ORIGINAL PAPER

AT RISK OF PRESSURE ULCERS – A NURSING DIAGNOSIS

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Abstract

Aim: The aim of the study was content validation of the nursing diagnosis of at Risk of Impaired Skin Integrity by a sample of Slovak nurse-experts. It focuses on identifying the major risk factors in pressure ulcer development. *Design:* Retrospective study. *Methods:* The Diagnostic Content Validity Model designed by Fehring was used for validation of the nursing diagnosis; we used it to establish the significance of the risk factors of the nursing diagnosis of at Risk of Impaired Skin Integrity in relation to pressure ulcer development. Correlation analysis was used for evaluation of the relationships between the risk factors. The sample consisted of 126 nurse-experts in accordance with modified Fehring criteria. *Results:* Out of 23 items, the nurses rated nine as significant (the most frequently present) risk factors (the weighted scores are shown in brackets): physical immobilisation (0.92), skeletal prominence (0.9), imbalanced nutritional state (0.86), moisture (0.86), mechanical factors (e.g., shearing forces, pressure, restraint) (0.84), a Norton Scale score of $14 \geq$ points (0.81), hyperthermia (0.81), excretions (0.77), and extremes of age (0.76). Statistically significant correlations, which are positive and range between 0.2 and 0.4, were found between some risk factors. The strongest correlations were found between moisture and mechanical factors ($r = 0.4008$) and moisture and physical immobilization ($r = 0.3072$). *Conclusion:* Using the DCV model, the experts identified nine significant risk factors which can be predictors of pressure ulcer development.

Keywords: pressure ulcers, validation, potential nursing diagnosis, risk factors.

Introduction

There are many definitions of pressure ulcers, all of which refer to skin or tissue damage caused by direct pressure or friction. According to Grofova (2007), pressure ulcers are considered serious complications occurring in 10–30% of bedridden patients. They are wounds occurring at predilection sites with little subcutaneous tissue between skin and bone that are subjected to increased pressure against a hard surface. Riebelová, Válka, Franců (2000) describes pressure ulcers as pressure sores in which the necrosis extent is related to intensity of pressure and duration, patient's overall condition, and external influences. Thus, it involves a synergy of internal and external factors which, if occurring at the same time, can be active in the development of pressure ulcers. The incidence of pressure ulcers worldwide varies, depending on the environments in which it is monitored. Vanderwee et al. (2007) state that the prevalence of pressure ulcers of all stages in five

European countries (Belgium, Italy, Portugal, Great Britain, and Sweden) is 18.1%; stage I pressure ulcers making up 7.6%. The data on the prevalence of pressure ulcers in Slovakia on a national level is restricted; only partial monitoring by insurance companies is available. Krajčík and Bajanová (2012) found pressure ulcers to be prevalent in 11.5% of patients in geriatric departments, and 15.1% of patients in long-stay departments in 2007.

Pressure ulcers are common yet serious occurrences in health care and are a very important part of nursing care. Their development affects patients' quality of life, causing secondary infections, suffering, and even premature death; they also prolong treatment and increase healthcare costs (Lyder, 2003; Kalvach, Kojanová, Vohradníková, 2004; Pokorná, Mrázová, 2012). Considering the possibly severe consequences of pressure ulcers, it is a priority for nurses to prevent their development by early prediction of existing risks, and effective prevention.

Prediction and prevention of pressure ulcers is largely the realm of experts in intensive, long-term and home care. Predicting the development of pressure ulcers involves a knowledge of risk factors and the identification of them in patients, followed by focusing nursing care on the elimination or

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amelioration of existing risk factors by taking effective preventive measures.

