

Relationship between Braden scale score and pressure ulcer development in patients admitted in trauma intensive care unit

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Iranmanesh S, Rafiei H, Sabzevari S. Relationship between Braden scale score and pressure ulcer development in patients admitted in trauma intensive care unit. *Int Wound J* 2012; 9:248–252

ABSTRACT

The purpose of this study was to determine the relationship between the scores of Braden scale and pressure ulcer development among critically ill patients. All patients who admitted to intensive care unit (ICU) in 3 months (during July–October 2010) were surveyed with Braden scale. Patients who gained higher score of Braden scale were at lower risk for pressure ulcer development compared with the other patients. Braden scale is a useful tool for predicting pressure ulcer development in trauma ICU patients. Also, factors such as age and level of consciousness may influence pressure ulcer development.

Key words: Braden scale • Pressure ulcer • Trauma intensive care unit

Key Points

- factors that cause pressure ulcers include age, dehydration, medication, malnutrition, incontinence, friction and shear
- a high incidence of pressure ulcers have been considered to be a negative care outcome that markedly affect patients' quality of life, morbidity and mortality
- patients in intensive care units (ICUs) are at an increased risk of developing pressure ulcers because they are sedated, ventilated and almost invariably confined to bed for long periods that particularly increase the risk of developing skin breakdown

INTRODUCTION

A pressure ulcer is localised of tissue necrosis that develops when soft tissue is compressed between a prominent bone and the external surface for a long time (1). Factors that cause pressure ulcers include age, dehydration, medication, malnutrition, incontinence, friction and shear (2). Common pressure ulcer points include the occiput, scapula, sacrum, buttocks, ischium, heels and toes (3). A high incidence of pressure ulcers have been considered to be a negative care outcome (4)

that markedly affect patients' quality of life, morbidity and mortality (5). Patients in intensive care units (ICUs) are at an increased risk of developing pressure ulcers (4–7) because they are sedated, ventilated and almost invariably confined to bed for long periods that particularly increase the risk of developing skin breakdown (6).

The development of pressure ulcers in the critically ill patients is a preventable complication (3) and thus many pressure ulcer risk assessment tools such as Braden, Waterlow, Norton and Cubbin–Jackson have been developed (3,8–10). Studies reported different results regarding the use of these tools in ICUs. Suriadi *et al.* (7) compared Braden scale and a multi-pad pressure evaluator for power of their prediction of pressure ulcer development. They reported no significant difference between the two scales' power (7). Mortenson *et al.* (11) who reviewed the scales' power and

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how they predict pressure ulcer development among spinal cord-injured patients reported that Braden scale has better outcome compared with other scales.

Kim *et al.* (12) also studied different scales (Braden, Song and Choi, Cubbin and Jackson) to determine and compare their power for prediction of pressure ulcers among surgical ICU patients. They showed that the Cubbin–Jackson scale more effectively predicts pressure ulcer risk compared with the other scales (12). Weststrate *et al.* (13) reported that Waterlow scale is better than other scales in predicting pressure ulcers in surgical ICU patients. In Iran, Reyhani *et al.* (14) assessed the incidence of pressure ulcer among cranio-spinal patients admitted in ICUs. They reported that Braden scale is somehow able to predict pressure ulcer among this group of patients (14). Totally, between the above-mentioned scales, Braden scale that designed by Bergstrom *et al.* is the best scale recommended by the US agency for health care policy and research (3,15). This scale is widely used in hospital setting (3,15).

In our country, the incidence of pressure ulcer in patients admitted in ICUs reported between 5.2 and 22.5% (14,16). Iranian critical care nurses use no scale to predict pressure ulcer. They usually assess patients' skin for any sign of pressure ulcer. So they routinely provide the same skin care for patients with different risk of pressure ulcer development. Using some tools that are able to predict the development of pressure ulcer can assist nurses to give proper skin care to the patients who are at the high risk of progression of pressure ulcer. This study, thus, was conducted to examine the relationship between scores of Braden scale and development of pressure ulcer among critically trauma ill patients in south-east of Iran.

METHODS

This descriptive–prospective study was approved by Kerman medical university and the head of Shahid Bahonar Hospital in Kerman. The study was conducted during July–October 2010 in Shahid Bahonar Hospital in Kerman. This study examined the relationship between pressure ulcer development and Braden scale score among patients admitted in trauma ICU. The relationship between development of pressure ulcer and factors (age, sex as well as level of consciousness) that may influence on

