



## Predictive validity of the Braden Scale for patients in intensive care\*

*Validade preditiva da escala de Braden para pacientes de terapia intensiva*

*Validez predictiva de la escala de Braden para pacientes de Cuidados Intensivos*

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### ABSTRACT

**Objectives:** To evaluate the predictive validity of the Braden Scale scores in patients in an intensive care unit and to describe the preventive measures implemented by the nursing staff. **Methods:** A prospective, descriptive study with data collected from medical records, physical examination, and application of the Braden Scale in 23 patients. **Results:** The results of tests of predictive validity produced scores of 14, 13 and 12 with the most efficient in predicting risk for pressure ulcers, in the first, second and third assessments, with their respective values of sensitivity (95%, 95% and 94%) and specificity (45%, 55% and 77%). **Conclusion:** We concluded that the Braden Scale is an efficient tool for early identification of risk and to support the development of a plan of care to prevent skin damage in critically ill patients.

**Keywords:** Pressure ulcer/prevention & control; Inpatients; Intensive care units; Predictive value of tests; Sensitivity and specificity

### RESUMO

**Objetivos:** Avaliar a validade preditiva dos escores da escala de Braden em pacientes de um Centro de Terapia Intensiva e descrever as medidas preventivas implementadas pela equipe de enfermagem. **Métodos:** Estudo prospectivo descritivo cujos dados foram coletados por meio de prontuário, exame físico e aplicação da Escala de Braden em 23 pacientes. **Resultados:** O resultado dos testes de validade preditiva apontou os escores 14, 13 e 12 como os mais eficientes na predição de risco para úlcera por pressão, nas primeira, segunda e terceira avaliações, com seus respectivos valores de sensibilidade (95%, 95% e 94%) e especificidade (45%, 55% e 77%). **Conclusão:** Concluiu-se que a escala de Braden é um instrumento eficiente para identificar precocemente o risco e para subsidiar a elaboração de um plano de cuidado capaz de prevenir danos na pele de pacientes em estado críticos.

**Descritores:** Úlcera por pressão/prevenção; controle; Pacientes internados; Unidades de Terapia Intensiva; Valor preditivo dos testes

### RESUMEN

**Objetivos:** Evaluar la validez predictiva de los escores de la escala de Braden en pacientes de un Centro de Cuidados Intensivos y describir las medidas preventivas implementadas por el equipo de enfermería. **Métodos:** Estudio prospectivo descriptivo cuyos datos fueron recolectados por medio de la historia clínica, examen físico y la aplicación de la Escala de Braden a 23 pacientes. **Resultados:** El resultado de los tests de validez predictiva apuntó los escores 14, 13 y 12 como los más eficientes en la predicción de riesgo para úlcera por presión, en las primera, segunda y tercera evaluaciones, con sus respectivos valores de sensibilidad (95%, 95% y 94%) y especificidad (45%, 55% e 77%). **Conclusión:** Se concluyó que la escala de Braden es un instrumento eficiente para identificar precozmente el riesgo y para subsidiar la elaboración de un plan de cuidados capaz de prevenir daños en la piel de pacientes en estado crítico.

**Descriptores:** Úlcera por presión/prevenición & controle; Pacientes internos; Unidades de terapia intensiva; Valor predictivo de las pruebas; Sensibilidad y Especificidad

\* Taken from the Master's Dissertation submitted to the Fundamental Nursing Program, Ribeirão Preto College of Nursing, University of São Paulo - USP - Ribeirão Preto (SP), Brazil.

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## INTRODUCTION

The professionals who care directly for patients in critical conditions and who are concerned with the prevention of pressure ulcers (PU) can find several tools or scales in the literature that will help to identify the risk factors present in the patient. Currently there are over 40 different tools or PU Risk Evaluation Scales, the most well known being those of Norton, Waterlow and Braden<sup>(1)</sup>. The variety of scales is mainly related to the needs of the distinct clinical areas. For example, the Waterlow and Braden Scales are more appropriate to evaluate hospitalized patients<sup>(1)</sup>, since the Norton Scale was originally developed to evaluate elderly patients in the hospital environment<sup>(2)</sup>.

