure ulcer

Avaliação de custo-efetividade de dois tipos de curativos para prevenção de úlcera por pressão

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## Keywords

Bandages, hydrocolloid/economics; Polyurethanes/economics; Nursing service, hospital; Pressure ulcer/prevention & control; Pressure ulcer/economics; Cost-effectiveness evaluation

## Descritores

Curativos hidrocoloides/economia; Poliuretanos/economia; Serviço hospitalar de enfermagem; Úlcera por pressão/prevenção & controle; Úlcera por pressão/economia; Avaliação de custo-efetividade

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## Abstract

**Objective:** To analyze the cost-effectiveness relationship of two types of dressing for prevention of sacral pressure ulcer.

**Methods:** This secondary analysis and comparative study included 25 patients. Of these, 10 used a hydrocolloid dressing and 15 used a transparent film dressing for prevention of sacral pressure ulcer. We measured costs of each dressing type, verified intermediate and final results, and estimated the cost-effectiveness relationship.

**Results:** The cost-effectiveness relationships for the intermediate results were R\$174.68 for the hydrocolloid dressing and R\$45.75 for the transparent film dressing. For the final result, the values were R\$272.00 and R\$28.97, respectively.

**Conclusion:** For sacral pressure ulcers, transparent film dressing was cost-effective compared with hydrocolloid dressing.

## Resumo

**Objetivo:** Analisar a relação custo-efetividade de dois tipos de curativos para a prevenção de úlcera por pressão na região sacral.

**Métodos:** Pesquisa de análise secundária, comparativa, que incluiu 25 pacientes dos quais dez utilizaram a cobertura hidrocoloide e 15 o filme transparente, para prevenção de úlcera por pressão na região sacral. Foram contabilizados custos de aquisição com cada tipo de cobertura; verificados desfechos intermediário e final; e foi estimada a relação custo-efetividade.

**Resultados:** A relação custo-efetividade do hidrocoloide para o desfecho intermediário foi de R\$174,68 enquanto do filme transparente foi de R\$45,74. Para o desfecho final, essa relação foi de respectivamente R\$272,00 e R\$28,97.

**Conclusão:** O filme transparente foi mais custo-efetivo do que o hidrocoloide na prevenção de úlcera por pressão sacral.

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**Conflicts of interest:** none reported.

## Introduction

The lack of patient safety in health institutions is an international problem and currently managers and health professionals have been mobilized to improve safety. The nurse, as the leader of the nursing team and moderator of the health care team, must develop or enhance his/her managerial and care skills in order to provide the resources needed for patient safety and quality of healthcare.

One of major concerns in health, particularly with regard to nursing and inpatient safety, is the prevention of pressure ulcer. This condition correspond to the area on tissue injury caused by pressure, shearing and/or friction.<sup>(1)</sup> Pressure ulcers often affect areas with higher susceptibility to dissimilar distribution of weight or areas with excessive pressure, such as the sacral region.<sup>(2)</sup>

The development of pressure ulcers is associated with intrinsic and extrinsic factors, especially immobility.<sup>(1)</sup> However, the risk is also increased in elderly persons, patients with chronic illness, and patients hospitalized in intensive care units for long periods.<sup>(3-5)</sup>

Absorbent foam dressing with a silicone border is recommended for prevention of sacral pressure ulcer in high-risk inpatients in intensive care units.<sup>(6)</sup> This type of dressing limits the excessive humidity in the skin, improves tolerance of tissues to pressure and, at the same time, reduces shear strengths during passive mobilization.<sup>(7)</sup>

Other types of dressing that can work similarly to absorbent foam dressings with a silicone border to prevent sacral pressure ulcers are polyurethane transparent film dressings and hydrocolloid dressings. The cost-effectiveness relationship must be evaluated in order to determine the best dressing for preventing sacral pressure ulcer, support the decision making process of health professionals and managers, and guarantee higher quality and safety of care while rationing financial resources.

Cost-effectiveness analysis of dressings used to prevent sacral pressure ulcer provides the opportunity to increase efficiency and reduce costs

in intensive care units, where care cost are higher. For this reason, our study sought to answer the following question: What is the cost-effectiveness relationship of two different types of dressing used to prevent pressure ulcers in the sacral region? To answer this question we analyzed the cost-effectiveness relationship of two different types of dressing (polyurethane transparent film dressings and hydrocolloid dressings) used to prevent sacral pressure ulcer.

## Methods

This secondary data analysis was conducted from October 2013 to March 2014 in the adult intensive care unit of a private teaching hospital in Paraná State, South Brazil.