The risk factors for pressure ulcer development are generally well-known, enabling health experts to design tools (scales) for assessing risk of pressure ulcers. In the Slovak and Czech professional literature, the most frequently published scales for assessing risk of pressure ulcers are: the Norton Scale, the Braden Scale, the Waterlow Scale, the Knoll Scale, and the Traden Scale (Trachtová, Fojtová, Mastiliaková, 1999; Kalvach, Kojanová, Vohradníková, 2004; Vörösová et al., 2005; Fúrová, 2006). Systematic reviews of some predictive scales with various lists of risk factors can be found in Bóriková (2006) and Fúrová (2006). The foreign literature refers to substantially more scales for prediction of pressure ulcers; some authors have attempted to modify the existing scales (Lepistö et al., 2006; Pancorbo-Hidalgo et al., 2006; Bavaresco, Lucena, 2012; Hyun et al., 2014; Demarre et al., 2015; Kumari et al., 2015).

The nursing diagnosis of at Risk of Pressure Ulcers 00249 was included in the international classification of nursing diagnoses, NANDA International for 2015–2017, as a potentially new nursing diagnosis in Domain 11 Safety/Protection – a Class 2 Physical Injury (NANDA International, 2014). It is defined as being "vulnerable to localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear" (NPUAP, 2007).

Before 2015, it was possible to use the nursing diagnosis of at Risk of Impaired Skin Integrity 00047 as a potential diagnosis regarding the risk of pressure ulcers. Found in Domain 11 Safety/Protection – a Class 2 Physical Injury, the diagnosis is defined as being "at risk of alteration in epidermis and/or dermis" (NANDA International, 2013). This diagnosis was drawn up in 1975 and revised in 1998, 2010 and 2013. NANDA regards risk factors as an important diagnostic element. Both investigated diagnoses have specific risk factors. There are 43 risk factors for the nursing diagnosis of at Risk of Pressure Ulcers 00249 (NANDA International, 2014). They are: ADULT: Braden Scale score of < 18; change in cognitive function; change in sensation; American Society of Anaesthesiologists (ASA) Physical Status classification score ≥ 2; anaemia; cardiovascular disease; CHILD: Braden Q Scale of ≤ 16; decrease in mobility; decrease in serum albumin level; decrease in tissue oxygenation; decrease in tissue perfusion; dehydration; dry skin; oedema; elevated skin temperature by 1–2°C; extended period of immobility on hard surface (e.g., surgical

procedure ≥ 2 hours); extremes of age; extremes of weight; female gender; hip fracture; history of cerebral vascular accident; history of pressure ulcer; history of trauma; hyperthermia; impaired circulation; inadequate nutrition; incontinence; insufficient caregiver knowledge of pressure ulcer prevention; low score on Risk Assessment Pressure Sore (RAPS) scale; lymphopenia; New York Heart Association (NYHA) functional classification ≥ 2; non-blanchable erythema; pharmaceutical agents (e.g., general anaesthesia, vasopressors, antidepressant, norepinephrine); physical immobilization; pressure over bony prominence; reduced triceps skin fold thickness; scaly skin; self-care deficit; shearing forces; skin moisture; smoking; surface friction; and use of linen with insufficient moisture wicking property. There are 22 risk factors for the nursing diagnosis of at Risk of Impaired Skin Integrity, including 11 external risk factors: chemical substance; excretions; extremes of age; humidity; hyperthermia; hypothermia; mechanical factors (e.g., shearing forces, pressure, restraint); moisture; physical immobilization; radiation; secretions; and 11 internal risk factors: changes in pigmentation; changes in skin turgor; developmental factors; imbalanced nutritional state (e.g., obesity, emaciation); immunological factors; impaired circulation, impaired metabolic state; impaired sensation; medications; psychogenetic factors; and skeletal prominence. The diagnosis includes the recommendation that a standardized risk assessment tool be used (NANDA International, 2012). Verification or validation of the nursing diagnosis involves establishing the significance of the individual risk factors related to the investigated nursing diagnosis. The outcome of validation is the confirmation of whether the risk factors, as presented by NANDA International, reliably identify the diagnosis examined.

