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RESEARCH

Pressure ulcers in critically ill patients: incidence and associated factors

Úlcera por pressão em pacientes críticos: incidência e fatores associados

Úlceras de presión en pacientes críticamente enfermos: incidencia y factores asociados

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RESUMEN

Objetivo: identificar la incidencia y describir los factores asociados con las úlceras de presión en pacientes críticamente enfermos. **Métodos**: es un estudio de cohorte prospectivo con 77 pacientes, uso clínico, metabólico y factores asociados a la evaluación de las úlceras de presión, la aplicación de las escalas de riesgo (Braden y Waterlow) y clasificación en categorías de las úlceras. **Resultados:** se encontró una incidencia del 22% (IC del 95%: 12.6-31.5), y el 17 con 32 úlceras por presión en la región sacra (47%) y Clase I (72%). Duración de la estancia superior a 10 días (71%), tipo de hospital quirúrgico (53%), insuficiencia cardíaca congestiva (24%) y alto riesgo en la escala de Braden (59%). **Conclusión:** el estudio pone de manifiesto la alta incidencia de úlceras de presión, clínicas, metabólicas y factores asociados y el resultado de muerte, lo que requiere, por lo tanto, de medidas preventivas.

Descriptores: Úlcera de Presión; Evaluación de Riesgos; Escalas; Cuidados de Enfermería; Incidencia.

RESUMO

Objetivo: identificar a incidência e descrever os fatores associados à úlcera por pressão em pacientes críticos. **Método:** trata-se de uma coorte prospectiva, com 77 pacientes, usando a avaliação clínica, metabólica e de fatores associados à úlcera por pressão, aplicando as escalas de risco (Braden e Waterlow) e classificando as úlceras em categorias. **Resultados:** constatou-se uma incidência de 22% (IC 95% 12,6 – 31,5), sendo 17 com 32 úlceras por pressão em região sacral (47%) e na categoria I (72%). Tempo de internação maior que 10 dias (71%), tipo de internação cirúrgica (53%), insuficiência cardíaca congestiva (24%) e alto risco na Escala de Braden (59%). **Conclusão:** ressalta-se a elevada incidência de úlcera por pressão, características clínicas, metabólicas e fatores associados, além do desfecho por óbito, necessitando, portanto, de medidas de prevenção.

Descritores: Úlcera por Pressão; Medição de Risco; Escalas; Cuidados de Enfermagem; Incidência.

ABSTRACT

Objective: to identify the incidence and describe the associated factors for pressure ulcers in critically ill patients. **Method:** this was a prospective cohort study with 77 patients, using a clinical, metabolic assessment and the associated factors for pressure ulcer, applying the risk scales (Braden and Waterlow) and assigning ulcers to categories. **Results:** an incidence of 22% (95% CI 12.6 - 31.5), with 17 patients with 32 pressure ulcers in the sacral region (47%), and of Class I (72%). The length of stay was greater than ten days (71%), most admissions were surgical (53%) or for congestive heart failure (24%), and were high risk on the Braden Scale (59%). **Conclusion:** the study highlights the high incidence of pressure ulcers, clinical and metabolic characteristics and associated factors, as well as the outcome of death, requiring, therefore, preventive measures.

Descriptors: Pressure Ulcer; Risk Assessment; Scales; Nursing Care; Incidence.

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INTRODUCTION

Pressure ulcers (PU) are injuries of the skin and/or underlying tissue, which normally occur on bony prominence sites, due to frictional forces (pressure, friction and shearing), with contributing factors that are still not clearly elucidated[1]. The prevention of PU is an essential action, as this injury causes pain and discomfort to the patient and family, and can delay recovery. The treatment generates costs to the institution and an increase in the nursing workload[2].

It is a common phenomenon among hospitalized people across the world in different health contexts[3], especially among those hospitalized in the intensive care unit, where it represents an additional threat to patients already physiologically compromised[4]. Recent international studies show an incidence of 14.3% and 18.7%[4-5] and in national studies, the incidence is 23.1% and 59.5%[6-7].

Patients in intensive care units (ICU) are the most disadvantaged for maintaining intact skin beginning on the first day of admission[8], being at high risk, mainly due to limited mobility and physical activity[5].

