THE DEVELOPMENT AND THE EVALUATION OF THE PSYCHOMETRIC CHARACTERISTICS OF A TOOL FOR THE ASSESSMENT OF THE NURSES' KNOWLEDGE, ATTITUDES AND PRACTICE IN THE FIELD OF PRESSURE ULCER PREVENTION AND MANAGEMENT

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BACKGROUND
Patient safety represents a priority field of the nurses' activity and pressure ulcer development and prevention are an important quality indicator of patient care. A first step in improving the care activities is the assessment of the nurses' level of knowledge, attitudes and practice regarding pressure ulcer prevention and management. Several international research studies indicated a deficit of the nurses' knowledge in this field, while on a national level no studies were made on this theme.
METHOD
The validation study included a group of 713 nurses randomly selected from 7 Bucharest hospitals and had as main objective evaluation of psychometric characteristics of a tool for the assessment of the nurses' knowledge, attitudes and practice in the field of pressure ulcer prevention and management for the adult patient, adapted to the competencies of nurses in Romania. The study included nurses who provide care to adult patients who can be at risk of developing pressure ulcers. Pediatric nurses were excluded from the study as well as those who didn't give their consent to participate, along with other medical staff categories such as doctors, physiokinetotherapists and students.
RESULTS
The final version of the instrument demonstrated acceptable psychometric qualities for each of the 3 scales that compose it, obtaining a Cronbach alpha coefficient with values of 0.613 (IC ** 0.556-0.667) for the knowledge scale, 0.714 (IC ** 0.678 - 0.748) for the attitude scale and 0.873 (CI ** 0.859 - 0.886) for the practice scale. The community analysis for the items that make up each rating scale was performed based on exploratory factor analysis to demonstrate the grouping of items on a single scale. For the knowledge scale, the values of the common variance have values between 0.792-0.465, for the attitude scale 0.731-0.519 and for the practice scale 0.701-0.412, values large enough to justify the grouping of items in a single scale.
CONCLUSION
Providing a valid and reliable tool for the assessment of specific knowledge, attitudes and practice represents a first step in improving the practice of care for patients and also an important starting point for the development of an educational program and a protocol for pressure ulcer prevention and management.

Keywords: nurses, knowledge, attitudes, practice, pressure ulcer, management, prevention.

INTRODUCTION

Through the proclamation of the Rio de Janeiro Declaration in October 2011, the prevention of pressure ulcers became a universal right of man. The Declaration was adopted by the Spanish National Group for the Study and Advise on Pressure Ulcer and chronic wounds (GNEAUPP) and the Ibero-Latin-American Society on Wound (SILAHUE). The two organizations set the objectives for pressure ulcer prevention by assuming a firm commitment for the development and implementation of politics in this field. The main aspect promoted by this proclamation represents the access of all the individuals to high- quality technical resources for pressure ulcer prevention and the use of best practice based on evidence, not on economic criteria when the therapeutic methods and resources are chosen. Another guideline refers to basic knowledge improvement for the professionals in the field of health care regarding the care of patients in risk of developing pressure ulcer or who present this type of lesion, using a complete interdisciplinary approach. Also, the consolidation of the nurse's role in providing care to patients with pressure ulcer represents another important aspect of the Rio Declaration [1].

Bedsores or „pressure ulcers represent a localized deterioration of the skin and/or of the deep soft tissue, usually on a bony prominence or associated with a medical device."

The lesion appears as a result of intense and/or prolonged pressure combined with shear force. The tolerance of the soft tissues to pressure and shredding can also be influenced by the local microclimate, nutrition, circulation, co-morbidities and the state of the soft tissue [2]. This type of lesion represents a major challenge for health specialists because there is a great number of people who are vulnerable to this complication. These can have important restrictions on the quality of the patient's life and can lead to an increase in the costs and in the hospital stay, being directly related to increased mortality.

The prevention of pressure ulcer represents an important activity field of nurses and the occurrence of this type of lesion represents an important indicator of monitoring the quality of the care provided by the nurse as well as an indicator of patient safety. In order to improve the

quality of care, nurses should have updated knowledge regarding pressure ulcers [3].