The Braden Scale (BS) is the most used worldwide, both in research and in clinical practice, being recommended by the Wound, Ostomy and Continence Nurses Society<sup>(3)</sup> and the Registered Nurses Association of Ontario/Canada<sup>(4)</sup>. The BS is composed of six domains (or subscales): sensory perception, mobility, activity, moisture, friction and shear, and nutrition. Five of these subscales are scored from 1 to 4, with friction and shear having a score of 1 to 3. Each subscale is accompanied by a brief description of the criteria that should be considered by the evaluators, according to their clinical observations. Adding the scores of the six subscales produces an overall risk score ranging from 6 to 23, with the lowest score indicating a greater risk of developing PU<sup>(2,5)</sup>. It is recommended that the risk for PU development from the BS is classified as follows: patients with a score equal to or less than 9: very high risk; patients with a score of between 10 and 12: high or increased risk; patients with scores 13 or 14: moderate risk; and patients scoring 15 or 16 (adults) and 17 or 18 (elderly): at risk<sup>(6)</sup>. The recommendations regarding the frequency of evaluations of specific sites were also established by Braden and are as follows: in the ICU patients should be evaluated upon admission, again in 48 hours and then every day; in internal medicine and surgical units - upon admission, then every two days; in long-term institutions - upon admission, then every 48 hours in the first week, weekly in the first month and monthly for four months or when there is a change in health status; and in Home Care - upon admission and at each domicile visit<sup>(7)</sup>.

Statistical tests of sensitivity and specificity are most commonly used and recommended to evaluate the value of the predictive validity for PU of the risk assessment

scales<sup>(8)</sup>. The ideal scale is one that meets 100% sensitivity and specificity, i.e. no under-prediction should occur, but such a scale is unrealistic, because when the sensitivity increases the specificity decreases<sup>(8-9)</sup>. In general, a cutoff score is used to classify patients that present a risk situation and those who do not. In Intensive Care Units, the score of 16 was described by Braden as the most predictive of PU. In the literature review study other scores are used, depending on the study site, as shown by the data in Fig. 1<sup>(10)</sup>.

To be certain of the efficiency of a scale, to assess the predictive validity, the studies should describe the preventive measures received by the at risk patients. Preventive measures (mobilization, use of mattresses, pillows, etc.) may reduce the risk of PU and influence the results of the sensitivity and specificity tests of the scale. Therefore, the preventive care actions should be similar in test environments, so that results can be compared<sup>(8,11)</sup>.

In the literature review performed in the LILACS database, the following Health Science Descriptors were used<sup>(12)</sup>: Risk Assessment, Scales, and Pressure Ulcer with its variations (decubitus ulcer and pressure sore). It was found that, after more than a decade of adaptation of the BS into Portuguese, various studies had been conducted using this scale to assess the risk of PU in ICU patients: however, few have used the sensitivity, specificity and positive and negative predictive validity tests, in this same population<sup>(13-14)</sup>. It must be considered that risk assessment through the Braden Scale is different to the prediction of risk, because the first identifies the classification of the patients at risk, and the second aims to identify the more sensitive and specific score in predicting the risk for PU, i.e. to allow the identification of the cutoff score.

The present study was performed due to the importance of the subject and there being few Brazilian studies on the predictive validity of the BS, with the application of the sensitivity and specificity tests. The aims of the study were to evaluate the predictive validity of the Braden scale scores in patients of an intensive care unit (ICU) and to describe the preventive measures implemented by the nursing team.

## METHODS

This is a prospective, descriptive study, performed in the ICU of a hospital in São Paulo State, between February and April 2002, after gaining authorization from the Human Research Ethics Committee of the Institution

**Figure 1** - Cutoff scores of the Braden Scale, according to the site studied

Site	Cutoff Score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Cardiac surgery	14	67	30	5	95
Internal medicine-surgery	16	100	90	43	100
ICU	16	83	64	61	85
Orthopedic	18	94	60	92	88
Home Care	18	100	34	21	100

PPV = Positive predictive validity, NPV = Negative predictive validity.

(Protocol No. 9.036/2001). Study participants were 53 patients over 18 years of age without PU at the time of admission, who remained hospitalized for at least 48 hours, and signed the Terms of Free Prior Informed Consent or had their participation authorized by the person responsible. The patients who met the criteria for inclusion in the study had the first evaluation within 24 hours of admission, the second evaluation 48 hours after admission and thereafter on alternate days until the development of the PU, discharge or death of the patient. Data collection was performed daily in the morning, including Saturdays, Sundays and holidays. Data were collected by consulting the medical records, Systematization of Nursing Care forms and through the physical examination of the patient. A data collection instrument was developed regarding the dependent variable (pressure ulcer) and its descriptors, such as location and stage of the lesion.

