Skin inspection for evaluating the presence of risk indicators to developing pressure ulcers

AUTHORS

Francisca Aline Arrais Sampaio Santos
RN, PhD
Nursing Professor, Federal University of Maranhão, Brazil.
alinearrais@hotmail.com

Allyne Fortes Vitor
RN, PhD
Nursing Professor, Federal University of Rio Grande do Norte, Brazil.
allynefortes@yahoo.com.br

Iane Ximenes Teixeira
RN
Master Student, Federal University of Ceará, Brazil.
ianeximenes@yahoo.com.br

Renata Pereira de Melo
RN, MSN
Doctoral Student, Federal University of Ceará, Brazil.
CAPES scholarship.
renatameloufc@yahoo.com.br

Marcos Venícios de Oliveira Lopes
RN, PhD
Nursing Professor, Federal University of Ceará / Brazil.
marcos@ufc.br

KEY WORDS

Nursing, Outcome Assessment, Skin, Pressure Ulcer.

ABSTRACT

Objective
The skin of patients with multisystem trauma or spinal cord injury was inspected in order to evaluate the presence of indicators of risk for pressure ulcer development associated with the Nursing Outcomes Classification (NOC) descriptor 'Tissue Integrity: Skin and Mucosa'.

Design and setting
A cross-sectional descriptive study performed in a tertiary referral hospital integrated into the public health network of Fortaleza, Ceará state, Brazil.

Subjects
Forty-nine patients with multisystem trauma or spinal cord injury.

Results
Most participants were young men with multisystem trauma. The majority used pressure redistribution devices; the most common was a pyramidal mattress. Among NOC indicators for tissue integrity, texture showed the most change, followed by tissue temperature. The sacral region showed the greatest change in colour and temperature, and the scapulas showed the greatest change in temperature. Seventy-five percent of subjects had a final score of 5:5, indicating non-compromised skin.

Conclusion
Classification parameters were developed based on NOC indicators and their applicability in our patients was verified. Use of the NOC skin integrity outcomes may be an effective method for identifying risk indicators for pressure ulcer development.

INTRODUCTION

Using the nursing process to establish a protocol for prevention or treatment of pressure ulcers (PU) is in its early stages in several countries. Existing nursing research focusing on PU in Brazil is limited (Costa et al 2005), and most studies focus on treatment rather than prevention. The failure to use the care-oriented nursing process with this type of wound may contribute to the scarcity of studies by nurses. One way to facilitate the application of the nursing process is by using established nursing care taxonomies. One such taxonomy is the Nursing Outcomes Classification (NOC), developed in 1991 by a research team in Iowa to implement practices specific to nursing that were different from the traditional clinical practice (http:www.nursing.uiwoa.edu).

In addition to helping guide outcome dependent nursing interventions directed toward the individual, family, or community, NOC indicators may be used to assess the patient's baseline condition. Therefore, it is necessary to evaluate specific indicators to determine whether they are indicative of the outcome of interest. 'Tissue Integrity: Skin and Mucous Membranes' is an important outcome within the NOC taxonomy (Moorhead et al 2003). Maintaining skin integrity, including prevention of PU is a key element of nursing management in the hospital, rehabilitation center, or long-term care facility. When compared to treatment, PU prevention reduces costs, decreases hospital length of stay, and avoids the morbidity associated with these significant wounds.

Previous studies suggest that Stage I PU tend to be underreported (Rogenski and Santos 2005; Ferreira 2001). In addition, Stage I and II PU may be confused with incontinence associated dermatitis when they occur in the sacral region of persons with urinary or faecal incontinence. Nevertheless, it is important to accurately differentiate the underlying aetiology of skin damage because of differences in prevention and treatment. This distinction is especially important for patients with other risk factors for pressure ulceration, such as immobility and diminished coetaneous sensations frequently seen in patients with spinal cord injury or multisystem trauma.

One of the instruments recommended to verifying the pressure ulcer risk is Gosnell's Scale (Gosnell 1989). A prospective study that compared the predictive validity of four scales for the pressure ulcer risk concluded that Gosnell's Scale was the most appropriate of the 4 scales for predicting PU risk in orthopaedic and neurologic populations (Jalali and Rezaie 2005). This scale is base on five criteria for rating PU (Mental status, Continence, Activity, Mobility, and Nutrition). Under each criterion are subcategories that are given points. At the end of the assessment the points are added up, and the minimum is five points that represent a low risk for PU and the maximum is 20 points that represent a high risk for PU (Gosnell 1989).