Risk factors that contribute to the development of PU have been studied, but the combination of risk factors that best predict its impact is still poorly understood[9]. Thus, studies regarding the occurrence of this disease with different populations must be conducted[6].

To facilitate the identification of the influence of the most common factors associated with the development of PU, and to stratify the risk with subsequent implementation of preventive actions, risk assessment scales have been developed, including the Braden[10] and Waterlow[11] Scales, which are the most used in Brazil, and are effective for use in hospitalized individuals.

Given these projections of a high incidence among critically ill patients, the objectives of this study were to identify the incidence of PU and describe the factors associated with its development in adults hospitalized in intensive care units of a university hospital in Vitória, Espírito Santo.

METHOD

Ethical aspects

The Research Ethics Committee of the institution approved the study.

Design, study site and period

This was a prospective cohort study, in which the patients from intensive care units of the University Hospital of Vitória, ES, were evaluated, for a period of four months.

Sample, inclusion and exclusion criteria

The sample was 77 patients. The study enrolled patients older than 18 years who were free of PU on admission. Those patients without metabolic profile laboratory tests were excluded from the cohort.

Study protocol

The researcher collected the data during the entire process, from admission to discharge or to the patient's death. Techniques of documentary analysis, interviews, and direct observation of the skin and ulcers were used. The instrument was composed of four parts: the first includedsocio-demographic data; the second, general and metabolic clinical data; third, results of the Waterlow and Braden scales; and the fourth, data for the assessment and classification of the PU as National Pressure Ulcer Advisory Panel NPUAP[1]. When PU development was identified, the nurse in charge was reported to implement specific therapeutic approaches.

Among the socio-demographic data investigated, the variables analyzed were: sex; age; skin color; hospital unit; marital status; education; and work situation. Established general clinical data included: length of stay; type of hospitalization; clinical diagnosis; body mass index (BMI); presence or absence of diabetes mellitus, smoking and congestive heart failure (CHF); type of diet; use or lack of mechanical ventilation, noradrenaline, sedation and the outcome. To investigate metabolic data, the following variables were observed: hemoglobin; hematocrit; lymphocyte cell count; albumin and transferrin. The factors related to PU about the categories, the number of ulcers, and location were described. The Waterlow and Braden scales were administered.

The Waterlow Scale evaluates seven key topics: weight/height ratio (BMI); visual assessment of skin at risk areas; sex/age; continence; mobility; appetite; and medications, as well as four items that punctuate special risk factors: tissue malnutrition, neurological deficit, surgical time lasting more than two hours, and trauma below the lumbar cord. The higher the score, the higher the risk of developing PU; results were stratified into three groups: at risk (10 to 14), high risk (15 to 19), and very high risk (≥ 20)[11].

The Braden Scale included six parameters: sensory perception, moisture, activity and mobility, nutrition, friction and shearing. Each parameter is assigned a score ranging from 1 to 4, in total the score ranges are: risk ($>$ 16), moderate risk (12-16), and high-risk ($\leq$ 11). Thus, lower values indicate the worst conditions[10].

Analysis of the results and statistics

The data were organized in the Microsoft Office Excel 2007 for Windows program, and subsequently analyzed using the Stata Version 11.0 program (Stata Corp, College Station, TX, USA, 2001). Sociodemographic, clinical and metabolic variables, description of the event, the location and category of pressure ulcers were analyzed. The process of analysis of the study data was divided into two stages. The PU incidence calculation was performed first; then, the bivariate analysis was conducted to identify significant variables with $p < 0.20$. In the second stage, the significant results of the bivariate analysis were subjected to logistic regression analysis, with $p < 0.05$.

The incidence of calculation was performed by dividing the number of new PU cases in the units evaluated, by the number of patients who were hospitalized in intensive care units during the study period.

For the bivariate analysis of the data, normality and homoscedasticity of data using the Kolmogorov-Smirnov test and

Levene test were evaluated, respectively. Then, the frequency distribution, measures of central tendency of the association between explanatory variables and the dependent variable (PU or lack of PU) were calculated, using the chi-square test or Fisher's exact test for categorical variables, and the Student t-test for continuous variables. Statistical significance was based on the descriptive value of the test (*p*), assuming a significance of 20%.