Aim

The aim of the study was to find out which risk factors are considered significant for pressure ulcer development by nurses in the Slovak Republic. As the study was conducted in 2014, the subject of validation was the potential nursing diagnosis of at Risk of Impaired Skin Integrity (NANDA International, 2013).

Methods

Design

The paper has the character of a retrospective study focusing on the validation of the potential nursing

diagnosis with the use of Fehring´s Diagnostic Content Validity Model.

Sample

Sampling was based on the defined criteria. We addressed 140 nurse-clinicians. Experts were classified as those nurses who gained a minimum of four points according to modified Fehring criteria (Zeleníková et al., 2010). Fourteen nurses were discarded from the sample for not meeting these

criteria. The sample included 126 nurses: 66 nurses from the Faculty Hospital in Nitra, 44 nurses from the Faculty Hospital in Nové Zámky, and 16 nurses from the General Hospital in Zlaté Moravce. The sample characteristics include: gender, education, workplace, specialty, age, years of clinical practice, score according to the modified criteria, etc. (Table 1)

Table 1 Sample characteristics: nurses-experts (n=126)

Characteristics	n	%
Gender – women	126	100
Education		
Secondary School of Nursing - secondary, higher vocational education	41	32
University – 1st level	55	44
University – 2nd level	28	22
University – 3rd level	2	2
Specialty		
yes	72	57
no	54	43
Master's, rigorous thesis related to the topic		
yes	7	6
no	119	94
Workplace		
Internal medicine clinic (department)	50	40
Surgical clinic (department)	29	23
Neurologic clinic	16	13
Intensive care unit	31	24
	mean (SD)	min.–max.
Age	42.0 (7.7)	26–59
Years of practice	19.4 (7.7)	6–38
Modified score for the expert	6.4 (1.0)	4–9

SD – standard deviation, min. – minimum, max. – maximum

Data collection

The Diagnostic Content Validity (DCV) Model designed by Fehring (Fehring, 1986) was used for validation of the potential nursing diagnosis; we used it to establish the significance of the risk factors of the nursing diagnosis of at Risk of Impaired Skin Integrity in relation to pressure ulcer development. Data were collected by an assessment tool consisting of 22 risk factors for the nursing diagnosis of at Risk of Impaired Skin Integrity (NANDA, International, 2013) and was completed by a Norton Scale score of 14 points and fewer (chosen because of its use in the selected health care facilities), and demographic data. The nurses rated the occurrence of the risk factors for impaired skin integrity in patients with pressure ulcers on the Likert-type scale from 1 to 5 (1 – the risk factor not present at all – no significance; 2 – seldom present – weak significance, 3 – sometimes present – moderate significance, 4 – often present – strong significance, 5 – very often present – the strongest significance). Research was conducted from

July to December 2014. The measurement tool was distributed to nurses by the study authors or other authorized persons.

Data analysis

The methods of descriptive statistics were used for statistical data analysis. The basic statistical values: arithmetic mean, standard deviation (SD) and weighted scores (WS) were calculated for each risk factor. Weighted scores were calculated by totalling the values assigned to each response and dividing by the total number of responses. The values for the responses were as follows: 5 = 1; 4 = 0.75; 3 = 0.5; 2 = 0.25; 1 = 0 (Fehring, 1986). Significant (the most frequently present) risk factors were those of WS greater than 0.75; moderately significant (less frequently present) risk factors had WS of between 0.5–0.75. Risk factors of WS less than or equal to 0.5 were minimally present. Total DCV scores were obtained by totalling the individual scores andcalculating the mean; risk factors with values less

than or equal to 0.5 were not included in the total score. Correlation between risk factors was identified by the Pearson correlation coefficient (r).

Results

Based on analyses of the nurses' responses, the tables below report the risk factors for the nursing diagnosis of at Risk of Impaired Skin Integrity in relation to pressure ulcer development. They are listed according to their significance. In addition, the results

of correlation analysis for the significant risk factors (r) and their statistical significance (p) are reported.