pressure ulcer was also assessed. The Braden scale is the most widely used in adult patient population. This scale consists of six subscales including (1) mobility, (2) activity, (3) sensory perception, (4) skin moisture, (5) nutrition state and (6) friction/shear. The items in five subscales scored between 1 and 4. The items in one subscale (friction/shear) scored between 1 and 3. The total scores ranged from 6 to 23. The lower Braden scale score indicate a higher risk for pressure ulcer development. Different cut-off scores that are indicative of patients at different risk for pressure ulcer development is suggested as follows: (1) 19–23: no risk, (2) 15–18: mild risk, (3) 13–14: moderate risk, (4) 10–12: high risk and (5) 9 and less: very high risk. Braden scales were filled by researcher and trained staff nurse for all patients who admitted to the ICU and have no pressure ulcer. Patients' skins were assessed three times per day for sign of pressure ulcer development. Patients' level of consciousness was assessed by Glasgow coma scale that routinely used in this ward. Demographic data extracted from patient's medical record. To assess the reliability of translated scale alpha coefficient of internal consistency computed. The alpha coefficient for Braden scale was 0.78. Using the Statistical Package for Social Scientists (SPSS 18.00), data were analysed. Descriptive statistics of the data that were computed included frequencies, means and reliability. To examine the relationship between Braden scale score, age, sex, level of consciousness and pressure ulcer development, Chi-square test, Pearson correlation test and Independent *T*-test were used.

RESULTS

During the 3 months, 82 patients who had no pressure ulcer were admitted. Of them, 68% were men and 32% were women. The mean age of patients was 41.4 years. Mean of Braden score was 13.4 ± 3.5 . The mean score of Glasgow coma scale was 10.6 ± 3.7 . Of all, 11 (13.4%) patients developed pressure ulcer. Mean age of patients who developed pressure ulcer was 58.6, whereas patients who have not developed pressure ulcer aged 38.7 years. So the age of these two groups was significantly different ($P < 0.05$). Two groups (with and without pressure ulcer) had different mean of Glasgow coma score (7.7 versus

Key Points

- Iranian critical care nurses use no scale to predict pressure ulcer
- they routinely provide the same skin care for patients with different risk of pressure ulcer development
- this study, thus, was conducted to examine the relationship between scores of Braden scale and development of pressure ulcer among critically trauma ill patients in south-east of Iran
- during the 3 months, 82 patients who had no pressure ulcer were admitted in Shahid Bahonar Hospital in Kerman

Key Points

- according to the findings, patients who gain higher score of Braden scale were at lower risk for pressure ulcer development compared to the other patients
- on the basis of the results, the most significant difference between two groups (with and without pressure ulcer) was found in the subscale of sensory perception (ability to respond meaningfully to pressure related discomfort)
- in this study, some patients were able to have activity and thus they could obtain higher score in subscale of 'degree of physical activity' compared with those who had no activity
- totally, the results of this study indicted that Braden scale could be a good predictor tool for pressure ulcer development among critically ill trauma patients

11.1). This difference was significant ($P < 0.05$). Pearson correlation test showed a significant correlation between Braden score scale and Glasgow coma score scale ($r = 0.823, P < 0.01$). The correlation between Glasgow coma score scale and subcategories of Braden score scales was as follows: (1) pressure-related discomfort ($r = 0.873, P < 0.01$), (2) degree of physical activity ($r = 0.723, P < 0.01$), (3) ability to change and control body position ($r = 0.644, P < 0.01$), (4) friction and Shear ($r = 0.582, P < 0.01$), (5) degree to which skin is exposed to moisture ($r = 0.574, P < 0.01$) and (6) usual food intake pattern ($r = -0.046, P < 0.01$). The rate of pressure ulcer development in both sex was similar ($P > 0.05$).

Mean score of Braden scale in patients with pressure ulcer was 10.3 and in patients without pressure ulcer was 13.9. Independent *T*-test showed that there is a significant difference between Braden scale score and developed pressure ulcer so that the lower Braden scale score, the higher risk for pressure ulcer development ($P < 0.05$). The results of six subscales of Braden scale was showed in Table 1.

DISCUSSION

The purpose of this study was to determine the relationship between score of Braden scale

and pressure ulcer development among critically ill patients. According to the findings, patients who gain higher score of Braden scale were at lower risk for pressure ulcer development compared to the other patients. In all subscales but one (nutrition: usual food intake pattern) patients with pressure ulcer gain lower score compared to the patients without pressure ulcer. On the basis of the results, the most significant difference between two groups (with and without pressure ulcer) was found in the subscale of sensory perception (ability to respond meaningfully to pressure-related discomfort). In this subscale, patients with pressure ulcer gain lower score compared with the patients without pressure ulcer (1.79 ± 0.9 versus 3.02 ± 1.5). Unlikely, Reyhani *et al.* (14) reported that only a decrease in mobility (ability to change and control body position) and sensory perception (ability to respond meaningfully to pressure-related discomfort) can cause pressure ulcer. This difference could be related to the type of sample in two studies, in Reyhani's study (14), the sample was cranio-spinal trauma patients who had no activity because of their critical clinical situation. Therefore, in the subscale of 'degree of physical activity' all patients obtained the lowest score. In this study, some patients were able to have activity and thus they could obtain higher score in subscale of 'degree of physical activity' compared with those who had no activity. In Reyhani's study (14), moisture was not found as a risk factor for pressure ulcer development, which is inconsistent with the finding of this study. In ICU patients, one of the most causes of moisture is urinary incontinence. Patients in Reyhani *et al.* (14) study were cranio-spinal and had indwelling catheter, so they less suffered from urinary incontinence compared with the patient in this study. Totally, the results of this study indicted that Braden scale could be a good predictor tool for pressure ulcer development among critically ill trauma patients. Suriadi *et al.* (7) in Japan examined the utility of two instruments (the Braden scale and a multi-pad pressure evaluator) for predicting pressure ulcer development and reported that Braden scale can be a good scale for predicting pressure ulcer development among critically ill patients. Nascimento *et al.* (17) in 2009 reported that Braden scale is an appropriate tool to use in critically ill patients. In contrast, Cho *et al.* (18) in South