We included 25 patients who were at least 18 years of age; had motor and/or neurological limitation for active mobilization in bed; and who, upon admission to the adult intensive care unit, received polyurethane transparent film dressing (n=15) or hydrocolloid dressing (n=10) on integrated skin of sacral region. We used non-probabilistic convenience sampling and excluded patients hospitalized in the adult intensive care unit for less than 24 hours.

Follow-up of patients from the group who used a polyurethane transparent film dressing and the group that received a hydrocolloid dressing was interrupted when the patient was discharged from the adult intensive care unit (n=8), died (n=7), or was transferred (n=1) or when desistence occurred (n=1), spontaneous decubitus change developed (n=1), pressure ulcer developed (n=6) or tape lesion on the sacral region was seen (n=1).

Dressings were placed by the nursing team using the team's standard method upon patient admission in the intensive care unit for adults or in the maximal period of 24 hours after their admission. These procedures were done if no signs of tissue injury were observed, in case of previous training and continuous follow-up by the researcher. Before placement of the dressing, nurses cleaned the skin with gauze immersed in

a Clorexiderm solution and then dried it with additional gauze.

In the polyurethane transparent film group, a standardized dressing, 15cm x 20cm (Tegaderm® non-sterile transparent film, each strip 15cm x 10m, 3M do Brasil Ltda, Brazil), was fixed to the skin base centrally located 20 cm and just above the intergluteal fold. In the hydrocolloid dressing group, we used a sacral contour plate (Comfeel® Plus Sacral Contour Dressing, 18cm x 20cm; Cotoplast S/A, Denmark), fixed to the skin in a way that the large, wide straight forward remained centralized just above the intergluteal fold and in direction to dorsal region. Both groups benefit from other preventive measures for pressure ulcers based on the work dynamic of the adult intensive care unit, such as decubitus change, daily skin hydration, management of humidity in the skin, and use of static air mattress under clinical judgment of the responsible nursing as well as daily intake recommended by the physician.

To collect data we visited the sector daily and directly observed the patients and their medical records. We collected demographic information (sex, age and residence) and clinical data (date of admission to and discharge from the adult intensive care unit, diagnosis, personal background, type of discharge and severity index based on Acute Physiology and Chronic Health Evaluation disease classification system [APACHE II]), along with pressure ulcer data (assessment of sacral region/dressing, angle of the section of the bed, mattress type, frequency of replacement, use or not of disposable diapers, and urinary and fecal incontinence).

We performed descriptive statistical analysis of the data and made comparisons using Mann-Whitney U test of the difference variable of characterization between patients using polyurethane transparent film dressing and those using hydrocolloid dressing. Results were considered significant at a 5% level using the Statistical Package for the Social Sciences (SPSS), version 20.

Cost-effectiveness analysis entails a method for choosing health technology in which costs are expressed in values and results at clinical-epidemiological units.<sup>(8)</sup> For this calculation, the cost of each alternative was estimated by the amount of the product and its cost to purchase. The price of transparent film dressing and hydrocolloid dressing was R\$15.80 and R\$68.00, respectively. The effectiveness was based on an intermediate outcome (mean number of days without pressure ulcer) and final outcome (proportion of patients without pressure ulcer), independent of the staging.<sup>(9)</sup>

Next, a cost-effectiveness analysis was done for each intervention for intermediate and final outcomes. The cost-effectiveness ratio was defined by total costs (in R\$ - Brazil currency) attributed to each dressing (polyurethane transparent film dressing and hydrocolloid dressing) over a denominator by intermediate and final outcomes.

Development of this study followed national and international ethical and legal aspects of research on human subjects.

## Results

Patient and dressing characteristics are described in table 1.

**Table 1.** Patient and dressing characteristics

Variable	Intervention GF				Intervention GH				p-value
	M	P25	P50	P75	M	P25	P50	P75	
Age (years)	77	72	77	84	67	48	67	76.5	0.016
APACHE II (score)	27	24	27	35	22,5	17	22.5	29.25	0.129
Body mass index (kg/m <sup>2</sup> )	21.48	19.35	21.48	24.69	25.39	20.8	25.39	27.97	0.238
Hospitalization in ICU (days)	3	2	3	6	5	2,75	5	59.25	0.160
Follow-up (days)	2	2	2	6	3	1,75	3	26.5	0.765

GF - group that used polyurethane transparent film dressing; GH - group that used hydrocolloid dressing; M - median; P25 - 25 percentile; P50 - 50 percentile; P75 - 75 percentile; SIG - p-value for Mann-Whitney U test; APACHE II: Acute Physiology and Chronic Health disease Classification System; A-ICU - Adult Intensive Care Unit

Table 2 shows cost-effectiveness analysis for the intermediate outcome and the mean number of days without pressure ulcers in the group that used polyurethane transparent film dressing and in the group that used hydrocolloid dressing.