From a total of 23 items, the nurses rated nine as significant (the most frequently present) risk factors: physical immobilisation (0.92), skeletal prominence (0.9), imbalanced nutritional state (0.86), moisture (0.86), mechanical factors (e.g., shearing forces, pressure, restraint) (0.84), the Norton Scale score 14 ≥ points (0.81), hyperthermia (0.81), excretions (0.77), and extremes of age (0.76). (Table 2)

Table 2 Factors identified as significant (the most frequently present) by experts

Risk factor	mean	SD	WS
physical immobilisation	4.69	0.57	0.92
skeletal prominence	4.59	0.57	0.90
imbalanced nutritional state	4.44	0.56	0.86
moisture	4.37	0.64	0.85
mechanical factors (e.g., shearing forces, pressure, restraint)	4.37	0.64	0.84
Norton Scale score 14 ≥ points	4.24	0.74	0.81
hyperthermia	4.21	0.74	0.81
excretions	4.08	0.57	0.77
extremes of age	4.01	0.74	0.76

SD – standard deviation, WS – weighted score

The nurses rated five risk factors as having moderate significance (less frequently present): changes in skin turgor (0.73), impaired sensation (0.72), impaired circulation (0.7), impaired metabolic state (0.58), and secretions (0.53) (Table 3). The total DCV score was 0.77.

Table 3 Factors identified as moderately significant (less frequently present) by experts

Risk factor	mean	SD	WS
changes in skin turgor	3.90	0.86	0.73
impaired sensation	3.91	0.73	0.72
impaired circulation	3.69	0.81	0.70
impaired metabolic state	3.33	0.78	0.58
secretions	3.11	0.74	0.53

SD – standard deviation, WS – weighted score

All statistically significant correlations of the risk factors are positive and stand at between 0.2 and 0.4, indicating weak (0.1–0.3) and moderate (0.3–0.7) relationships. The strongest correlations were found between moisture and mechanical factors (r = 0.4008), and moisture and physical immobilization (r = 0.3072). Weak relationships were found between physical immobilization and mechanical factors; extremes of age and physical immobilization; Imbalanced nutritional state and skeletal prominence; mechanical factors and imbalanced nutritional state; and skeletal prominence and hyperthermia. The identified correlations might suggest relationships between the individual risk factors (Table 4).

Table 4 Correlations between significant risk factors

	Extremes of age	Hyperthermia	Moisture	Physical immobilization	Mechanical factors	Imbalanced nutritional state	Skeletal prominence
excretions	0.0320	0.0486	-0.0702	-0.0692	-0.0155	-0.0448	0.0617
extremes of age	1	0.0316	0.1105	**0.2215****	0.1796	0.1905	0.0520
hyperthermia		1	0.1263	-0.0889	0.0593	0.1119	**0.2008****
moisture			1	**0.3072***	**0.4008***	0.1691	0.1792
physical immobilization				1	**0.2516****	0.1007	0.1450
mechanical factors					1	**0.2117****	0.0087
imbalanced nutritional state						1	**0.2188****

*Correlation is significant at the level 0.01; **Correlation is significant at the level 0.05

The weakest significance (risk factors present minimally) was identified in the risk factors: immunological factors (0.43), medications (0.4), psychogenetic factors (0.38), developmental factors (0.37), humidity (0.35), radiation (0.31), hypothermia (0.24), changes in pigmentation (0.23), and chemical substance (0.21).

Discussion

The process of making nursing diagnoses has become the subject of investigation only in recent decades. The objectives of the researchers include validation of nursing diagnoses, usually on the basis of the present defining characteristics or risk factors. There are many studies with the aim of validating current nursing diagnoses; however, few of these attempt to validate potential diagnoses on the basis of the risk factors present. There are, for example, studies by Pereira de Melo et al. (2011) who validated the nursing diagnosis of at Risk of Decreased Cardiac Output, or Schulz et al. (2014) who focus on Risk of Infection. In an attempt to validate the nursing diagnosis of at Risk of Impaired Skin Integrity in relation to pressure ulcers, we used the DCV model to establish the significance of the risk factors for the diagnosis.

