

ORIGINAL ARTICLE

Concordance of Shape Risk Scale, a new pressure ulcer risk tool, with Braden Scale

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Braden; Pressure ulcer; Prevalence; Risk tool; Shape Risk Scale

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Soppi ET, Iivanainen AK, Korhonen PA. Concordance of Shape Risk Scale, a new pressure ulcer risk tool, with Braden Scale. *Int Wound J* 2014; 11:611–615**Abstract**

The occurrence of pressure ulcers was examined in a cross-sectional study in 23 health care facilities and in home care involving 548 patients. The screening of pressure ulcer risk was assessed simultaneously using the Braden Scale and the new Shape Risk Scale (SRS), and the results were compared. The overall prevalence of pressure ulcers in the study population was 15.5% (85/548). The Braden Scale was performed as described in the literature. The direct concordance of the Braden and SRS scales was 46%. In more than 90% of cases, the SRS classified patients as well as or better than the Braden Scale. The SRS allocates patients significantly different from the Braden Scale into the risk categories, especially the difference is significant between the low- and medium-risk categories. The greatest advantage of SRS to Braden Scale is that it correctly identifies patients with low risk of pressure ulcers. It is interesting that the two risk scores, taking into consideration the basically different pathophysiological factors, can still give rather similar results. The users considered that both scales are easy to use.

Introduction

Pressure ulcers are a common form of skin trauma. The prevalence of pressure ulcers is about 5–20% of patients treated at home, institutions and hospitals (1). Pressure ulcers are painful, impair the quality of life of the patients and increase the risk of infections. They increase mortality and the burden of work for the nursing personnel and generate enormous costs (2).

A pressure ulcer is defined as a local injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure or of pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated (3). The current definition of pressure ulcers underlines the complicated pathophysiology of pressure ulcers and the fact that there are a number of unknown factors involved. As a consequence, assessing the pressure ulcer risk of an individual patient poses a significant clinical challenge. The purpose of risk evaluation is to identify the patients who benefit most from preventive actions. The risk

Key Messages

- a new, simple, pressure risk tool, Shape Risk Scale (SRS), is introduced, taking into consideration the new information about the pathophysiology of pressure ulcer development
- Shape Risk Scale takes into consideration the body mass index, body shape, physical activity and mobility, consciousness and sensory perception, and body temperature
- as a part of its validation programme, its performance was compared with the Braden Scale and appears to assess risk better than the Braden Scale. Especially, SRS totally reclassifies patients at low and medium risk and identifies better the patients with low risk of development of pressure ulcers compared with the Braden Scale
- this study highlights the multiplicity of risk causing factors in the pressure ulcer development

tools should score all factors and patient-related characteristics that contribute significantly to the development of pressure ulcers. There are tens of different such scoring methods, the ones that are most recommendable for clinical work are the ones that have been validated. The most popular scoring system for institutionalised patients has been developed by Braden (4) and is considered the best performing scoring method of the ones available (5). The use of the Braden Scale may not be very assessor-friendly, and all measures are prone to subjective interpretation. We have created a new pressure ulcer risk assessment scale (6,7) that takes into account not only pressure but also other pertinent pathophysiological variables related to risk of pressure ulcers.

Patients, materials and methods

Ethical considerations

Approval by the central Ethics Committee of the Kuopio University Hospital was obtained for this multicentre study (includes also the pilot study) in line with the ethical guidelines of 1975 Declaration of Helsinki. Also, each study centre approved the study. Each study person was given written and oral information about the purpose and goals of the study before their consent. Participation was voluntary and all participants were informed that they were at liberty to discontinue their participation in the study at any time, if they wanted.

Study centres and case report forms

The study was carried out in 2010 and 2011 in 23 centres (12 health care centres and eleven central hospital wards) and in home care.

The case report forms included 45 structured items regarding the medical history of the patients and the nature and organisation of the department involved in the study, together with data on the nursing staff. Each category of the Braden and Shape Risk Scale of each patient was estimated and

recorded, but no immediate risk assessment was carried out. The skin of each patient was thoroughly examined and its condition was assessed by wound care nurses specially trained in the use of the Braden and SRS Scales. Any observed pressure ulcers were classified using the EPUAP classification (www.epuap.org).