On the other hand, there are no studies comparing the concurrent validity of NOC indicators related with the tissue integrity and other predictive scales for pressure ulcer risk. The use of NOC indicators also may help identify clinical signs that aid the nurse to assess risk indicators for loss of skin integrity via development of a PU. Although the NOC taxonomy is well known in the United States of America, it is in an initial phase of implementation in other countries. Therefore, in the present study, skin inspections in patients with multisystem trauma or spinal cord injury were performed in order to evaluate the presence of risk indicators for PU development using a questionnaire that incorporated indicators of the NOC descriptor 'Tissue Integrity: Skin and Mucosa'.

METHODS

A cross-sectional study was conducted in a public emergency hospital that specialises in trauma care located in Fortaleza, Ceará, in north-eastern Brazil. The research sample comprised patients with spinal cord injury or multisystem trauma who were conscious, capable of expressing themselves verbally, and 14 to 65 years

of age. These criteria were selected to ensure a relatively homogeneous sample, and to avoid age-related factors affecting PU risk at the extremes of life. Study procedures were approved by the Research Ethics Committee at Federal University of Ceará; informed consent was obtained from each participant.

The sample size was calculated from an equation developed for cross-sectional studies (Hulley et al 2003). This equation is based on an assumption that subjects are drawn from an infinite population. Our sample was calculated using a significance level of .05 and a sampling error of 10%. A PU prevalence rate of 85% for the calculation was used, based on the findings by Ferreira (2001), which identified a range of PU prevalence rates in paraplegic and quadriplegic patients between 25% and 85% (incorporating all PU stages). Calculation of the equation based on these parameters yielded a sample size of 49 individuals.

The exclusion criteria were one or more Stage II, III or IV PU based on the National Pressure Ulcer Advisory Panel (http:www.npuap.org/resources.htm) or having missing data on the questions on the form used in this study. Presence of a Stage I PU was not an exclusion criterion since these lesions did not involve a compromise of the skin's integrity.

Data were collected using a standardised form that included the indicators for 'Tissue Integrity: Skin and Mucous Membranes', defined in the NOC scheme (Moorhead et al 2003). The form was designed to identify factors indicating an increased likelihood of developing a PU (Appendix A). The indicators of 'Skin intactness', 'Sensation', 'Hydration', 'Elasticity', 'Colour', 'Texture', and 'Hair growth' were selected in order to better evaluate their ability to predict PU occurrence. The indicator 'Continence' was added because of its association with PU occurrence. Additional information was obtained from the participant's medical records and from direct queries. The indicators were measured using a 1-to-5 point Likert scale, where one represented the most unhealthy response and five the most healthy response. A total score was calculated by summing the score of each item.

Data Analysis

Data analysis was performed in two stages, using the SPSS 13.0 software. In the first stage, demographic and pertinent clinical findings were described. In the second stage, the 'Tissue Integrity: Skin and Mucosa outcome' was evaluated using scores from the NOC indicators. For a general evaluation of the main outcome, values of central tendency and variability were calculated. The Kolmogorov-Smirnov test was used to evaluate the symmetry of the NOC scores. In addition, absolute and relative frequencies were calculated for each indicator and sub-indicator.

To verify the concurrent validity, the data of NOC indicators were compared with the indicators of Gosnell's scale. The value final scores of Gosnell's scale were evaluated previously regarding the symmetry. Afterwards, it was verified the correlation (Pearson' coefficient) and the consistency (Cronbach's Alpha) between the final scores of the two scales.

FINDINGS

Forty-nine individuals participated in the study. The majority (n =46) were male. Their mean age was 32.4 years ± 11.31 (mean ± SD). They completed an average of 7.02 ± 4.3 years of education. Most were victims of multisystem trauma (77.6%), or spinal cord injury (20.4%). Almost half of the group (42.9%) were unable to bathe themselves. Their average fluid intake was 1592.86 ml/day (± 879.749), and their average hospital stay was 30.04 days (± 35.721).

