# Using the Braden Scale and photographs to assess pressure ulcer risk*

## O USO DA ESCALA DE BRADEN E FOTOGRAFIAS NA AVALIAÇÃO DO RISCO PARA ÚLCERAS POR PRESSÃO

## USO DE LA ESCALA DE BRADEN Y FOTOGRAFÍAS EN LA EVALUACIÓN DEL RIESGO PARA ÚLCERAS POR PRESIÓN

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**ABSTRACT**

The objective of this paper was to identify critically ill patients at risk for pressure ulcer (PU) using the Braden scale and digital photographs. A sample of 42 subjects was evaluated for 15 days, between March and June 2009, in Fortaleza, Brazil. A total of 47 lesions were identified, 23 (48.9%) as stage I and 24 (51.1%) as stage II. It is necessary for nurses to become familiar with and adopt the technologies used to assess and treat PU in order to lessen the negative effects of this public health problem.

**DESCRIPTORS**

Pressure ulcer
Intensive Care Units
Risk assessment
Scales
Photographs
Nursing care

**RESUMO**

O objetivo deste artigo foi identificar casos de risco para úlcera por pressão (UP), em pacientes críticos, a partir da escala de Braden e de fotografias digitais. Uma amostra de 42 sujeitos foi avaliada durante 15 dias entre março a junho de 2009 em Fortaleza, Brasil. No total foram identificadas 47 lesões, sendo 23 (48,9%) com estágio I e 24 (51,1%) com estágio II. Conclui-se que é necessário que o enfermeiro que ainda não utiliza usualmente tecnologias na avaliação e tratamento procure se familiarizar com isso, a fim de diminuir as repercussões negativas deste problema de saúde coletiva.

**DESCRITORES**

Úlcera por pressão
Unidades de Terapia Intensiva
Medição de risco
Escalas
Fotografias
Cuidados de enfermagem

**RESUMEN**

El objetivo de este artículo fue identificar casos de riesgo de úlcera por presión (UP) en pacientes críticos a través de la escala de Braden y de fotografías digitales. Una muestra de 42 sujetos fue evaluada durante quince días entre marzo y junio de 2009 en Fortaleza-Brasil. En total, fueron identificadas 47 lesiones, resultando 23 (48,9%) en estado I y 24 (51,1%) en estado II. Es necesario que el enfermero que aún no utiliza con habitualidad tecnologías de evaluación y tratamiento intente familiarizarse con ello, a efectos de minimizar las repercusiones negativas de este problema de salud colectiva.

**DESCRIPTORES**

Úlcera por presión
Unidades de Cuidados Intensivos
Medición de riesgo
Escalas
Fotografías
Atención de enfermería

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## INTRODUCTION

In Brazil, the adoption of technological resources in nursing care has been an increasing fact since the late 1960's with the scientific grounding of the profession. Brazilian nurses who study the relationships between technology and care, conceive the first as the solidification of quotidian experience and research in the development of scientific knowledge that culminates in the construction of material products, or not, with therapeutic goals. Thus, there is a disassociation of the prevailing idea of technology and materiality that becomes understood as the application of skills and abilities in the fusion of processes that conceive products and/or knowledge[1].

In the treatment and prevention of pressure ulcers (PUs), for example, there are many technologies available for the nurse, especially in hospitals. There are constructs and/or equipment, such as biological dressings, topical substances, mattresses, photographs, etc. There is structured clinical knowledge that directs this work, such as protocols and PU risk evaluation scales, and finally there is the interaction between the nurse and patient. However, much of this is still onerous and is already used with the patient who presents skin lesions.

The recognition of individuals vulnerable to PUs not only depends on the clinical skills of the health professional, but also on the use of accurate measurement instruments to assist in the identification of individuals at risk, examples of which are, scales, protocols and photographs of the skin of the patients[2-3]. The diagnosis and evaluation of PUs based solely on the subjectivity of health professionals through their observations and documentation is inaccurate. There are results of studies which show discrepancies in the identification process of cicatrization with granulation, fibrin, exudate or necrosis or even the lesion size. There are also differences of up to 30% in the diagnosis of PUs between healthcare professionals[4].

As highlighted by some studies, digital photography is an accurate technology, important in this aspect because it facilitates the difficult task of measuring, describing and documenting the skin lesions of the patients. It allows the electronic transmission of images and the consultation of specialist professionals in distant locations. Furthermore, it is an economical technology that can motivate the patient in situations of improvement and has a greater impact than the written word in matters of juridical claims for healthcare[5-6].