The sample of the Slovak nurse-experts (n = 126) who met modified Fehring criteria, based on their clinical practice in which they were in contact with pressure ulcers, rated the following risk factors as significant (the most frequently present): physical immobilisation, skeletal prominence, imbalanced nutritional state, moisture, mechanical factors (e.g., shearing forces, pressure, restraint), the Norton Scale score 14 ≥ points, hyperthermia, excretions, and extremes of age. Nurses rated the following factors as having moderate significance (less frequently present): changes in skin turgor, impaired sensation, impaired circulation, iompaired metabolic state, and secretions.

Immobility was also described as the most significant risk factor for pressure ulcers by Lindgren et al. (2004), who, in a sample of patients from medical and surgical departments, found other significant factors such as old age, weight, length of hospitalization, and surgical treatment in surgical patients. Overall physical state and physical activity were also considered significant risk factors by Källman, Lindgren (2014), Kumari et al. (2015), Papanikolaou, Lyne, Lycett (2003). Coleman et al. (2013), by analysis of 36 research studies, come to the conclusion that there is a higher risk of pressure ulcers with poorer patient mobility/activity. The statistically significant relationship between mobility/activity and pressure ulcers has been confirmed in up to 80.5% of these studies. Immobility is closely related to mechanical factors such as shearing forces, pressure and restraint, which were also rated as significant risk factors by the experts. A similar conclusion was also drawn by Källman, Lindgren (2014) who suggested friction and shear; Kumari et al. (2015) and Perneger et al. (2002) pointed out friction and shearing forces. The significance of these conclusions underlines most definitions of pressure ulcers which describe the action of pressure, friction or shearing forces, or the synonym "pressure sore" is used for pressure ulcer. Coleman et al. (2014) found a close relationship between immobility, friction and shear, but they also drew attention to difficulties in measuring these risk factors in clinical practice.

Imbalanced nutritional state was rated as the third most significant risk factor for pressure ulcer development by the nurses. Hyun et al. (2014) reported study results on the influence of obesity on pressure ulcer development. The incidence of pressure ulcers was higher in the group of underweight patients, and in extremely obese patients it was almost twice as high as in patients of normal weight. Similar conclusions were drawn by Kumari et al. (2015), Lindgren et al. (2004), Pattanshetty, Prasade, Aradhana (2015), Casimiro, García-de-Lorenzo and Usán (2002); thus we can consider imbalanced nutritional state as a significant factor for pressure ulcer development. Coleman et al. (2013), however, after analysis of 34 research studies, found that only 13 (38.2%) of them described nutrition as a significant predictive factor.

Moisture is identified as a significant risk factor in several studies particularly in relation to impairment of urinary or faecal continence (Papanikolaou, Lyne, Lycett, 2003; Källman, Lindgren, 2014; Demarre et al., 2015). According to Coleman et al. (2013), moisture was indentified as a statistically significant factor in pressure ulcer prediction in 48% of the studies analysed. Using meta-analysis, Beeckman et al. (2014) found a possible relationship between incontinence-associated dermatitis and moisture as significant factors for pressure ulcer development. In our study moisture was rated the fourth most significant risk factor, and nurses drew attention to its significance, also choosing excretions as the most frequently present risk factor in pressure ulcer development.