Patients

The study population consisted of 548 patients; 39% males and 61% females. The age of the patients varied from 17 to 99 years, mean 74.8 years. Close to a third of the patients were over 85 years old.

The mean weight of the patients was 70.6 kg (range 34–135 kg). The mean height of the patients was 166 cm (range 98–196 cm). The body mass index (BMI) ranged from 14 to 43 kg/m² with a mean of 25.5 kg/m².

The mean body temperature on the day of examination was 36.4°C, range 34.0–38.7°C. Of the patients, 17% had a body temperature above 37.0°C.

Braden Scale and Shape Risk Scale

The original Braden risk assessment scale was used as described (4). The Shape Risk Scale (SRS) pressure ulcer risk assessment scale was developed in 2008 and 2009 (6,7). The new scale includes five risk assessment categories (Table 1).

Mobility and physical activity

This category combines two categories from the original Braden classification. The definitions in the SRS leave, however, less room for subjective interpretation.

Consciousness and sensory perception

This category includes sensory perception from the Braden scale but assesses also consciousness to give a more holistic view of the patients. Thus this category includes features from

Table 1 Variables of the Shape Risk Scale (SRS)

Risk variable/points	1	2	4	6
Body shape	Pear	Column	Hourglass or inverted triangle (athletic)	Apple
BMI (kg/m ²)	30.0–40.0	22.5–29.9	<22.5	>40.0
Physical activity and mobility	Walks unaided	Cannot bear his/her own weight; needs help to be moved to chair or wheelchair	Can move his/her trunk or extremities only occasionally or only little	Cannot move from chair or bed without aid; need assistance when being moved, or position must be changed by assistant
Consciousness and sensory perception	No apparent disturbance	Reacts appropriately to verbal command or pain stimulus	Is unable to communicate appropriately or to express discomfort by other means than by moaning or by restlessness	Unconscious or unable to react to pain stimulus. Hemiplegia or paraplegia
Body temperature	Add 1 point for every 0.5°C increment of body temperature above 37.0°C			
Risk category	Low risk: ≤6	Medium risk: 7–12	High risk: 13–18	Extremely high risk: ≥19

Each assessment category (body shape, BMI, physical activity and mobility, and consciousness and sensory perception) is assessed and scored. Then point score related to body temperature is added to give the final SRS score.

the patient's basic illness and sedating medications which may increase the risk of the patient for pressure ulcers. The definitions also leave less room for subjective interpretation than the Braden scale.

Body mass index

Physical pressure generates a stress reaction and stretching forces which affect the tissues in proximity to the bony prominence of the body. Pressure also affects tissue elasticity. It is extremely difficult to measure these forces directly.

BMI (kg/m^2) gives an indirect but accurate measure of pressure in the tissues, since it is a pressure unit: P (pressure) = Force (body weight) divided by area (body surface) (8). In addition to this, the BMI reflects other risk factors, e.g., those related to risk of death (9). The BMI requires only knowledge of the patient's body weight and height, figures that are readily available of every patient.

Body shape

Distribution of the pressure over different parts of the body determines the magnitude of point pressure in the tissues and thus the pressure ulcer risk. Different body shapes reflect variations in the pressure distribution over the skin and have a significant effect on the point pressure distribution in tissues and, thus, on risk assessment (Figure 1). Different body shapes can also include other patient-related variables, e.g. body composition, life style and dietary habits (10). Body shapes are also linked to internal metabolic variables. Thus, the apple body shape is linked to the metabolic syndrome which acts on blood pressure and metabolic disturbances which, in the end, affect endothelial function and tissues oxygenation.

Body temperature

An increase in body temperature is generally a manifestation of infection: proinflammatory cytokines and free radicals are released into the body (11). Early in pressure ulcer development there is an inflammatory reaction; a fever-induced cytokine storm will now only worsen the inflammatory reaction and the local tissue damage and promote overt pressure ulceration (12). A body temperature rise increases oxygen consumption by the tissues by 7–8% for every increment of 0.5°C . Tissue oxygenation may not be sufficient to

keep the pressure-susceptible tissues viable, as the tissue oxygenation decreases due to pressure and oxygen consumption increases with fever.