The risk evaluation scales for PUs are also an innovative technology and have presented significant results for this problem, although focused on local experiences. From a literature review, it was possible to encounter more than 40 PU risk scales worldwide, with the most widely used in the Americas and Europe being the scales of Norton, Gosnell, Braden and Waterlow. These instruments address intrinsic and extrinsic factors of the patients related to lesion development. These aspects help the nurse in the measurement of the risk and the planning of care directed toward the risk factors of each patient[7]. However, their use should be regular, not limited only to the admission of the patient, because the risk is continuous and early identification of these patients allows the implementation of preventive measures that can reduce PU incidence by up to 50%[7].

Nurse researchers admit that the technology issue is still incipiently addressed in nursing practice in Brazil[1]. Added to this, longitudinal studies on the use of technologies, such as photographs, together with risk scales for PUs, are also scarce. In the case of the photographic documentation of wounds, for example, a review of the literature found that among 43 articles, only one had been developed in Brazil[8]. Therefore, the aim of this study was to identify PU risk cases in critically ill patients in northeastern Brazil through the use of the Braden scale and digital photographs.

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## METHOD

### *Study design and participants*

An exploratory and longitudinal study was developed in three intensive care units (ICU) of a health institute, a reference in urgent and emergency care in northeastern Brazil. The study was conducted from March to June 2009, with all patients admitted, during the study period, to the three adult ICUs of the institution, who met the following inclusion criteria: being over 18 years of age; not presenting PU on admission; having spent up to 48 hours hospitalized in the ICU, prior to data collection. In turn, the exclusion criteria were as follows: being a hemodynamically unstable patient; having a medical diagnosis of brain death; and having a prognosis of leaving the ICU within fifteen days.

### *Population and sample*

Because the population was comprised of patients over 18 years, the pediatric ICU was not integrated into the research, the reference for calculating the population being 23 beds. According to the center of epidemiological surveillance of the institution, in 2008 a total of 432 adult patients in the three ICUs was recorded. For the calculation of the sample a formula for longitudinal before and after studies was used, with the confidence interval of 95%. After performing the calculations, a sample of 42 patients for the study population was identified.

To arrive at the 42 patients evaluated, the inclusion and exclusion criteria were taken into account, and during the four months there were 83 inpatients, 11 were admitted with PU, two were younger than 18 years, 10 died before completing the minimum of ten days and 18 were transferred before completing the minimum of ten days.

***Instruments***

Two instruments were used in the data collection, the first was a form with sociodemographic and clinical data, and the second the translated Braden Scale, adapted and validated in Brazil. It is composed of six subscales which are: sensory perception, skin moisture, activity, mobility, nutritional status, friction and shear. All are scored from 1 to 4, with the exception of friction and shear, where the measure ranges from 1 to 3. Total scores range from 6 to 23. Patients achieving a score of 16 or more are considered low risk for the development of PUs; between 11 and 16, indicates a moderate risk and under 11 a high risk, as this shows inadequate functioning of the evaluated parameters[10].

For the evaluation of the PUs encountered the classification of the National Pressure Ulcer Advisory Panel was considered[11]: Stage I - redness of intact skin that does not whiten after removing the pressure; Stage II - skin loss involving the epidermis, dermis or both. The ulcer is superficial and presents clinically as an abrasion or shallow crater; Stage III - full thickness skin loss, involving damage or necrosis of subcutaneous tissue that may deepen, not reaching the fascia. The ulcer presents clinically as a deep crater; Stage IV - full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures such as tendons or joint capsules.

***Data collection***

The clients who fulfilled the criteria for sample inclusion were monitored for 15 consecutive days. Evaluations were performed once a day, always in the matutinal period, the moment at which the application of dressings and cleaning of the patients occurred. At the time of the first visit, each client had their clinical data recorded on a form. In turn, the data concerning the skin and the Braden scale were investigated in all 15 visits performed for each patient. In those cases where the 15 visits were not concluded, for reasons of death or transfer, they only remained in the study if at least 10 visits had already been carried out.

Every five days digital photographs were taken of a set of anatomical regions of the patients, after cleaning the wound and before applying new dressings, namely: occipital, scapular, elbows, sacrum, trochanter, calcaneus and malleolus. It is noteworthy that images were only taken of these regions, regardless of whether the skin was intact or not (Figure 1). The camera used had a resolution of 12 mega pixels and in order to produce a correct image of the wound without any distortion, the photos of all the above mentioned areas were taken in the perpendicular position with the flash function active. The photographs taken were stored on a note book for their later consideration. Together, two nurses who work with critically ill patients studied the photographs and reached a consensus on the meaning of images.