For the classification of the PU, the stages I to IV were considered, according to the recommendations of the National Pressure Ulcer Advisory Panel<sup>(15)</sup>. When hyperemia was identified in sites of bony prominence, the patients had their position changed and were reevaluated after 30 minutes to rule out the possibility of classifying reactive hyperemia as a stage I ulcer. Data were also collected regarding the independent variables (demographic and clinical characteristics of the patients). For the risk assessment, the Braden Scale was applied and the sub-scores were added, resulting in the overall score. Inspection of the skin was performed, preferably during the bodily hygiene procedure, to avoid repeated manipulations in the patient. With regard to ethical issues, when a PU was detected, the researcher always communicated this to the nurse responsible for the patient.

The collected data were transferred to an Excel spreadsheet for analysis using Epi Info and SPSS version 10.0 (SPSS 10.0, 1999). For the statistical analysis, guidance was provided by a specialist professional. Thus, it was considered more appropriate to employ the Predictive

Validity Tests for the Braden Scale scores and the Chi-square Test for Homogeneity ( $\chi^2$ ) for the variable 'type of mattress'. In a secondary analysis of the data, the Chi-square Test for Homogeneity ( $\chi^2$ ) was also used to verify the associations between change in position and presence or absence of PU. The results of the Yates corrected Chi-square test were used when the variables had a frequency less than 5. For the analysis, the significance level used was  $p=0.05$ .

The formulation of the tests of predictive validity was adapted from other authors with the aim of verifying<sup>(16)</sup>: *Sensitivity*: all the subjects who developed PU whose scores were equal to or lower than the cutoff; *Specificity*: all the subjects who did not develop PU, with scores higher than the cutoff, *Positive predictive value (PPV)*: all those who had scores less than or equal to the cutoff and developed PU, *Negative predictive value (NPV)*: those with scores greater than the cutoff who did not develop PU (Table 1).

## RESULTS

During the three months of the study, 61 patients met the inclusion criteria. For the patient to be part of the study, at least two evaluations were necessary. Therefore, 53 patients formed the sample and were evaluated until the appearance of the PU, discharge or death and of these 20 (37.7%) developed a total of 59 ulcers.

### Results regarding the predictive validity of the Braden Scale

The data in Table 2 presents the results of the predictive validity of the tests that had a statistically significant relationship.

At the first evaluation, the predictive validity tests detected the score of 14 as the best balance between sensitivity (95%) and specificity (45%). A score of 16 identified by international studies, as the cutoff score for critical patients, showed 100% sensitivity, but was

**Table 1** - Formulas of the measures of sensitivity, specificity, and positive and negative predictive validity

	Pressure ulcer	
	Yes	No
Positive test (less than or equal to the cutoff score)	<b>A</b> True positive	<b>C</b> False negative
Negative test (greater than the cutoff score)	<b>B</b> False positive	<b>D</b> True negative
Sensitivity:	$\frac{A}{A + B} \times 100$	
Specificity:	$\frac{D}{C + D} \times 100$	
Positive predictivity:	$\frac{A}{A + C} \times 100$	
Negative predictivity:	$\frac{D}{D + B} \times 100$	

practically nonspecific (24%). At the second evaluation, which occurred 48 hours after admission to the ICU, the score of 13 showed the best balance between sensitivity (95%) and specificity (55%). In this evaluation, the score of 16 was again shown to be nonspecific (27%) despite the high sensitivity (100%). At the third evaluation, which occurred 72 hours after admission, the score of 12 demonstrated the best performance with 94% sensitivity and 77% specificity, with 85% and 91% for the positive and negative tests respectively. In this evaluation, there were no patients with a score of 13, and the score of 14 presented low specificity (54%), probably due to the decrease in the sample size as the patients left the study. The score of 16 once again showed 100% sensitivity, however, remained unspecified (23%).