Modification of the Shape Risk Scale

On the basis of a pilot study ($N = 280$; A. Iivanainen *et al.* 2010, unpublished) the significance of the pear body shape and the cut-off limits of the different risk categories were slightly modified from the original (6,7). The English version of the Shape Risk Scale was created and validated by back and forth translations by medically qualified translators (Table 1).

User experiences

The easiness of use of both scale as well as their comparison was inquired from the user ($N = 27$) employing five-step questionnaires.

Results

Occurrence of pressure ulcers

Eighty-five patients had a total of 119 pressure ulcers (Table 2). Before the systematic inquiry of this study, only some 43% of pressure ulcers were known to exist in the study population. In acute care, long-term care and home care, the pressure ulcer prevalences were 12.9% (36/280), 16.5% (31/188) and 22.5% (18/80), respectively; 60.5% of those who had pressure ulcers were female.

Comparison of the Braden scale and SRS for pressure ulcer risk assessment

The direct concordance between the Braden and the Shape Risk Scale (SRS) scales was 43.0% (Table 3).

In the study population 56 patients were classified into a lower risk category with the SRS than with the Braden scale; the prevalence of pressure ulcers was 13 (23.1%). With the SRS scale 254 patients were classified into a higher risk category than with the Braden scale and the prevalence of pressure ulcers was 24 (9.4%). Six patients classified to medium risk by the Braden scale were classified as low risk by SRS had pressure ulcer; they were classified as low risk with the SRS and none of these had pressure ulcers. It is noteworthy that 15 patients of 189 classified as having no/low risk with the Braden scale had a pressure ulcer. However, more correctly they were classified into the medium risk group with the SRS.

The risk scales categorises similarly the patients into the extremely high and high risk groups. In these groups, the sensitivities of Braden and SRS were 0.29 and 0.25 and the corresponding specificities were 0.75 and 0.89, respectively, assuming that all patients in these groups should have had a pressure ulcer (Table 3). SRS allocates significantly less patients into the low risk group than the Braden scale (Table 3); 38.9% of the patients referred to the very high risk category by SRS had a pressure ulcer. The figure for the Braden scale was 46.7%. With the Braden scale 46.1% of the population belonged to a low risk group, where the

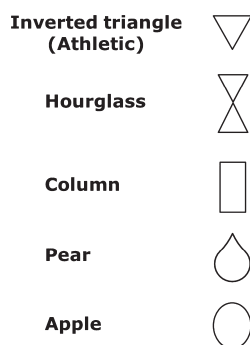


Figure 1 The five main body shape types.

Table 2 Distribution of the number and severity of pressure ulcers

Patients with pressure ulcer	Stage of pressure ulcers* (according to EPUAP)	Total number of pressure ulcers	Stage 1 (N)	Stage 2 (N)	Stage 3 (N)	Stage 4 (N)
36	1	45	45	–	–	–
38	2	58	15	43	–	–
6	3	8	–	1	7	–
5	4	8	–	3	–	5
85		119	60	47	7	5

*Staging was done based on the most severe pressure ulcer. Several patients had more than one pressure ulcer of different stages as shown in the horizontal axis.

Table 3 Concordance between Braden and Shape Risk Scales and risk groups in assessment of pressure ulcer risk*

Risk scales	SRS Extremely high risk ≥ 19	SRS High risk 13–18	SRS Medium risk 7–12	SRS Low risk ≤ 6	Braden: All together	Distribution patients in risk groups (%)
Braden Extremely high risk 6–9	4/5 80.0% [†]	3/10 30.0%	0/0 0.0%	0/0 0.0%	7/15 46.7%	2.8
Braden High risk 10–14	3/12 25.0%	27/97 27.8%	10/39 25.6%	0/1 0.0%	40/149 28.7%	27.4
Braden Medium risk 15–18	0/1 0.0%	6/42 14.3%	15/80 18.6%	0/6 0.0%	21/129 16.3%	23.7 [‡]
Braden No/Low risk 19–23	0/0 0.0%	0/10 0.0%	15/189 7.9%	2/52 3.9%	17/251 6.8%	46.1 [‡]
SRS: All together	7/18 38.9%	36/159 22.6%	40/308 14.0%	2/59 3.4%	85/544 [§] 15.6%	–
Distribution patients in risk groups (%)	3.3	29.2	56.6 [‡]	10.9 [‡]	–	100

*The left figure signifies the number of patients with pressure ulcer and the right figure the total number of patients. The bold figures signify the direct concordance of Braden and SRS risk scales.