In the multivariate analysis, logistic regression by stepwise method was performed to determine the independent effect of the associations by means, of the odds ratio (OR), with a 95% confidence interval and a significance level of 0.05.

RESULTS

Between March and June of 2013, 87 patients were admitted to intensive units of HUCAM; ten subjects were excluded, according to inclusion and exclusion criteria. A total of 77 individuals were investigated, and 17 developed pressure ulcers, corresponding to an incidence of 22% (95% CI 12.6 - 31.5) (Figure 1).

A gender balance was identified, with 39 (51%) women and 38 (49%) men; there was a predominance of: married individuals, 46 (60%); with elementary school education, 45 (58%); currently employed, 42 (55%).

The bivariate analysis of the data showed that of the patients with PU: nine (53%) were aged > 60 years, with a mean of 61.3 years; ten (59%) were male; 14 (82%) were Caucasian; and 15 (88%) were hospitalized in the ICU, according to Table 1.

Regarding the clinical variables (Table 2), 12 (71%) patients developed a PU ($p < 0.05$), with a length of stay greater than ten days. The average length of stay was 31.7 days, ranging from five to 110 days, while in the group that did not develop a PU, 47 (78%) spent less than ten days in the ICU, with an average of 7.3 days, ranging from two to 37 days.

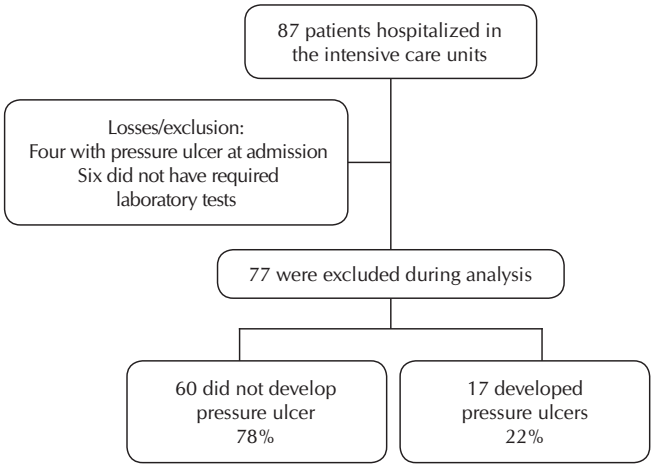

Figure 1 – Flowchart of participation in the study, Vitória, Espírito Santo, Brazil, 2013

Of the patients who developed a PU, nine (53%) were surgical cases. In both groups, most hospitalizations were for surgical reasons, with the most common clinical diagnoses of gastrointestinal and cardiorespiratory reasons, without statistical significance.

Among the five patients with congestive heart failure (CHF), four of them developed PU. Among the 17 individuals who developed PU, ten (59%) had death as the outcome($p < 0.05$).

The variables of BMI, diabetes mellitus/comorbidities, smoking, type of diet, use of mechanical ventilation and sedation were not statistically significant in this study.

In the group with a PU, 15 (88%) had a hemoglobin higher than 8.0 g/100 ml, with a mean of 9.4 g/100 ml; 14 (82%)had a hematocrit above 24%, and a mean of 28.2%; 12 (71%) had

Table 1 - Bivariate analysis of demographic data of patients with and without pressure ulcers, Vitória, Espírito Santo, Brazil, 2013

Variables	With pressure ulcer		Without pressure ulcer		*P* value
	n	%	n	%	
Age					
< 60	8	47	32	53	0.785
> 60	9	53	28	47	
Sex					
Female	7	41	32	53	0.421
Male	10	59	28	47	
Skin color					
White	14	82	39	65	0.24
Non-white	3	18	21	35	
Unit					
Intermediate unit – IU	2	12	14	23	0.499
Intensive care unit – ICU	15	88	46	77	

a lymphocyte cell count below 1200/mm^3; 16 (94%) had an albumin level below 3.5 g/dl, and an mean of 2.65 g/dl; and ten (59%) presented transferrin below 100 mg/dl, with a mean of 134 mg/dl (Table 2).