**Table 2** - Results of predictive validity tests applied to the scores of the first (24h), second (48h) and third (72h) evaluations with the Braden Scale. Ribeirão Preto, SP, 2002

Cutoff score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
<b>1<sup>st</sup> evaluation</b>				
13	75	61	54	80
14*	95	45	52	94
15	100	33	48	100
16	100	24	44	100
<b>2<sup>nd</sup> evaluation</b>				
13*	95	55	56	95
14	100	45	53	100
15	100	36	49	100
16	100	27	45	100
<b>3<sup>rd</sup> evaluation</b>				
12*	94	77	85	91
14	100	54	75	100
15	100	46	72	100
16	100	23	64	100

\* cutoff score

**Results regarding the preventive measures**

Considering the need to describe the preventive measures, when performing the application of the predictive validity test, it was identified that, in the ICU, prevention was performed through the use of static air mattresses for all the patients and regular position changes (2/2h) verified in the nursing prescriptions (Table 3).

**Table 3** - Patients, according to preventive measures performed and the presence/absence of PU. Ribeirão Preto, SP, 2002

Preventive measures	Pressure ulcer				Total		$\chi^2$	P Value
	Yes		No		n	%		
	n	%	n	%				
<b>Air mattress</b>								
Yes	15	75	18	55	33	62	2.217	0.136
No	5	25	15	45	20	38		
<b>Change of position</b>								
Yes	4	20	21	12	25	47	9.33	0.002
No	16	80	12	36	28	53		

It was observed that of the 20 patients who developed PUs, 15 (75%) were using air mattresses and 5 (25%) normal foam mattress. For this variable, the statistical test presented no significant difference ( $p=0.136$ ). It should be noted that the position changes were rarely carried out, both for patients with PU (20%) as well as for those without PU (12%). Furthermore, the majority (80%) of the patients with PU did not have their position changed. The statistical test showed a significant difference for this preventive measure ( $p=0.002$ ), revealing that patients who had their position changed, had fewer PUs than those who were not moved.

**DISCUSSION**

In this study, the results of the predictive validity tests showed the scores of 14, 13 and 12 as the most efficient in predicting risk for pressure ulcers, in the first, second and third evaluations with their respective values of sensitivity (95%, 95% and 94%) and specificity (45%, 55% and 77%). After the translation and validation of the BS for the Portuguese language, the authors performed its clinical application with 34 patients in the Intensive Care Unit (ICU) of a university hospital of the municipality of São Paulo, at three moments of the hospitalization. The scores that obtained the best results in the first (24 hours of hospitalization), second (48 hours of hospitalization) and third (78 hours of hospitalization) evaluations were those of 13, 11 and 13 with sensitivity of 87%, 68% and 94%; specificity of 52%, 84% and 89%; Positive Predictive Validity Test (PPVT) of 61%, 78% and 80%; and Negative Predictive Validity Test (NPVT) of 100%, 76% and 94% respectively. Subsequently, the authors applied the test to the mean scores of all the evaluations and the score of 13 also presented the best results (94%, 89%, 80% and 94% for sensitivity, specificity, PPVT and NPVT, respectively). Furthermore, the score of 16, showed high sensitivity (100%), as in our study, but low specificity (21%)<sup>(13)</sup>.

In a study of ICU patients of a general hospital, also in the municipality of São Paulo, the score of 16 presented the best cutoff point, however, showed a sensitivity (67%) and specificity (40%) lower than those found in the present study and in the study which translated the scale to Portuguese, with positive predictive values of 12% and negative of 91%. It was noted that even having verified the score of 16 as the cutoff point, 60% of the patients receiving preventive care were not considered at risk<sup>(17)</sup>. In another study performed in the ICU of a public hospital in the interior of Paraná, where the preventive measures adopted were the change in decubitus position of 2/2 hours and lubricating the skin with sunflower oil. The scores that stood out were of 15 and 13, with the score of 15 presenting a higher predictive value for the tests of sensitivity (100%), specificity (100%) for positive predictive value (100%) and negative predictive value (zero)<sup>(14)</sup>. In a South Korean hospital, 715 patients of a surgical ICU were selected



with inclusion criteria similar to those used in the present study and it was found that the score of 13 showed the best sensitivity (75.9%) and specificity (47.3%). The scores of 16 and 18, showed higher sensitivity (94.0% and 91.6%) but low specificity (11.6% and 22.2%), respectively<sup>(5)</sup>. In a study carried out in ICUs of German hospitals performed in April 2007, the final total score of the Braden Scale revealed that 83% of the patients were at risk for PU, with a score of 20 considered as the cutoff<sup>(18)</sup>. Regarding the preventive measures, it was found that the use of air mattresses did not prevent the development of PUs in 75% of the patients. The tests showed statistically significant differences only for the preventive measure of changing position, this being a protective factor for preventing PUs.