Over half the sample (55.1%) did not use pressure redistribution devices; the most common was a pyramidal foam mattress. However, 65.3% also used an alternative positioning device. The most commonly used positioning device was a pillow placed underneath bony prominences (51%). Many also used sheets or towels to reduce tissue interface pressures in susceptible areas.

Assessment of the skin using NOC indicators revealed that the sacral region showed alterations in temperature (warmer) (42.85%) and colour (erythemae) (26.53%). Although 25 patients (51%) presented with relevant heat in the scapula region, this region showed changes in colour in only two patients (4%). Of all patients, 10% were more sensitive to pain on their heels, and only 2% were sensitive to temperature in that region. The sciatic region showed the least amount of alterations.

Among the NOC indicators, texture was the most affected (mean score 3.39), with some PU areas having completely thinned skin. Skin texture was classified as smooth and firm, rough and wrinkled and/or thin. These characteristics were evaluated by inspection and palpation of the limb (Jarvis 2007). The tissue temperature was the second most compromised (mean score 3.79). Based on the 5-point Likert Scale values, both texture and tissue temperature were considered moderately compromised. Fluid intake was deemed adequate, and all other indicators were classified as slightly compromised (table 1).

Table 1: Descriptive statistics of the operational indicators of tissue integrity for skin and mucous membranes based on NOC criteria and the indicators of Gosnell Scale (n=48).

Indicators	Mean	Standard deviation	25th Percentile	50th Percentile	75th Percentile
1. NOC Criteria					
Tissue temperature	3.80	0.912	3.00	4.00	5.00
Sensation	4.90	0.368	5.00	5.00	5.00
Hydration	4.02	1.164	4.00	4.00	5.00
Elasticity	4.84	0.426	5.00	5.00	5.00
Colour	4.02	1.283	3.00	5.00	5.00
Texture	3.43	1.791	1.00	4.00	5.00
Continence	4.59	1.079	5.00	5.00	5.00
Hair growth on skin	4.86	0.612	5.00	5.00	5.00
Final classification	4.31	0.496	4.06	4.25	4.68
2. Gosnell Scale					
Mental status	1.00	0.000	1.00	1.00	1.00
Continence	1.43	1.000	1.00	1.00	1.00
Nutrition	1.53	0.793	1.00	1.00	2.00
Activity	2.10	1.159	1.00	2.00	3.00
Mobility	2.49	1.063	2.00	2.00	3.50
Final Score	8.55	2.558	7.00	8.00	10.50

Although 25% of participants were found to have extremely compromised skin texture (score 1) and moderately compromised tissue temperature (score 3) the mean value across all indicators (final classification) was high, as were the values for the 25th, 50th and 75th percentiles.

Regarding the concurrent validity analysis, the final scores presented symmetrical distribution (NOC – p = 0.228; Gosnell – p = 0.180). The Pearson' correlation coefficient showed high inverse correlation (R = -0.727; P = 0.000). The negative value it relates with the inverse orders of the scales to define high risk to develop PU (for the NOC scales the worst health condition is related to a low scores, while in the Gosnell's Scale occurs the opposite). Cronbach's Alpha for consistency between both scales also was high and negative (-0.746) indicating good consistency between scales.

This study had some limitations. It was a cross-sectional study, and there is a scarcity of studies that conducted skin inspections through NOC indicators, which inhibits the ability to make comparisons. However, the authors were able to develop classification parameters for the NOC indicators, and verified its applicability.

DISCUSSION

Existing evidence demonstrates that preventive strategies can reduce the incidence and severity of hospital acquired PU in the acute care setting (Cardoso et al 2004). The results of our study, based on NOC indicators, suggest that the sacral region and the scapula regions are susceptible areas, since they showed high temperatures.