The data found in the images were not recorded in the medical records of the patient. However, as an ethical issue, any alterations detected during the study were reported to the nurses of the evaluating ICU.

**Data organization and analysis**

The data were double entered and stored in a database using the Excel program, then exported to the Epi Info version 6.04 program for the elaboration of the absolute frequency and percentage, as well as for measures of central tendency. The Bartlett's test was employed in the evaluation of the homogeneity of the data, and a confidence level of 95% was used. To compare percentage differences the Fischer test was carried out, while ANOVA was used to compare the means.

***Ethical aspects***

The study was conducted after approval by the research ethics committee of the institution, under to protocol No. 86145/08. In the case of an unconscious patient consent was obtained from the relatives and guardians.

## RESULTS

The mean length of monitoring was 14 days (SD±3.6), with 32 (76.2%) patients monitored for 15 days. The remaining seven (16.7%) subjects were monitored for 10 days because of transfer to another hospital sector and/or death. Of the 42 patients evaluated, most were young adults, 13 (31%) between 18 and 25 years of age, followed by 11 (26.2%) between 36 and 46 years of age. The mean age was 35.3 (SD±4.7) years. There was a predominance of males with 34 (81%).

The majority of patients admitted to the ICU and included in this study came from the anesthesia recovery and emergency rooms, with 25 (59.5%) and 14 (33.3%), respectively. The most common clinical conditions verified at the time of admission were neurological dysfunction, with the predominant traumatic brain injury, 26 (61.9%), followed by surgery, 11 (26.2%), mainly exploratory laparotomy and neurosurgery. The use of mechanical ventilation, vasoactive drugs and sedation were detected in 78.6%, 31% and 69% of the patients, respectively.

Through the combined use of the Braden scale and digital photographs during the daily physical examination, it was found that of the 42 patients, 25 developed PUs. In total 47 lesions were identified, 23 (48.9%) as stage I, and

24 (51.1%) as stage II. Regarding the number of lesions per patient, the distribution was: six (1PU), sixteen (2 PU), and only three (3 PU) (Table 1).

**Table 1 -** Distribution of the characteristics of the PU according to stage, number and location of lesions of the patients. Fortaleza-Brazil, 2009

| Variables | f | % |
|---|---|---|
| PU stage | | |
| I | 23 | 48.9% |
| II | 24 | 51.1% |
| Total | 47 | 100.0% |
| Number of lesions | | |
| One lesion | 6 | 24% |
| Two lesions | 16 | 64% |
| Three lesions | 3 | 12% |
| Total | 25 | 100.0% |
| Location | | |
| Scapular | 18 | 38.3% |
| Occipital | 18 | 38.3% |
| Calcaneus | 11 | 24.4% |
| Total | 47 | 100.0% |

Regarding the location of the lesions, the sacral and occipital regions presented the same frequency of 18 (38.3%) patients. The calcaneus region presented a frequency of 11 (23.4%) cases. The PUs in this region were not divided between right and left calcaneus. Among patients who developed two lesions, four patients had lesions in the sacral and calcaneus regions; nine in the sacral and occipital; and three in the calcaneus and occipital (Table 1). Among these, 88% of the cases occurred in males, however, this was not statistically significant according to Fischer's test (p=0.156). The mean ages of subjects with PU absent or present were similar, thus, there was no statistically significant difference in this variable (p=0.918). The same trend was observed when comparing the mean scores of the Braden Scale between these subjects (p=0.709) (Table 2).

In the item sensory perception of the Braden scale, the response *completely limited* presented a percentage above 23.8% in the first 10 days. Following this there was a decrease in this percentage up to the 15th day, when the values started to increase again. In turn, the response *very limited* to the item sensory perception presented the highest percentage among the participants throughout the entire evaluation, with the minimum and maximum values of 15 (39%) and 20 (68.8%), respectively. The percentage of subjects with sensory perception *completely limited* and *very limited* decreased during the study, between the first and last days of evaluation, as shown by the intervals of 14 (33.3%) to 9 (28.1%) and 20 (47.6%) to 13 (40.6%), respectively.