European and American panels (the European Pressure Ulcer Advisory Panel-EPUAP and the National Pressure Ulcer Advisory Panel - NPUAP) have jointly developed guidelines, based on scientific evidence, for the prevention and treatment of PUs. They recommend the use of pressure reducing devices and routine changes of position every two hours for bedridden patients and every hour for patients in a chair. These guidelines show strong evidence for using a low interface pressure mattress rather than a normal mattress with patients at risk of developing PUs<sup>(19)</sup>. Specialized support surfaces (such as mattresses, beds and pillows) help reduce or relieve the pressure that the weight of the body of the patient has on the skin and subcutaneous tissues when they are pressed against the surface of the bed or chair<sup>(20)</sup>.

National and international studies conducted with ICU patients have identified significant<sup>(18)</sup> and non-significant differences<sup>(21)</sup> between special mattresses, change in position and development of PUs. Correlation has been observed between the type of mattress and the change in decubitus position when related to the subscales of mobility and sensory perception, since pressure reduction mattresses and several changes in decubitus position were used when there was an increased risk of the patient developing PUs according to the BS<sup>(17)</sup>.

The position change is fundamental in the PU prevention protocols, and it is recommended that it be performed every two hours. The aim of the repositioning and of the support surfaces is to reduce or eliminate the interface pressure and, thus, to improve the microcirculation in the regions of the body that are at risk<sup>(20)</sup>. The change in decubitus position and hydration

of the skin of patients at risk for PU depend solely on the nurse making the prescription and the implementation of it by the nursing team. These interventions are effective preventive measures to reduce the incidence of PU, according to the results presented in the literature<sup>(22)</sup>.

To avoid the preventive measures interfering with the predictive value of the scales an alternative method would be to try to define two cutoff points and to divide patients into groups of high risk, moderate risk and no risk. Those, for example, with a risk indicated by the score of <17, should receive standard preventive care, while those with risk indicated by a score of <12 should receive additional preventive care<sup>(11)</sup>.

**Study limitations** - in the present study, the size of the sample available and obtaining data from a single hospital limited the verification of the cutoff score in all the evaluations, since the sample was reduced significantly as the patients left the study. Thus, it is intended to expand, in further studies, the sample size and the number of hospitals, in order to obtain the cutoff point of reference for ICU patients.

## CONCLUSION

In this study, it was found that, although the score of 14 presented good performance in the three evaluations, only in the first evaluation did the results of the tests for this score show better balance between sensitivity (95%) and specificity (45%), when compared to the other scores in the same evaluation. Thus, it was not possible to identify the cutoff score for this clientele. It was concluded that the Braden Scale is an instrument that is easy to use and efficient in predicting the risk of PU development in critically ill patients, with adequate sensitivity and specificity and that it can really help the nurse in the decision making process regarding the interventions.

As well as the need for further studies that apply the predictive validity tests, it is necessary to describe the preventive measures used, so that results can be compared. It is understood that the special surfaces used for PU prevention are fundamental, but do not replace the need for regular and appropriate repositioning. These measures should, therefore, be carried out in order to improve comfort and to reduce the risk of developing PUs in the period in which the patient stays in the same position even for a short interval of time.

## REFERENCES

1. Anthony D, Parboteeah S, Saleh M, Papanikolaou P. Norton, Waterlow and Braden scores: a review of the literature and a comparison between the scores and clinical judgement. *J Clin Nurs*. 2008;17(5):646-653.
2. Sharp CA, McLaws ML. Estimating the risk of pressure ulcer development: is it truly evidence based? *Int Wound J*. 2006;3(4):344-53.
3. Wound, Ostomy and Continence Nurses Society (WOCN). Guideline for Prevention and Management of Pressure Ulcers. Glenview (IL): WOCN; 2003. (WOCN Clinical Practice Guidelines Series)
4. Registered Nurses Association of Ontario (RNAO). Risk assessment and prevention of pressure ulcers [Internet]. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005 [cited 2010 Apr 20]. Available from: <http://www.rnao.org/Page.asp?PageID=924&ContentID=816>
5. Cho I, Noh M. Braden Scale: evaluation of clinical usefulness in a intensive care unit. *J Adv Nurs*.