In the group of patients without PU, the variables presented with similar results, with only a slight variation in the average value of albumin, which was 2.95 g/dl, and transferrin, which was 162 mg/dl. These results were not statistically significant.

Table 2 – Bivariate analysis of clinical and metabolic data of patients with and without pressure ulcers, Vitória, Espírito Santo, Brazil, 2013

Variable	With pressure ulcer		Without pressure ulcer		*P* value
	n	%	n	%	
Length of stay					
< 10 days	5	29	47	78	0.000
≥ 10 days	12	71	13	22	
Type of admission					
Surgical	9	53	44	73	0.141
Clinical	8	47	16	27	
Clinical diagnosis					
Gastrointestinal	8	47	31	51	0.427
Cardiorespiratory	5	29	18	30	
Urogynecological	1	6	4	7	
Rheumatic/Hematologic	2	12	4	7	
Neuroinfectious	1	6	3	5	
BMI					
Normal (18.5 – 24.9)	6	35	27	45	0.463
More than Average (25 – 29.9)	4	24	18	30	
Obese (>30)	3	17	9	15	
Below the average (<18.5)	4	24	6	10	
Diabetes mellitus					
Yes	4	24	11	18	0.73
No	13	76	49	82	
Smoking					
Yes	3	18	20	33	0.248
No	14	82	40	67	
CHF					
Yes	4	24	1	2	0.008
No	13	76	59	98	
Type of diet					
None	10	59	40	68	0.84
Enteral	6	35	14	23	
Oral	1	6	4	7	
Parenteral	0	0	2	3	
Mechanical ventilation					
Yes	6	35	16	27	0.548
No	11	65	44	73	
Noradrenalin					
Yes	5	29	7	12	0.123
No	12	71	53	88	
Sedation					
Yes	3	18	8	13	0.699
No	14	82	52	87	
Outcome					
Hospital discharge	7	41	51	85	**0.001**
Death	10	59	9	15	

To be continued

Table 2 (concluded)

Variable	With pressure ulcer		Without pressure ulcer		*P* value
	n	%	n	%	
Hemoglobin					
> 8.0 g/100 ml	15	88	53	88	1.0
< 8.0 g/100 ml	2	12	7	12	
Hematocrit					
> 24%	14	82	52	87	0.699
< 24%	3	18	8	13	
Lymphocyte cell count					
> 1,200/mm³	5	29	14	23	0.751
< 1,200/mm³	12	71	46	77	
Albumin					
> 3.5 g/dl	1	6	12	20	0.276
< 3.5 g/dl	16	94	48	80	
Transferrin					
> 100 mg/dl	7	41	30	50	0.54
< 100 mg/dl	10	59	30	50	

Table 3 – Bivariate analysis of risk levels on the Waterlow and Braden scales in patients with and without pressure ulcers, Vitória, Espírito Santo, Brazil, 2013

Variable	With ulcer		Without ulcer		*P* value
	n	%	n	%	
Risk level					
Waterlow					
Risk (10-14)	5	29	27	45	0.397
High risk (15-19)	9	53	21	35	
Very high risk (≥ 20)	3	18	12	20	
Braden					
Risk (> 16)	1	6	9	15	**0.003**
Moderate risk (12-16)	6	35	41	68	
High risk (≤11)	10	59	10	17	

Among the patients with low albumin, 18 (95%) died and 43 (81%) were surgical cases, but there was no statistical significance.

Table 3 shows the bivariate analysis of risk levels in the Waterlow and Braden scales. The mean score for the group with PU was 16.8 points on the Waterlow scale, with nine (53%) at high risk for the development of PU. In the group of patients without PU, the mean score was 15.7 (high risk), with 27 (45%) of them at risk. For the Braden Scale, the mean score for those with PU was 11 (high risk), with a median of 10, and a range of 6-19, with a predominance of individuals (11, 59%) with a high level of risk. For the group without PU, the mean score was 13.9, with a median of 14, a range 8-20, and 41 (68%) patients with moderate risk.

For the sociodemographic, clinical and metabolic variables with p-value <0.2, when associated with pressure ulcer development, the logistic regression was performed: length of stay, type of hospitalization, CHF, norepinephrine and presence of risk on the Braden Scale. However, at the end of the regression, none of the variables remained significant.