According to the *European Pressure Ulcer Advisory Panel* (EPUAP), a risk assessment tool should include, among other factors, the level of skin damage. In a study by Rocha and Barros (2007), among the items assessed in the Waterlow scale, non-healthy skin was a statistically significant predictor of the development of PU. It also found that 86% of the patients who developed PU had skin that was very thin, dry, with oedema, moist, sticky (at a high temperature), blanchable, tearing, or macerated, and it found that such a result was observed in all the three risk assessment scales that were evaluated. The findings of the present study are consistent with this, as the texture indicator was the most compromised, indicating rough and/or thin skin. Therefore, this condition of the skin may increase the occurrence of pressure wounds because it indicates tissue fragility. The hydration item showed somewhat lower than perfect values, and this slightly lower hydration may have contributed to patients' dry and brittle skin. In addition, there were slightly lower than perfect values for the tissue temperature, which may have contributed to sticky skin. Although the study included patients with spinal cord injury, the sensation indicator showed high scores in pressure areas, probably due to incomplete and low-complexity injuries. The hair growth item, which is included in the list of NOC indicators but not included in other assessment scales, was also not compromised, probably because there were not hairs in some of the problematic bony prominence areas.

Using the NOC and the indicators established by NOC allowed to evaluate which parameters were important as risk indicators for developing PU. Although patients with multiple trauma or spinal cord injuries are supposedly at high risk for developing PU, this study showed that such patients were not compromised based on the NOC indicators.

It is important to remember that the use of forms to measure risk is an important tool to help guide nurses in ultimately improving the quality of health care, reducing costs and reducing the pain and suffering of patients. The use of assessment techniques should, however, be combined with the clinical judgment of the professional, and there should be agreement in the two evaluations with each particular situation. A clinical instrument with clear terms can be used to guide health care workers to effectively allocate the physical and human resources.

Using the NOC skin integrity assessment may be an effective method to evaluate the presence of risk indicators for the development of PU, and it can guide nursing actions according to the observed needs. Thus, the skin condition can become a specific quantitative indicator for the nursing team. Other advantages of this type of form include the fact that it can assess the degree of compromise and the fact that it can be easily applied.

CONCLUSIONS

In terms of the operational NOC indicators, texture showed the most change, followed by tissue temperature. The sacral region showed the most change in terms of colour and temperature, while the scapula showed changes exclusively in temperature. Approximately 70% of patients presented a final score of five (out of five maximum score), which meant they had non-compromised skin. The correlations between study variables were evaluated, and no significant correlations were found. The used indicators showed satisfactory concurrent validity when compared to the Gosnell's scale.

REFERENCES

Cardoso, M.C.S., Caliri, M.H.L. and Hass, V.J. 2004. Prevalência de úlceras de pressão em pacientes críticos internados em um hospital universitário. *Revista Mineira de Enfermagem,* 4(2):316-320.

Costa, M.P., Sturtz, G., Costa, F.P.P., Ferreira, M.C. and Barros, T.E.P.F. 2005. Epidemiologia e tratamento das úlceras de pressão: experiência de 77 casos. *Acta Ortopédica Brasileira,* 13(3):124-133.

Ferreira, L.M. 2001. Etiopatogenia e tratamento das úlceras por pressão. *Diagnóstico e Tratamento,* 6(3):36-40.

Gosnell, D.J. 1989. Pressure score risk assessment: a critique, part I: the Gosnell scale. *Decubitus,* 2(1):32-43.

http://www.npuap.org/resources.htm (accessed 26.07.09).

http://www.nursing.uiowa.edu (accessed 19.07.07).

Hulley, S.B., Cummings, S.R., Browner, W.S., Grady, D., Hearst, N. and Newman, T.B. 2003. *Designing Clinical Research: An Epidemiologic Approach* (2nd edn). Lippincott Williams & Wilkins: Philadelphia.

Jalali, R. and Rezaie, M. 2005. Predicting pressure ulcer risk: comparing the predictive validity of 4 scales. *Advances in Skin & Wound Care,* 18(2):92–97.

Jarvis, C. 2007. *Physical examination and health assessment* (5th edn). Saunders: Philadelphia.

Moorhead, S., Johnson, M. and Maas, M. 2003. *Nursing Outcomes Classification* (3rd edn). Mosby: St Louis.

Rocha, A.B.L. and Barros, S.M.O. 2007. Avaliação de risco de úlcera por pressão: propriedades de medida da versão em português da escala de Waterlow. *Acta Paulista de Enfermagem,* 20(2):143-149.

Rogenski, N.M.B. and Santos, V.L.C.G. 2005. Estudo sobre a incidência de úlceras de pressão em um hospital universitário. *Revista Latinoamericana de Enfermagem,* 13(4):474-480.