The Indian authors Kumari et al. (2015), who studied the predictive validity of three risk assessment pressure ulcer scales, found the Norton Scale to be the most effective in prediction of risk in Indian

surgical departments. The most significant factors monitored are: nutrition (BMI), mobility/activity, friction, and shear. Implementing four scales, Pattanshetty, Prasade and Aradhana (2015) conclude that the Cubbin and Jackson Scale has greater ability to predict the risks of pressure ulcers in the intensive care units in an Indian environment. In their study, the most significant factors for pressure ulcer development are: nutritional state (underweight and obesity), old age, artificial ventilation, musculoskeletal system diseases, and diabetes mellitus type 2. The study findings by Papanikolaou, Lyne, and Lycett (2003) suggest the relatively high importance of the factors included in the simplified version of the Waterlow risk assessment scale (which has satisfactory predictive ability): skin condition, mobility, continence, and admission route. Defloor and Grypdonck (2005) compared the predictive values of the Braden and Norton scales with clinical judgements of nurses, revealing that nurses were less effective in prediction of pressure ulcer development (prediction accuracy was lower by 25–28% in nurses than with the use of both predictive scales). The significant predictors of pressure ulcers were activity, sensory perception, skin diseases, and a history of pressure ulcers. Similarly, Pancorbo-Hidalgo et al. (2006), on the basis of a review of the literature, came to the conclusion that the use of both the Braden and Norton scales in prediction of the risk of pressure ulcers is more accurate than clinical judgements by nurses. Conversely, Saleh, Anthony, Parboteeah (2009) in their study rated clinical judgements by nurses as effective as a pressure ulcer risk assessment scale. Šáteková and Žiaková (2014), in their analytical review of foreign literature, came to the conclusion that the Braden Scale showed optimal predictive validity and that there was a need for further tests of the Norton and Waterlow scales in clinical conditions. Three scales were tested in the Slovak Republic; the Braden Scale, the Norton Scale and the Waterlow Scale were found to demonstrate the best predictive ability, with only slight differences. (Šáteková, Žiaková, Zeleníková, 2015). These findings confirm the role of a measurement tool (scale) for prediction of pressure ulcers; it is included among the risk factors in both examined nursing diagnoses. In the potential nursing diagnosis of at Risk of Impaired Skin Integrity, NANDA International recommends the use of a standardized tool (NANDA International, 2013) which is specified as the Braden Scale in the new nursing diagnosis at Risk of Pressure Ulcer (NANDA International, 2014). In our study the nurses rated a Norton scale score of 14 ≥ points as a significant risk factor; they did not comment on other measurement tools. This

finding probably relates to the fact that nurses from all three hospitals use the Norton Scale for prediction of the risk of pressure ulcers.

Hyperthermia was rated as a significant risk factor by the nurses in our study. A relationship between higher body temperature and pressure ulcer development has also been detected by Suriadi et al. (2007) in intensive care patients. Demarre et al. (2015) describes it as an independent predictor of pressure ulcer development (stage II and III). Coleman et al. (2013) conclude that higher body temperature can be an important indicator of pressure ulcer development; however, this requires further investigation.

Extremes of age were last in the list of the nine significant predictive factors in our study. On the basis of regression analysis, Bours et al. (2001) illustrated their findings on four risk factors which were significantly related to the incidence of pressure ulcers: infection, age, length of stay and total Braden score. Using multivariable techniques, Perneger et al. (2002) came to the conclusion that there are four key factors in the prediction of pressure ulcers: age, mobility, mental status and friction/shear, and they designed a tool for pressure ulcer risk prediction. The likelihood of increasing incidence of pressure ulcers related to increasing age was also confirmed by Margolis et al. (2002) in the elderly in community care. Similarly, Casimiro, García-de-Lorenzo and Usán (2002) concluded that the prevalence of pressure ulcers in the elderly Spanish population increased with age, poor nutritional state, immobilization, and restricted functioning. Extremes of age, particularly higher age, are often indentified as a predictive factor of pressure ulcer development, which probably relates to both higher concentration of risk factors and changes in overall physical condition. Conversely, Defloor and Grypdonck (2005) found no relationship between age and pressure ulcer development.