During the follow-up period, 32 PU were identified in the patients. Among the group that developed ulcers, nine (53%) had only one ulcer; four (23%) showed two; and two (12%) had three or four. The largest numbers of ulcers were in the sacral region 15 (47%), followed by six (19%) in the trochanteric region, and five (16%) in the malleolus. Regarding the categories, 23 (72%) of the PU were class I, six (19%) were class II, and three (9%) had suspected deep tissue injury (sDTI).

DISCUSSION

The incidence of pressure ulcers among critically ill patients in this study was 22%, with length of stay, type of hospitalization, having CHF, norepinephrine use, and risk score on the Braden Scale as significant variables by bivariate analysis. Most patients only developed one PU, with a predominance of lesions in the sacral region, classified as class I.

The results of this study on the incidence of PU in critical patients remain high. However, the literature mentions an incidence ranging from 14.3% to 62.5% in this population, among national and international studies, with most ulcers classified in classes I and II[4-7,12].

The variation between the incidences is mainly due to the type of patient assessed – whether surgical or clinical, chronic or critical – in addition to the fact that some studies excluded class I PU. However, in this study, the complete NPUAP classification[1] was considered, especially in the understanding that an injury had occurred to the tissue, even though it might be reversed with the specific actions for pressure relief.

The age variable was not statistically significant in this investigation; however, a median of advanced age (60 years) was observed, especially in the group of patients with PU, in patients older than 60 years, according to other studies[4-5]. Literature findings demonstrate that the elderly are the most prone to the development of PU, due to decreased skin elasticity, insufficient skin hydration, and changes in sensitivity, as well as other factors that may be aggravated when associated to chronic diseases[13].

A higher occurrence of PU in men and white individuals occurred, which corroborates the study of Blanes et al.[14]; however, these variables are still controversial in the literature.

Most patients with PU evolved to death. This information indicates important aspects in the analysis of the phenomenon, such as the severity of clinical conditions of these patients, the length of stay in the intensive care unit, no diet, metabolic and blood profile, and comorbidities, among other factors that potentiate the risks and that may or may not be associated with the presence of PU. These risk factors, both intrinsic and extrinsic, are relevant to the patient care and service management. Studies indicate high cost of treatment for hospitalized patients with PU[15].

The condition of having CHF was associated with the occurrence of PU in this study, and was an important factor, because the clinical manifestations of this condition can interfere with peripheral circulation and tissue perfusion[16], and the use of medications such as noradrenaline, that, according to a study of Cox[4] was a significant predictor for PU.

Several additional factors may influence the development of pressure ulcers, especially when they interfere with tissue tolerance to pressure, such as diabetes mellitus[17] and smoking[12]. Changes in BMI may also be related, as it is known that in patients with reduced body mass, an impairment in protection of areas of bony prominence can be present; however, in this study, these variables were not associated[2].

Although the metabolic variables were not significant, the study sample showed low values for the lymphocyte cell count, albumin and transferrin, and the values of hematocrit and hemoglobin, used as references, were low when analyzed as nutritional markers, but acceptable in the clinical management of critically ill patients. These nutritional markers, commonly, are noted among ICU patients due to prolonged fasts, their catabolic and hypercatabolic states, surgeries, and the change in food intake or weight loss, which are factors often altered from time of admission. However, change in the nutritional status is considered a relevant factor in the formation of PU, contributing to reduce tissue tolerance to pressure[12].

Most of the surgical patients, and those who died, had low albumin values, which indicated the need for a better preoperative assessment, given the importance of this protein in wound healing and in maintaining the stability of body fluids in the vascular spaces, also considering that the surgical patient presents relevant variables, such as time of anesthesia and surgery classification for the development of PU[18].

The PU risk assessment scales are important tools in nursing care, as they demonstrate vulnerabilities, reinforce the importance of continuous evaluation, and promote prevention mechanisms[7]. In this study, among the evaluated scales, only the Braden Scale risk score by was associated with the PU, although this was not the purpose of the study.