**Table 2.** Intermediate outcome based on intervention group

Intervention	Cost (R\$)	Effectiveness (median days without PU)	Cost-effectiveness (R\$/day without PU)
GF (n=15)	347.60	7.6	45.74
GH (n=10)	1,904.00	10.9	174.68

GF - group that used polyurethane transparent film dressing; GH - group that used hydrocolloid dressing

Table 3 describes the cost-effectiveness for the final outcome and proportion of patients who did not develop pressure ulcers.

**Table 3.** Final outcome based on intervention group

Intervention	Cost (R\$)	Effectiveness (median days without PU)	Cost-effectiveness (R\$/day without PU)
GF (n=15)	347.60	80	28.97
GH (n=10)	1,904.00	70	272.00

GF - group that used polyurethane transparent film dressing; GH - group that used hydrocolloid dressing

## Discussion

This study was based only on a cost-effectiveness analysis of two types of protective dressing that did not include the absorbent foam dressing with silicone border because this dressing type was not available in the institution investigated. In addition, our use of a small sample at a single institution limited our ability to infer and extrapolate our results. Another potential source of bias stemmed from the age difference between participants in the two groups ( $p=0.016$ ) because age is considered an intrinsic risk factor for development of pressure ulcer.<sup>(1)</sup> For this reason, the effectiveness in the group that used a polyurethane transparent film dressing was considered underestimated compared with that in the group that used a hydrocolloid dressing because the first group had more elderly patients. Therefore, polyurethane transparent film dressing can be considered extremely superior especially with the homogenization of age groups.

Despite the limitations mentioned, our study can contribute to the discussion about the use of dressings to prevent sacral pressure ulcers. This is particularly relevant because this topic requires

further discussion and high-quality studies to support a scientific recommendation,<sup>(6)</sup> without comparison of cost-effectiveness ratio between available options.

A study<sup>(10)</sup> of 90 inpatients in an intensive care unit and a cardiology intensive care unit at a hospital in Thailand submitted patients to non-invasive mechanical ventilation; authors did not find a statistically significant difference in the effectiveness of hydrocolloid dressing and transparent film dressing. In addition, according to the final result these investigators concluded that the two dressing types can be used to prevent facial pressure ulcers caused by mechanical ventilation masks.

In our study we observed that hydrocolloid dressings were 1.4 times more effective for the intermediate outcome but that transparent films were 1.1 times more effective for the final outcome. This result indicates that both dressing types can help prevent sacral pressure ulcers.

The transparent film was 5.5 times cheaper than the hydrocolloid dressing because of its lower purchase cost and subsequent use in more patients. In addition, for both intermediate and final outcome, the transparent film was a more cost-effective alternative and enabled mean economic savings for these outcomes of R\$128.94 and R\$243.03, respectively. This means that hydrocolloid dressing was 3.8 and 9.4 times more expensive than transparent film.

A controlled clinical trial with 440 patients from an emergency service and intensive care unit at a hospital in Australia<sup>(11)</sup> found that absorbent foam dressing with a silicone border prevents sacral and calcaneus pressure ulcers, and, consequently, resulted in an economic saving for the hospital. In this sense, it is important to consider the evaluation of absorbent foam dressing with a silicone border in comparison with transparent film dressing, which in our study was more cost-effective in preventing sacral pressure ulcer.

## Collaborations

Inoue KC and Matsuda LM contributed to the conception of the project, data analysis and interpretation,

drafting the manuscript, critical review for intellectual content and approval of final version to be published.

## Conclusion

Although hydrocolloid dressing was more effective in intermediate outcome, this study data suggest that use of polyurethane transparent film dressing has advantages to prevent sacral pressure ulcers (final outcome). However, this results need to be further investigated because patients who were hospitalized in intensive care units for long periods and received hydrocolloid dressing may be influenced for the high use of dressing and also for the occurrence of pressure ulcers in the group.

The transparent film dressing was more cost-effective than hydrocolloid dressing to prevent sacral pressure ulcers among patients in intensive care unit. The transparent film dressing was 3.8 and 9.4 times less expensive than hydrocolloid dressing for intermediate and final outcomes.

Economic and clinical outcome differences occurred between the dressings used for sacral pressure ulcers. This can support decisions about the use of these resources in clinical practice. However, other studies are warranted to expand the knowledge about this type of technology. In addition, more accurate cost-effectiveness analyses should be obtained including analyses with other products.

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