The study results by Demarre et al. (2015) confirm that the predictive factors which independently relate to pressure ulcer (stage II and III) development are non-blanchable erythema, urogenital disorders and higher body temperature; for superficial pressure ulcers they are: admission to an internal medicine ward, incontinence-associated dermatitis, non-blanchable erythema and a Braden score of < 17. Non-blanchable erythema is described as a risk factor for the new nursing diagnosis of at Risk of Pressure Ulcer (NANDA International, 2014); we did not include it in our study and it was not reported by nurses. In their study, Vanderwee, Grypdonck, Defloor (2007) suggested it to be a key indicator in

pressure ulcer prevention. The study by Alman et al. (1995) suggested five risk factors significant for pressure ulcer prediction, including non-blanchable erythema (intact skin), immobility, dry skin, and decreased body weight. NPUAP (2007) categorizes non-blanchable erythema as pressure ulcer stage I, which may influence its inclusion among the risk factors.

Changes in skin turgor, impaired sensation, impaired circulation, impaired metabolic state, and secretions were rated by our respondents as moderately significant risk factors (less frequently present). These factors are more characteristic of physician-assessed criteria and are not nursing-sensitive factors. In the reviewed studies, they occurred only rarely or under different labels such as dry skin, skin condition, skin disease, diabetes mellitus type 2, blood vessel diseases, smoking, blood pressure, perfusion, etc. Because of the terminological ambiguity, it is difficult, if not impossible, to compare the obtained results and draw conclusions.

The risk factors in the third group (minimally present) are those which do not relate to pressure ulcer development but which contribute to other types of skin impairment.

In our study we used the DCV model and identified nine risk factors that were rated by the nurses as significant (the most frequently present) predictive factors allowing prediction of pressure ulcer development in patients and early implementation of preventive measures. They are mostly the risk factors that are formulated so that they can be assessed objectively by nurses and result in the diagnostic conclusion of at Risk of Impaired Skin Integrity (in relation to pressure ulcers) or at Risk of Pressure Ulcer (a new nursing diagnosis according to NANDA I. 2015–2017). There might be a problem in identification of the risk factor mechanical factors (e.g., shearing forces, pressure, restraint), which was also illustrated by Coleman et al. (2014) related to difficulties with its measurement in clinical practice. In research studies, pressure ulcer risk prediction focuses on the use of the standardized tools which, however, have various levels of validity and reliability. The authors of the studies have come to various conclusions about the predictive ability of the individual scales, related to the clinical environments in which they were tested. Some of them have attempted to find the key risk factors and modify the scales. One of the selected significant risk factors in our study was a Norton Scale score of 14 ≥ because of its use in clinical practice in the selected hospitals. The question is, however, if it (or other scales) is to be used for all patients admitted or only for those with at least one identified significant factor for pressure ulcer development.

In the study we were limited by the sample size and focus on only one region in the Slovak Republic. In further research it is necessary to focus on testing the scales and on identification and comparison of significant risk factors in various regions in Slovakia.

Conclusion

Pressure ulcers are a serious health problem and an important part of nursing care. The priority task for nurses is to prevent their development by early prediction of existing risks, and effective prevention. There are many tools for identifying multiple risk factors. However, their validity and reliability vary. Nine significant risk factors which can be predictors of pressure ulcers were identified by experts using the DCV model. We recommend that these factors be considered as key risk factors, thus improving the assessment process and facilitating nurses in their choice of interventions to be applied in the prevention of pressure ulcers so that health care is purposeful and effective.

Ethical aspects and conflict of interest

The authors declare no conflict of interest; all ethical aspects of research were met. All the respondents were informed about the research purpose and gave their consent to being included in the study.

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Author contribution

Conception and design (ĽP, AS), data analysis and interpretation (ĽP, AS), manuscript draft (ĽP, AS), critical revision of the manuscript (ĽP, AS), final approval of the manuscript (ĽP).

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