Regarding the location of the PU, the findings corroborate national and international studies[4-6,19-20], in which prevalence is evident of PU in the sacral, trochanteric and calcaneal region, considered the location of support when the patient is in a supine or lateral position (common position in critically ill patients). The class is also an aspect that displays the difference among studies; some are similar to the present study, in which most ulcers were classified as class I[5,12] , and others point to the predominance of class II[4,6-7,19]. Although the methodology of the study was not aimed at monitoring the evolution of the PUs, most were reversed, and only seven evolved to more advanced classes.

The limitations of this study were: the small number of patients, which may have interfered in identifying possible risk factors, and the temporary closing of the institution's emergency room during data collection, which favored the hospitalization mainly of surgical patients in the ICU. In contrast, the strengths of this study were performing a pilot study for adjustment of the instruments and uniformity in the assessment and classification of pressure ulcers and data collection performed only by the researcher, which builds theoretical and practical experience with the subject and professional with the critical patient.

Identifying the incidence of pressure ulcers is essential to demonstrating the relevance of this adverse event in hospitals, and a challenge for nurses at the bedside providing care, as well as a quality indicator of care for managers of services. The systematic collection of these indicators in health services is closely linked to methodologies of evaluation of care processes and those related to patient safety.

Investigations with this theme can promote discussion in the academic and scientific community in order to expand the knowledge of nursing technologies for pressure ulcer prevention and skills for the clinical practice.

CONCLUSION

A high incidence of pressure ulcers was found in the population studied, as well as the identification of clinical and metabolic characteristics of patients, and factors associated with PU development; the need for surgical patients to be better assessed for their clinical and metabolic conditions as well as the incidence of PU, demonstrate the need for studies on the phenomenon, as well as studies using protocols and care with the use of appropriate technologies in order to reduce the incidence in critically ill patients, as the cost of prevention will be lower than that necessary for the treatment of injuries.

Other studies with different populations and scenarios will allow the knowledge of the true extent of this problem in the country, in order to provide subsidies for the construction of prevention strategies based on protocols not only in the field of study, but also to compose a national public policy.