In the item moisture, 32 (76.2%) patients were classified as *occasionally moist* throughout the entire investigation. The subjects evaluated had little variation from the first until the tenth day, as shown by the interval: 28 (66.7%) and 32 (76.2%) individuals, respectively. No patient presented an absence of moisture. In the item activity in the Braden Scale it was found that 90% of the subjects were *confined to bed*. In the final five days there was a decrease in these values. In the question of mobility it was observed that 12 (28.6%) patients were *completely immobile* during the first 10 days of evaluation, with a reduction of this percentage over the last five days. Simultaneously, in this final phase there was also a small increase in the patients with *slight limitation*, moreover, only two were categorized as *no limitation*, with the ability to make major changes in position without assistance.

In the subjects investigated there was a decrease in the frequency of those with *very poor nutrition* and *probably inadequate nutrition* between the first and twelfth days as shown in the variations of 15 (35.7%) to 1 (2.8%) and 13 (31%) to 6 (18.7%) respectively. Consequently, the subjects classified as *adequate nutrition* jumped from 14 (33.3%) to 29 (87.8%). In the item of friction and shear of the skin the response *problem* presented the highest frequency among those surveyed throughout the entire monitoring period (69% to 87.5%). Between the first and last days of evaluation there was a fall of two thirds of patients with *potential problem*, from 13 to 4 individuals. Only 2.4% of subjects presented *no apparent problem* for skin friction and shear.

**Table 2** - Distribution of gender, age, time to onset of PU and Braden Scale scores, according to the presence of PU. Fortaleza-Brazil, 2010

| Variables | Presence of PU | | | | p |
|---|---|---|---|---|---|
| | Yes | | No | | |
| | f | % | f | % | |
| **Gender** | | | | | |
| Male | 22 | 88.0 | 12 | 70.6 | 0.156* |
| Female | 03 | 12.0 | 05 | 29.4 | |
| Age (years) | $\overline{X}$= 35.0 | DP (±13.8) | $\overline{X}$ = 35.4 | DP (±11.6) | 0.918** |
| Days hospitalized | $\overline{X}$ =14.2 | DP (±1.7) | $\overline{X}$ = 13.7 | DP (±2.1) | 0.396** |
| Escores na Escala de Braden (pontos) | $\overline{X}$ =12.2 | DP (±1.6) | $\overline{X}$ = 12.4 | DP (±1.6) | 0.709** |

$\overline{X}$ = Mean; DP= Standard deviation *Fisher's test ** ANOVA test

In general, the patients presented Braden Scale scores with means ranging from 11.6 to 12.5 and from 9.1 to 16.7 per day and per patient, respectively. From this, one patient with low risk, 34 with moderate risk and seven with high risk were identified. Of those with moderate and high risk, 19 (76.0%) and 5 (20.0%), respectively, developed some type of PU.


**Figure 1 -** Evolution of the calcaneus region of a critical patient evaluated by digital photographs and the Braden Scale on the 1st, 5th, 10th and 15th day - Fortaleza, Brazil, 2010

## DISCUSSION

During the reading of these data, it is important to note that the version of the Braden scale adopted in this research has low sensitivity (31.2%) but high specificity (88.2%)[12]. Therefore, initially it may be thought that this percentage could be higher, however, the high specificity of the instrument, coupled with the simultaneous use of digital photographs, ensure that there was a more accurate skin assessment and completion of the Braden scale. Thus, the data found depict faithfully the situation of the institution in question. Additionally, the literature has stressed that relevant clinical disagreements of up 58.4% occur between nurses that use only a physical examination and those who adopt a physical examination and digital photo images in their consultations with patients with wounds. Therefore, the nurses who do not use digital images in their evaluation, either in the domicile or the hospital, are at risk of underestimating the presence of skin lesions[13].

The data source and the methods of measurement are often the reason for the divergence of prevalence and incidence of PUs among the studies. For example, publications based on analysis of medical records, certainly present an underestimated frequency of PUs, in addition, the adoption of different scales can cause confusion between the results[14]. Another important detail is the frequency of the application of the PU risk scales. Some authors found tissue tolerance to pressure to be a pathophysiological aspect of the evolution, which in the bones and muscles are respectively 30 and 2 hours[9]. Therefore, it is possible for significant changes to occur in these lesions within 30 hours, making daily monitoring ideal, especially in critically ill patients. However, in the reality of many health institutions there is an increase in the contingent of patients while the number of nurses is decreasing, leading to the delegation of pressure ulcer risk assessment to other professionals, without the necessary skills and competencies. This could result in the skin analysis and the filling of such instruments being performed incorrectly, with a consequent impact on the patient's health. For this reason it is recommended that the application of PU risk scales occurs at least every other day, so that changes detected can be corrected in a timely manner.