- 2010;66(2):293-302.
6. Ayello EA. Predicting pressure ulcer risk [Internet]. 2007. New York: Hartford Institute for Geriatric Nursing; 2007 [cited 2010 Apr 20]. (Available from: [http://consultgerirn.org/uploads/File/trythis/try\\_this\\_5.pdf](http://consultgerirn.org/uploads/File/trythis/try_this_5.pdf)).
  7. Braden BJ, Maklebust J. Preventing pressure ulcers with the Braden Scale: An update on this easy-to-use tool that assesses a patient's risk. *Am J Nurs*. 2005;105(6):70-2.
  8. Defloor T, Grypdonck MF. Pressure ulcers: validation of two risk assessment scales. *J Clin Nurs*. 2005;14(3):373-82.
  9. Kim EK, Lee SM, Lee E, Eom MR. Comparison of the predictive validity among pressure ulcer risk assessment scales for surgical ICU patients. *Spinal Cord*. 2008;46(3):168-75.
  10. Pancorbo-Hidalgo PL, Garcia-Fernandez FP, Lopez-Medina IM, Alvarez-Nieto C. Risk assessment scales for pressure ulcer prevention: a systematic review. *J Adv Nurs*. 2006;54(1):94-110.
  11. Defloor T, Grypdonck MF. Validation of pressure ulcer risk assessment scales: a critique. *J Adv Nurs*. 2004; 48(6):613-21.
  12. Biblioteca Virtual em Saúde. Descritores em Ciências da Saúde [Internet]. São Paulo: Centro Latino-Americano e do Caribe de Informação em Ciências da Saúde; 2010 [citado 2010 Fev 16]. Disponível em: [http://decs.bvs.br/cgi-bin/wxis1660.exe/decsserver/?IsisScript=../cgi-bin/decsserver/decsserver.xis&interface\\_language=p&previous\\_page=home\\_page&previous\\_task=NULL&task=start](http://decs.bvs.br/cgi-bin/wxis1660.exe/decsserver/?IsisScript=../cgi-bin/decsserver/decsserver.xis&interface_language=p&previous_page=home_page&previous_task=NULL&task=start).
  13. Paranhos WY, Santos VL. Risk assessment for pressure ulcers using the Braden Scale in Portuguese. *Rev Esc Enferm USP*. 1999; 33(Nº Esp):191-206.
  14. Fernandes LM, Braz E. Avaliação de risco para o desenvolvimento de úlcera de pressão em pacientes internados em um centro de terapia intensiva. *Cogitare Enferm*. 2002;7(1):17-22.
  15. Pressure ulcers prevalence, cost and risk assessment: consensus development conference statement - The National Pressure Ulcer Advisory Panel. *Decubitus*. 1989;2(2):24-8.
  16. Bergstrom N, Demuth PJ, Braden BJ. A clinical trial of the Braden Scale for Predicting Pressure Sore Risk. *Nurs Clin North Am*. 1987;22(2):417-28.
  17. Petrolino, H. M. B. S. Úlcera de pressão em pacientes de Unidade de Terapia Intensiva: incidência, avaliação de risco e medidas de prevenção [dissertação]. São Paulo: Universidade de São Paulo, Escola de Enfermagem; 2002.
  18. Shahin ES, Dassen T, Halfens RJ. Pressure ulcer prevention in intensive care patients: guidelines and practice. *J Eval Clin Pract*. 2009;15(2):370-4.
  19. European Pressure Ulcer Advisory Panel (EPUAP). Prevention and treatment of pressure ulcers: quick reference guide [Internet]. 2009. Washington DC: National Pressure Ulcer Advisory Panel; 2009 [cited 2010 Apr 2]. Available from: [http://www.epuap.org/guidelines/QRG\\_Prevention\\_in\\_english.pdf](http://www.epuap.org/guidelines/QRG_Prevention_in_english.pdf)
  20. Reddy M, Gill SS, Rochon PA. Preventing pressure ulcers: a systematic review. *JAMA*. 2006;296(8):974-84.
  21. Fernandes LM, Caliri MH. Using the Braden and Glasgow Scales to predict pressure ulcer risk in patients hospitalized at intensive care units. *Rev Latinoam Enferm*. 2008;16(6):973-8.
  22. Diccini S, Camaduro C, Iida LI. The incidence of pressure ulcer in neurosurgical patients from a university hospital. *Acta Paul Enferm*. 2009; 22(2):205-9.