Knowledge is important to decide which patients need prevention, what measures are efficient, when and how these measures should be applied. Also, knowledge has an impact on the nurses' attitude towards pressure ulcer which, in turn, directly influence the practice and care of patients at risk of developing pressure ulcers.The assessment of knowledge in the field of pressure ulcer prevention represents a first step in elaborating actions for the improvement of nurses' practice and knowledge. Research showed that, on one hand, only 10,18%-13,9% of the patients at risk received appropriate prevention and, on the other hand, more than 70% of the risk-free patients received a prevention form which is redundant and inefficient, the main cause being the lack of knowledge [4].

Several studies conducted by researchers in different countries showed that the main cause of inefficient pressure ulcer management is the nurses' lack of knowledge and inadequate training in this field [5],[6]. In our country, up to now, there have been no studies on this theme.

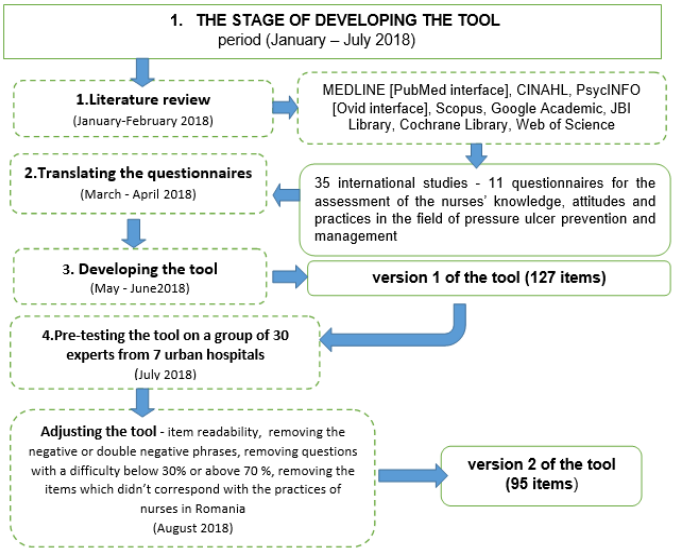
The development of a tool for the assessment of the nurses' level of knowledge, attitudes and practice regarding pressure ulcer prevention and management is an extremely laborious process, but also an extremely important part of the improvement of the patient care process. This research study represents the starting point of the development of an educational program according to the current training necessities as well as of a protocol for the pressure ulcer prevention and management with the purpose of making improvements in the field of prevention and care of the patients at risk of developing pressure ulcer.

METHODOLOGY

The objective of the study was to develop and evaluate the psychometric characteristics of a tool for the assessment of the nurses' knowledge, attitudes and practices in the field of pressure ulcer prevention and management, adapted to the level of competency of the nurses in Romania.

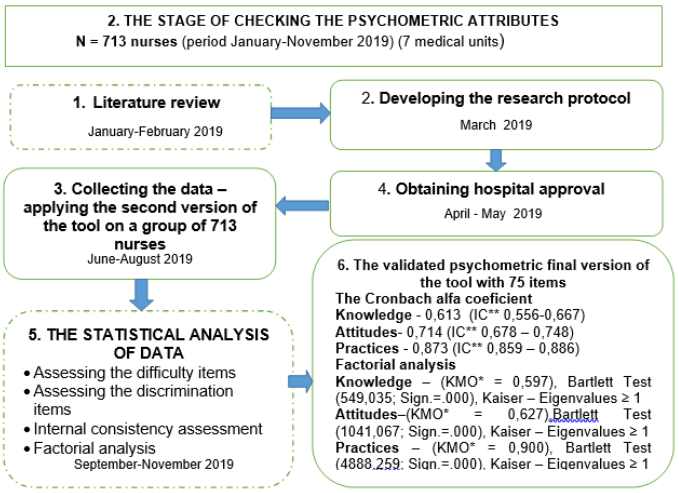
The initial stage of developing the assessment tool took place during January – July 2018 and was comprised of 5 phases consisting of: the reviewing of specialized literature in order to identify the main questionnaires in the field of pressure ulcer prevention and management, translating into Romanian the main questionnaires, the phase of elaborating the questionnaire, the phase of pre-testing the questionnaire on a group of 30 nurses with expertise in the field and the phase of adjusting and finalizing the first version of the tool (Figure 1). The second stage that took place during June-August 2019 was dedicated to testing the psychometric characteristics of the tool for the assessment of the nurses' knowledge, attitudes and practice in the field of pressure ulcer prevention and management on a group of 713 nurses randomly selected from 7 hospitals in Bucharest and who provide care to adult patients who can be at risk of developing pressure ulcers (Figure 2).