The method considered the gold standard for the diagnosis of cases of PU is interobserver evaluation, although, the reliability decreases in the classification of the lesions, especially in the gluteal and hip regions[14]. However, this is sometimes made difficult due to a scarcity of health professionals proficient in the area. A fact that could be circumvented with the use of photos shared between experts on the topic. Furthermore, this technology presents many advantages such as: accuracy in the analysis of the depth, coloration and position of the borders of the lesions over time; it serves as a record of the evolution of the therapeutic process; and it reduces the need for handling the lesion during examination. However, some peculiarities should be considered, namely: the technological precision of the photo requires additional costs in training, equipment and storage, as well as in consultation with experts in finalizing the diagnosis[4,15].

To make the use of photography viable in the study and intervention of PUs it is also necessary that some aspects are reformulated: there should be standardization of anatomical zones to be photographed, health professionals must undergo training to guarantee the precision of the images, and they should also use similar equipment[6]. On the same theme, the Wound, Ostomy and Continence Nurses Society (WOCN) states that the use of digital photography is not a new resource in the documentation of injuries, it is even banal, but nevertheless can be an important complement since it is supported by valid protocols that address ethical aspects, skills and abilities in the technique and handling of these arsenals[16]. However, as previously stated, in Brazilian hospitals the adoption of this technology is still not routine for documentation of the evolution of skin lesions. According to Brazilian nurses, the main difficulties of producing and applying assistive technologies lies in administrative, economic, physical

and even curriculum problems[1]. Thus, nurses can encounter another drawback: the lack of access for nurses to training and administrative support for the adoption of new technologies, which raises the costs of adoption of these resources. Therefore, as this interferes with their care practices, nurses must learn how to work with new technologies, given their time, knowledge and demand and then combine these resources with their quotidian clinical practice without reducing the direct contact with the patient.

With regard to the spread of use, the Braden scale has a different position to digital photos, since its adoption is already routine in Brazilian institutions. Thus, the results of this and other studies conducted in Brazil confirm that the scores obtained for the Braden scale can assist nurses, from the initial evaluation upon admission, in the identification of patients at higher risk for developing PUs, so that efforts be made to implement the recommended prevention measures[10,17-20].

The fact is that in this study of the 34 subjects with some degree of risk, only 25 developed PUs during the study period. This reinforces that it is possible to block the genesis through preventive actions, such as PU risk scales and digital photographs, thereby reducing the economic and clinical burden of the institutions and of the patients, respectively. For this, the healthcare institutions should seek to ensure the supplies necessary for the work of all the healthcare professionals involved in wound care. The nurse, in turn, should aim to become familiar with the new technologies in wound care, such as the PU risk scales and digital photographs, and to utilize them in their quotidian. Questions such as the frequency of recording and anatomical points necessary, times and the influence of structural and human resource factors should be focus of new studies in this area to clarify the use of more accurate and reproducible pressure ulcer risk scales and digital photographs in prevention.

## CONCLUSION

This study has some limitations that should be listed. Firstly, the time set for monitoring of the patients prevented the monitoring of the outcome of patients with low risk for developing PUs; secondly, there was no comparison between the results obtained during the data collection and the notes in the medical records of the patients in order to clarify similarities and differences regarding the skin of the subjects; and, finally, the evaluations of the digital photos were performed by only two nurses. However, the results of this study confirm the findings of the Brazilian and foreign literature: the adoption of digital photos and the Braden Scale is an adjunct in the work of identification and prevention of PUs in critically ill patients.

It is important to highlight that the version of the Braden scale adopted in this study has low sensitivity but high specificity. However, the high specificity of the instrument, coupled with simultaneous use of digital photos, ensures that the data found faithfully portray the situation of the ICU of the institution evaluated in relation to pressure ulcers.

Today there are many technologies available to the nurse to prevent the emergence of PUs, however, many of them are only partially accessible in many countries, as is the case in Brazil. Therefore, it is necessary that nurses, not only of Brazil but also of other countries, who still do not usually use these resources in the whole of their territory, seek to become familiar with these technologies for diagnosing and coping with PUs. Furthermore, their use should be continuous and systematic not restricted only to the admission of the patient. It is recommended that further research be developed with a view to divulge and suggest improvements or mitigation of costs in the use of these technologies, so that finally there is a spread of these technologies.

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