APPENDIX A - INSTRUMENT FOR EVALUATION

I. SOCIOECONOMIC DATA:

Age: _____ Gender: _____

Occupation: _____ Years of education:_____

II. CLINICAL DATA:

Days in-hospital: _____ Date: _____

Medical diagnosis:_____

Other health alterations:_____

Last glycaemia result: _____.Date:_____

Last Haematocrit/Haemoglobin results: _____.Date:_____

Last Leukometry:_____. Date:_____

Daily fluid intake: _____ml

Referred weight: _____ Body Mass Index:_____

Referred height: _____m

Diuresis:

( ) Diuresis in diapers
( ) Use of female/male catheter
( ) Diuresis in bedpan or male urinal
( ) Diuresis in the toilet

Hygiene:

( ) Bath on bed
( ) Bath on the chair
( ) Shower bath

Use of preventive mattress ( )Yes ( )No

( ) Standard hospital mattress
( ) Eggshell mattress
( ) Water mattress
( ) Articulated mattress
( ) Other option

Use of pressure-reducing ( )Yes ( )No
( ) pillow
( ) gloves with water
( ) inflatable cushions
( ) Other option

III. DATA RELATED TO TISSUE INTEGRITY: SKIN AND MUCOSA:

	1	2	3	4	5
1. Temperature					
2. Sense					
3. Hydration					
4. Elasticity					
5. Colour					
6. Texture					
7. Continence					
8. Growth of hair					
Total score					

1. Temperature

1.1 Body Temperature	**Score**
Normothermic during all measures	5
Temperature changed once a day	4
Altered temperature twice a day	3
Altered temperature three times a day	2
Altered temperature four times a day or more	1

Result:____

1.2. Temperature on pressure areas	**Score**
Without temperature changes	5
High temperature on one pressure area	4
High temperature on two pressure areas	3
High temperature on three pressure areas	2
High temperature on four pressure areas or more	1

Result:____

Overall score	**Classification**
10	Without impairment or compromised
8 or 9	Slightly impaired or compromised
6 or 7	Moderately impaired
4 or 5	Substantially impaired
3 or 2	Extremely impaired

1.1 Areas of pressure with changes in temperature

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)

2. Sense

2.2 Sensation (sense)	**Score**
Pain sensitivity, superficial sensitivity and deep sensitivity all over the limb.	5
Pain sensitivity, deep sensitivity and lack of superficial sensitivity in some area of the limb.	4
Pain sensitivity, lack of deep sensitivity and lack of superficial sensitivity in some area of the limb.	3
Lack of pain sensitivity and superficial sensitivity, but deep sensitivity in some area of the limb.	2
Lack of pain sensitivity, lack of deep sensitivity and lack of superficial sensitivity in some area of the limb.	1

2.1 Areas of pressure with changes in sense

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)

3. Hydration	**Score**
Hydrated skin	5
Dry or humid skin	4
Peeled or intumescing skin	3
Skin with superficial fissures or excessively wet	2
Skin with deep fissures or macerated	1

3.1 Areas of pressure with changes in hydration

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)

4. Elasticity	**Score**
Skin returns to normal immediately	5
Skin returns to normal after 1 second	4
Skin returns to normal after 2 seconds	3
Skin returns to normal after 3 seconds	2
Crease	1

Result:____

5. Colour	**Score**
Normal staining	5
Pallor	4
Mild erythemae	3
Moderate erythemae	2
Intense erythemae	1

5.1 Areas of pressure with changes in colour

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)

6. Texture	**Score**
Normal texture (smooth and firm)	5
Rough skin	4
Rough and wrinkled skin	3
Wrinkled and thin skin	2
Completely thin skin	1

6.1 Areas of pressure with changes in texture

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)

7. Continence	**Score**
Continent	5
Occasional incontinence	4
Urinary incontinence	3
Faecal incontinence	2
Urinary and faecal incontinence	1

Result:____

8. Hair growth	**Score**
Normal amount of hair	5
Little decrease of hair	4
Moderate decrease in amount of hair	3
Great decrease in amount of hair	2
Alopecia	1

8.1 Areas of pressure with changes in amount of hair

Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
Area_____ Score_____
(total number of areas with changes)