[†]The percentage of pressure ulcers in the given risk groups.

[‡]The change of distribution of patients in these groups was significant, $P < 0.0001$ (Bhapkar test).

[§]Braden score was unavailable from four patients without pressure ulcers.

Table 4 Distribution of preferences between the Braden and SRS scales

Easiness of the use of the scales				
Braden Scale much easier	Braden Scale easier	Equal	Shape Risk Scale easier	Shape Risk Scale much easier
0	7	11	8	1

prevalence of pressure ulcers was 6.8%, meaning specificity of 0.93. The corresponding low risk group with SRS was only 10.9% and the pressure ulcer prevalence there was 3.4%, meaning specificity of 0.97 (Table 3).

Ten users considered Braden Scale very easy to use and in 17 cases easy. The corresponding figures with SRS were 8 and 18, respectively. When the scales were compared, a slight preference favouring SRS was noticed (Table 4)

Discussion

There are numerous assessment methods available for estimation of the risk of pressure ulcers, in addition to the clinical judgment. The most common methods are the ones by Norton, by Waterlow and by Braden; of these the Braden Scale is considered to be superior (6). Nevertheless, the use of the Braden scale in everyday clinical work poses a challenge, since especially nutrition, friction and shear may be very difficult to objectively assess. From an academic point of view, the most

recent knowledge about the pathophysiology of pressure ulcer development renders the current assessment scales somewhat questionable (3).

The Braden Scale is practically the only method in use for assessment of the risk of pressure ulcers in the United States (1). The Braden risk scores correlate only moderately with the true occurrence of pressure ulcers. Our results are in line with those of VanGilder *et al.* (1) The Braden scale identified about half of the patients in the very high risk group as having a pressure ulcer but it also placed about 20% of patients with pressure ulcers in the no-risk category (Table 3).

In the SRS, the patients' mobility and activity have been combined into one risk factor. In the Braden scale these two factors together have a higher relative weight than in the SRS (data not shown), although they measure at least partially the same properties of the patients and risk, that is, the effect of the duration of pressure on susceptible persons. Friction, shear and nutrition are represented by the body mass index (BMI) variable which can be determined with high accuracy, while the body shape – also easy to assess accurately – includes properties of patients, such as the metabolic syndrome, that are of pathophysiological significance with regard to the development of pressure ulcers (3,8,9,10). Body temperature is a novel risk measure that can also be determined with high accuracy, although its significance in the screening of pressure ulcers is rather unknown (3).

The idea behind the Shape Risk Scale has been to create a simple and easy bedside risk tool which does not require any extra measurements or procedures and which can be readily applied by any member of the staff with a minimum training. The positive user experiences verify that this goal was also achieved. In more than 90% of cases, SRS is able to classify patients at least as well as the Braden Scale. The corresponding figure with the Braden Scale is 64% (347/544; Table 3). The main reason for the difference is that SRS identifies patients at risk within the no-risk group of the Braden scale (false negatives) and may identify a subgroup of patients with a very high risk of ulcer development.

The results obtained highlight the fact that the two scoring methods measuring clearly different pathophysiological factors can give similar results signifying the multiplicity of pathophysiological factors in pressure ulcer development (3). The combined use of SRS and Braden Scales seem to identify a population with an extreme high risk of pressure ulcer development. The greatest advantage of SRS to Braden Scale is that it correctly identifies patients with low risk of pressure ulcers. The predictive value of SRS in the pressure ulcer development remains to be evaluated.

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Conflict of interest

Esa Soppi is the chairman of board of Carital group, a group of companies manufacturing and marketing globally mattresses for pressure ulcer prevention.

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