REFERENCES

1. National pressure ulcer advisory panel and European pressure ulcer advisory panel. Prevention and treatment of pressure ulcer: Clinical Practice Guidelines. Washington, DC: Nacional Pressure Ulcer Advisory Panel; 2009.
2. Miyazaki MY, Caliri MHL, Santos CB. Knowledge on pressure ulcer prevention among nursing professionals. Rev Latino-Am Enfermagem [Internet]. 2010[cited 2014 Dec 16];18(6):1203-11. Available from: http://www.scielo.br/pdf/rlae/v18n6/22.pdf
3. Shahin ES, Dassen T, Halfens RJE. Pressure ulcer prevalence and incidence in intensive care patients: a literature review. Nurs Crit Care [Internet]. 2008[cited 2014 Dec 16];13(2):71-9. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1478-5153.2007.00249.x/abstract
4. Cox J. Predictors of pressure ulcer in adult critical care patients. Am J Crit Care [Internet]. 2011[cited 2014 Dec 16];20(5):364-74. Available from: http://ajcc.aacnjournals.org/content/20/5/364.long
5. Sayar S, Turgut, S, Dogan H, Ekici A, Yurtsever S, Demirkan F, et al. Incidence of pressure ulcers in intensive care unit patients at risk according to the Waterlow scale and factors influencing the development of pressure ulcers. J Clin Nurs [Internet]. 2009[cited 2014 Dec 16];18(5):765-74. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2702.2008.02598.x/abstract
6. Rogenski NMB, Kurcgant P. The incidence of pressure ulcers after the implementation of a prevention protocol. Rev Latino-Am Enfermagem [Internet]. 2012[cited 2014 Dec 16];20(2):333-9. Available from: http://www.scielo.br/pdf/rlae/v20n2/16.pdf
7. Araújo TM, Araújo MFM, Caetano JA. Comparison of risk assessment scales for pressure ulcers in critically ill patients. Acta Paul Enferm [Internet]. 2011[cited 2014 Dec 16];24(5):695-700. Available from: http://www.scielo.br/pdf/ape/v24n5/en_16v24n5.pdf
8. Estilo MEL, Angeles A, Perez T, Hernandez M, Valdez M. Pressure ulcers in the Intensive Care Unit: new perspectives on an old problem. Crit Care Nurse [Internet]. 2012[cited 2014 Dec 16];32(3):65-70. Available from: http://ccn.aacnjournals.org/content/32/3/65.long
9. Benoit R, Mion L. Risk factors for pressure ulcer development in critically ill patients: a conceptual model to guide research. Res Nurs Health [Internet]. 2012[cited 2014 Dec 16];35:340-62. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22511327
10. Paranhos WY, Santos VL. Avaliação de risco para úlceras por pressão por meio da Escala de Braden, na língua portuguesa. Rev Esc Enferm USP. 1999;33(esp):191-206.
11. Rocha ABL, Barros SMO. Avaliação de risco de úlcera por pressão: propriedades de medida da versão em português da escala de Waterlow. Acta Paul Enferm [Internet]. 2007[cited 2014 Dec 16];20(2):143-50. Available from: http://www.scielo.br/pdf/ape/v20n2/a06v20n2.pdf
12. Fernandes LM, Caliri MHL. Using the braden and glasgow scales to predict pressure ulcer risk in patients hospitalized at intensive care units. Rev Latino-Am Enfermagem [Internet]. 2008[cited 2014 Dec 16];16(6):973-8. Available from: http://www.scielo.br/pdf/rlae/v16n6/06.pdf
13. Moraes GLA, Araújo TM, Caetano JA, Lopes MVO, Silva MJ. Evaluation of the risk for pressure ulcers in bedridden elderly at home. Acta Paul Enferm [Internet]. 2012[cited 2014 Dec 16];25(spe1):7-12. Available from: http://www.scielo.br/pdf/ape/v25nspe1/02.pdf
14. Blanes L, Duarte IS, Calil JA, Ferreira LM. Avaliação clínica e epidemiológica das úlceras por pressão em pacientes internados no Hospital São Paulo. Rev Assoc Med Bras [Internet]. 2004[cited 2014 Dec 16];50(2):182-7. Available from: http://www.scielo.br/pdf/ramb/v50n2/20781.pdf
15. Lima ACB, Guerra DM. [Evaluation of the cost of treating pressure ulcers in hospitalized patients using industrialized dressings]. Ciênc Saúde Colet [Internet]. 2011[cited 2014 Dec 16];16(1):267-77. Available from: http://www.scielo.br/pdf/csc/v16n1/v16n1a29.pdf Portuguese.
16. Rogensky NMB, Santos VLCG. Estudo sobre a incidência de úlceras por pressão em um hospital universitário. Rev. Latino-Am Enfermagem [Internet]. 2005[cited 2014 Dec 16];13(4):474-80. Available from: http://www.scielo.br/pdf/rlae/v13n4/v13n4a03.pdf
17. Zambonato BP, Assis MCS, Beghetto MG. Association of Braden subscales with the risk of development of pressure ulcer. Rev Gaúcha Enferm [Internet]. 2013[cited 2014 Dec 16];34(2):21-8. Available from: http://www.scielo.br/pdf/rgenf/v34n2/en_v34n2a03.pdf
18. Ursi ES, Galvão CM. Occurrence of pressure ulcers in patients undergoing elective surgeries. Acta Paul Enferm [Internet].

2012[cited 2014 Dec 16];25(5):653-9. Available from: http://www.scielo.br/pdf/ape/v25n5/en_aop2112.pdf

19. Diccini S, Camaduro C, Iida LIS. [The incidence of pressure ulcer in neurosurgical patients from a university hospital]. Acta Paul Enferm [Internet]. 2009[cited 2014 Dec 16];22(2):205-9. Available from: http://www.scielo.br/pdf/ape/v22n2/a14v22n2.pdf

20. Matos LS, Duarte NLV, Minetto RC. [Incidence and prevalence of ulcer for pressure in CTI of a Public Hospital of DF]. Rev RENE [Internet]. 2010[cited 2014 Dec 16];12(4):719-26. Available from: https://www.fen.ufg.br/fen_revista/v12/n4/pdf/v12n4a18.pdf