Figure 1. The process of developing the tool for the assessment of the nurses' knowledge, attitudes and practices in the field of pressure ulcer prevention



Data source: personal contribution

Figure 2. The process of psychometric validation of the tool for the nurses' assessment of knowledge, attitudes and practices in the field of pressure ulcer prevention and management



Data source: Statistical processing of data collected after the application of version 2 of the tool on a sample of 713 general nurses

RESULTS

1.1. Reviewing the specialized literature to identify the main questionnaires in the field of pressure ulcer prevention and management

The process of developing the tool began with making an online bibliographic study which identified a total of 11 tools for the assessment of the nurses' knowledge, attitudes and practice regarding pressure ulcer.

1.1.1. PUKT tool (Pressure Ulcer Knowledge Test) was first developed in 2010 by D. Beeckman to assess the nurses' knowledge and it has good psychometric

characterstics (Cronbach index of 0,77 and a stability index of 0,88) [7]. The tool was adopted and adapted to the culture and practice of the medical system in Turkey and China. In the study that was made in Turkey, the validity tests showed psychometric qualities and good reliability that were shown and supported through the values obtained for different statistic indexes (the index of the content validity 0,94, the intra-class correlation coefficients 0,37 - 0,80, the difficulty indexes 0,21 - 0,88, the indexes of discriminating the values between 0.20 - 0.78 and the Kuder Richardson index 0.803) [8]. In China, the tool also got good psychometric values. (the general Cronbach's index 0,792, and for the subthemes, it got values between 0,426 and 0,804, the general reliability of the tests was 0,826, the difficulty index had values between 0,46 and 0,93 and global values for the discrimination index between 0.28 and 0.55) [9].

1.1.2. The APUP tool (The Attitude towards Pressure ulcer Prevention instrument APuP) was developed by the same author in order to assess the nurses' attitudes towards pressure ulcer prevention and showed very good psychometric characteristics. The general coefficient of intraclass correlation was 0,88. The tool obtained similar results during the stability tests [ICC = 0,88 (CI 95% = 0,84-0,91,P <0,001)] and recorded for the total of items a value of Cronbach-alfa internal consistency of 0,79 [10].

1.1.3. The PZ-PUKT tool (Pressure Ulcer Knowledge Test) was developed and first tested in the U.S. in 1993 by Barbara Pieper. In 2014, the authors updated the version according to the new reccommendations of NPUAP and EPUAP. The Cronbach's value was 0.80 for the PZ-PUKT test. Cronbach's values recorded for the subscales were: staging 0.67, the description of lesions 0.64 and prevention/risk 0.56 [11].

1.1.4. The QARPPU questionnaire (***Questionnaire to evaluate nurses' adherence to recommendations for preventing pressure ulcers)*** was developed in Spain by A. B. Moya-Suárez and his collaborators in 2016 in order to assess the nurses' compliance regarding pressure ulcer recommendations. The results of the validation study showed that QARPPU is a tool developed to measure the compliance with the recommendations for preventing pressure ulcer and its psychometric characteristics make it adequate for hospital use [12].

1.1.5. PUKAT 2.0 (Knowledge assessment tool for pressure ulcer prevention) is a reviewed and updated version of the tool for the assessment of knowledge about pressure ulcer developed in 2010 by Beeckman D. and his collaborators. The validity of the content was proven by applying the Delphi procedure and included the participation of experts from EPUAP and NPUAP. During the validation stage, the tool showed good validity, a moderate difficulty index and a correlation coefficient of 0,69, which recommends it for being used internationally in order to assess knowledge about pressure ulcer prevention [4].

1.1.6. The PUKT tool-version 1 (Pressure Ulcer Knowledge Test) – was developed in 2015, in Australia, by P. Lawrence and his collaborators, being adapted to the conditions in the hospitals in Australia, and the items were updated so that to ensure the coherence with the current guidelines in clinical practice. The authors of the study recommend that the practices of pressure ulcer prevention and management be audited in order to determine compliance with the available evidence and current trends [13].