Table 1 Mean of Braden score in six subgroup

Subgroup of Braden scale	Patients' status regarding ulcer development	Mean score
Ability to respond meaningfully to pressure-related discomfort	With pressure ulcer	1.72 ± 0.9
	Without pressure ulcer	3.02 ± 1.15
Degree to which skin is exposed to moisture	With pressure ulcer	2.63 ± 1.12
	Without pressure ulcer	3.19 ± 0.76
Degree of physical activity	With pressure ulcer	1.27 ± 0.63
	Without pressure ulcer	2.16 ± 0.94
Ability to change and control body position	With pressure ulcer	1.09 ± 0.3
	Without pressure ulcer	1.6 ± 0.62
Usual food intake pattern	With pressure ulcer	2.63 ± 0.93
	Without pressure ulcer	2.28 ± 0.72
Friction and shear	With pressure ulcer	1.09 ± 0.3
	Without pressure ulcer	1.6 ± 0.74

Korea reported that Braden scale is not suitable for prediction of pressure ulcer development in ICUs. This difference can be related to differences between these two studies in three aspects. Cho *et al.*'s (18) study design is retrospective, whereas this study is prospective. The other difference of two studies is related to the setting within which they were conducted. Cho *et al.* (18) assessed surgical ICU patients, whereas this study was carried out in trauma ICU patients. In the study by Cho *et al.* (18), there are some inclusion criteria such as age (higher than 18 years), which are different from those in this study. According to the results, risk of pressure ulcer development in the aged was more than that among younger patients. Reyhani *et al.* (14) also reported that age correlated with the development of pressure ulcer. Older patients compared with the younger ones have more risk factor for development of pressure ulcer. Impairments in mobility, nutrition, skin health as well as incontinence among older patients may increase the rate of pressure ulcer development (19). Findings also showed significant correlation between Glasgow coma scale score and all subcategories of Braden score scale except nutrition subscale. The most significant correlation was found between Glasgow coma score scale and subscale of pressure-related discomfort. Glasgow coma score indicates the level of consciousness. Glasgow coma score lower than seven considered as coma. One part of Glasgow coma score is motor function. From score 15 of Glasgow coma score scale, score 6 is related to motor function. In Braden scale, three subscales (degree of physical activity, ability to change and control body position, and ability to respond meaningfully to pressure-related discomfort) influenced by motor function. Patients who have lower level of consciousness have lower control in urination and are not able to change their position. These may increase the rate of pressure ulcer development among patients with low Glasgow coma score scale. The results also showed that risk of pressure ulcer development among patients with lower Glasgow coma score scale is more than that among patients with higher Glasgow coma score. Decreasing level of consciousness may cause impairment of perception of pressure, activity as well as mobility and consequently increase the risk of pressure ulcer development among critically ill patients with low Glasgow

coma score. So Glasgow coma scale should be considered in patients who are at a risk of pressure ulcer, especially critically ill patients. This item can be used for pressure ulcer scale development among critically ill patients.

CONCLUSION

Our findings indicate that Braden scale is a useful tool for predicting pressure ulcer development in trauma ICU patients. The results also showed that factors such as age and level of consciousness may influence pressure ulcer development. These factors do not exist in Braden scale, so such factors should be considered, while predicting pressure ulcer development. Moreover, oxygenation and perfusion situations that are not exist in Braden score scale may also affect pressure ulcer development. So these two factors should be considered in assessment of patients admitted in ICUs. Using Braden Q scale that has these two factors is (oxygenation and perfusion) suggested. Further studies suggest predicting pressure ulcer development among patients who are at high risk for pressure ulcer such as the ones admitted in emergency department and operation room (20). Other scales such as Waterlow scale, Norton scale and Cubbin-Jackson scale are also suggested to be used in order to predict pressure ulcer development among this group of patients. Using one of these scales strongly suggests to the nurses whose patients are at the high risk of pressure ulcer development in order to improve quality of care in trauma ICUs.

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Key Points

- our results also showed that factors such as age and level of consciousness may influence pressure ulcer development
- these factors do not exist in Braden scale, so such factors should be considered, while predicting pressure ulcer development
- moreover, oxygenation and perfusion situations that do not exist in Braden score scale may also affect pressure ulcer development
- further studies suggest predicting pressure ulcer development among patients who are at high risk for pressure ulcer such as the ones admitted in emergency department and the operating room

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