1.1.7. The tool for the assessment of Nurses' attitudes, behaviors and practices in the field of perceived barriers towards pressure ulcer prevention and management was developed in 2004 by Moore Z. and Price P. in Ireland as a scale for measuring the staff's attitude towards pressure ulcer prevention measures, being used to give useful feedback on the clinical beliefs of the medical staff regarding pressure ulcer. The conclusion of the validation study was that further research is necessary to analyze the relation between the level of the nurses' knowledge and their attitudes towards pressure ulcer prevention and management [14].

1.1.8. The tool for the assessment of the nurses' attitude, practice and knowledge regarding pressure prevention for hospitalized patients was developed by ***Shariful Islam – Bangladesh*** as a part of his master thesis at the University Song Prince in Thailand. The author didn't check the psychometric characteristics of the questionnaire, but the recommendations of the study refer to updating knowledge about pressure ulcer prevention for practice improvement [15].

1.1.9. The Pressure Ulcer Knowledge Questionnaire (PUKQ) was used and developed as part of an action to improve the pressure ulcer care facilities during 2008-2009, an action initiated by the Ministry of Health in Indiana (ISDH), as a result of the data obtained from the care units which showed an increase in the rate of pressure ulcer development. This was used to assess the staff's knowledge about pressure ulcer before and after applying a training program [16].

1.2. Translating the questionnaires

By following the WHO translation methodology, for the first stage, the tools were translated into Romanian by an English speaking person, familiarized with terminology specific to the activity field of the tool. The translation took into consideration the conceptual equivalence of words or of the contextual situation of the terms, avoiding the literal translations or the word by word translations. In the second stage, the tools were translated again into English by an independent authorized translator who had no knowledge regarding the questionnaire content. In this stage we identified elements that were double interpreted, with emphasis on the conceptual and cultural correspondence of the terms and not on the linguistic equivalence. In the last stage, a second translation into Romanian was made [17].

1.3. The stage of developing the tool

These questionnaires represented the starting point of developing the first version of the tool. The first version of the tool consisted of 127 items and was made by selecting the questions from a basis of 338 items extracted from the specialty papers. Items from the PUKT, PUKAT 2.0, QARPPU, PZ-PUKT, APUP, PUKQ questionnaires

were taken and other 35 new items were added. In order to collect the demographic data of the respondents, 7 items were created, 56 items referred to prevention measures and 64 items referred to pressure ulcer management. The items regarding prevention and management were divided into 3 subcategories: knowledge 41 items, attitudes 30 items, practice 39 items, while 10 items were free-response items regarding the current practices of identification and documenting of the care process. The initial variant of the questionnaire was pre-tested and validated as part of a focus group of 30 nurses with expertise in the field, from 7 Bucharest hospitals and who performed their duties in different specialties like neurology, intensive care, neuro-surgery, orthopedics, medical recovery and palliative care.

The questionnaire was analyzed as a part of a focus group from the point of view of its adaptability to practices in Romania, of the text clarity, of readability and of answer alternatives to items or to choosing the best alternative expressions to define the context and the level of difficulty of the items. Certain items needed rephrasing in order to avoid negative constructions or to have a better understanding of the message. The terms „pressure injury", „decubitus ulcer" or „pressure ulcer" were replaced with the term „eschar"(„escare"), more frequently used in Romanian. The items which recorded a difficulty index under 30% and above 70% were removed. The result of the first pre-testing stage generated the second version of the tool for the assessment of knowledge, attitudes and practice which consisted of 95 items on the theme of pressure ulcer prevention and management and which form 3 assessment scales as follows: knowledge scale, attitude scale and practice scale, with a medium time of filling in of 30 minutes.

2. The stage of checking the psychometric characteristics

2.1. Objectives

In the second stage of developing the tool, a method of descriptive quantitative research was used by collecting data based on a semistructured interview with the help of the tool for the assessment of nurses' knowledge, attitudes and practice regarding pressure ulcer prevention and management.

The second version had as a main objective to check the psychometric characteristics of the three main scales of the questionnaire.

2.2. Sample

The study included a group of 713 general medical assistants randomly selected from 7 acute care hospitals in Bucharest who perform their activities in units where patients who are at risk of developing pressure ulcers are taken care of. Pediatric nurses were excluded from the study as well as those who didn't give their consent to participate, along with other medical staff categories such as doctors, physiokinetotherapists and students.

2.3. Ethical considerations

The study was performed based on a protocol between the partner hospitals and The *Order of Nurses*, Midwives and Medical Assistants in *Romania*, Bucharest branch. Each participant in the study was informed through a consent form on the way the study will be performed so that the anonymity of the hospitals and of the participants would be kept. The nurses' participation in the study was voluntary and they were notified about the fact that they could always withdraw from the study without having to motivate their choice.

2.4. Results – the statistic analysis of data

The statistic analysis of data was made using the program IBM SPSS Statistics 20 and it included the calculation of the discrimination index and that of the item difficulty, the assessment of the internal consistency of the questionnaire scales and applying the statistical technique of factorial analysis in order to assess the complex series of variables and to demonstrate the hypothesis that the items were logically grouped in only one assessment scale for each of the three scales.

The difficulty index (d) is represented by the percentage of right answers obtained from each of the items which were initially a part of the 3 scales, divided by 100. One scale is discriminative enough when it uses items with a moderate difficulty index (0,30 – 0,40)[18]. The discrimination indexes (D) give us useful information regarding the relation between each item and the scale from which it supposes to be a part of. D calculation is done by dividing the subjects into 3 categories (superior, middle and inferior), depending on the total score obtained on the respective scale, then we compare the percentage from the first and last category (superior and inferior) of the right answers to the items (from the percentage of those from the superior category we substract the percentage of those from the lower category and the difference is divided by 100). If, after the calculation we get positive discrimination indexes, we can suppose that the respective items are rightly discriminating. The higher the discrimination index is, the higher the discrimination force of that item is (it has a better capacity of distinguishing between the good items and the weak ones regarding the respective characteristic). According to Popa (2010), the items with discrimination indexes lower than 0,20 should be removed or reviewed completely, those with values between 0,20 and 0,30 should be partially reviewed, an index between 0,30 and 0,40 is considered good and one above 0,40, very good (with a very high discriminatory force).[18]

The internal consistency represents the characteristic of the items to correlate with the global score of the scale from which they are a part of so that we could be certain that they reflect the same characteristic.Therefore, the correlation between the respective item provides an indication regarding the relevance of that item to the total result. Although it is not the only existing procedure, the Cronbach alfa coefficient is more used as an indicator of the measuring precision of a scale. Usually, the index tends to get higher at the same time with the increase of the number of the included items, but it is recommended to eliminate the items that negatively correlate with the total score or that have very low correlation coefficients (they don't contribute to the score of the scale)

The factorial analysis represents another set of statistical techniques which has as an objective to

simplify complex sets of variables. One of the major applications of the factorial analysis used in the case of validation studies was to determine the structure of the relation between the variables. There are two models of factorial analysis: exploratory (when there is no predetermined model of structuring the variables) or confirmatory (when there is a predetermined model). In our study, we made an exploratory analysis [18].

2.4.1.The respondents' socio-demographic characteristics

degrees and only 16 % higher degrees (15% licence degree and 1% master's degree). 41% of the nurses worked in surgical units, 42 % in medical units, 14% ICU and 3 % in other fields.

The frequency of self-training on the theme of pressure ulcer was reported by 16% of the nurses as being frequent, 79% of the participants reported that they sometimes or very rarely had read papers that had as a theme pressure ulcer and 5% of the nurses didn't read papers on this theme. Only 42% of the respondents said that they had participated in courses on the theme of pressure ulcer in the last 2 years.

Tabelul 1. Date socio-demografice ale participanților la studiul de validare

	N	Range	Mini	Max	Mean		Std. Dev.	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Age	650	48	22	70	41.05	.339	8.655	74.904
Professional experience	678	46	1	46	14.11	.371	9.655	93.219
Valid N	623							

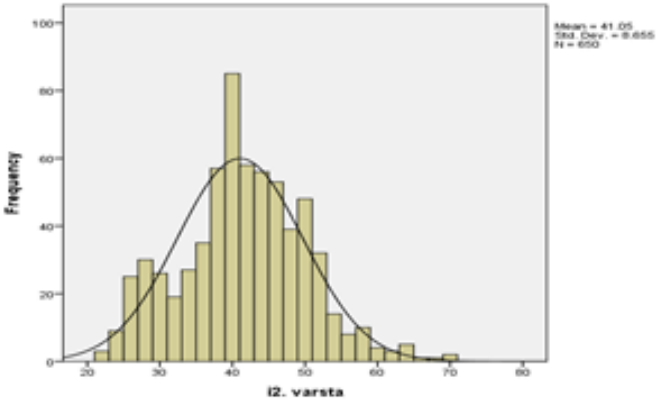


Figure 3. The graphic representation of the respondents' distribution depending on age

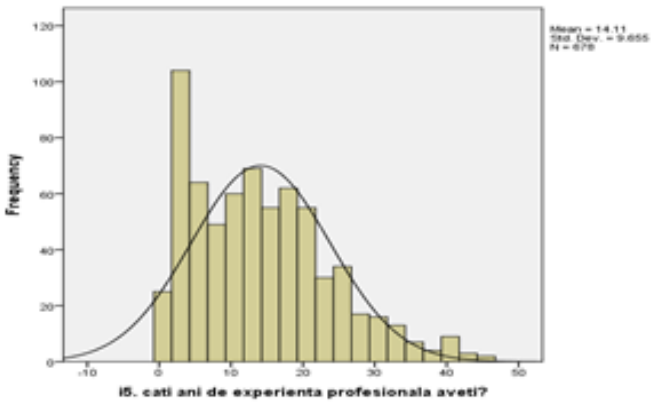


Figure 4. The graphic representation of the respondents' distribution depending on professional experience professional experience.

The data source in table 1, figures 1 and 3 represents the socio-demographic characteristics of the respondents that resulted from the statistical processing of the data collected after the application of version 2 of the tool on a sample of 713 general nurses.

The respondents' characteristics

The study included 713 nurses in 7 urban hospitals**.** The participants' average age was 41,05 and the average of the years of professional experience was 14,11 years. 82% of the nurses had post-high school degrees, 12 % high school

Table 2

Characteristics	**n (%)**
Gender	
Female	637 (91)
Male	16 (9)
Educational level	
School of Nursing	12 (2)
Post-high school vocational program of nursing	579 (82)
University studies	104 (15)
Master's degree	8 (1)
Doctoral studies	0 (0)
activity field	
Surgical unit	287 (41)
Intensive care	98 (14)
Medical unit	295 (42)
Other fields (palliative care)	18 (3)
post – initial training	
Courses	
yes	296 (42)
No	406 (58)
Self-training (reading books/journals/papers)	
yes, frequently	109 (16)
yes, sometimes	406 (57)
yes, very rarely	158 (22)
No	34 (5)

[1]the differences up to 713 (N) are represented by non-answers.

The data source in the table below represents the socio-demographic characteristics of the respondents that resulted from the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

2.4.2. The statistical analysis of the items which form the scale for the assessment in the field of pressure ulcer prevention and management *(items 19 – 50)*

a. *The analysis of the difficulty and discrimination indexes for the knowledge scale*

The items referring to the nurses' knowledge was assessed from the point of view of the difficulty and discrimination index. The difficulty indexes on the scale of knowledge assessment had values between -0,02 up to 0,94. In the final structure of the questionnaire we kept items that recorded values of the index of 0,30<d<0,70 and also

of the index D≥0,30 [18]. Based on the two indexes, 11 items were removed and a part of the rest of the items was kept, even if they didn't fully follow the theoretical conditions, being rephrased where their construction implied the use of negation or double negation.

b. ***The assessment of the internal consistency for the knowledge scale***

The assessment of the internal consistency for the knowledge assessment scale was applied to the 20 items that remained after the preliminary analysis of the difficulty and discrimination index. Subsequently, the number of items was successively adjusted in 6 stages by removing the items that had low coefficients of correlation with the total score of the scale. The values of the Cronbach alfa index have, theoretically, values between 0 and 1, the level of 0,70 being the most frequently considered as a minimum acceptable threshold, other researchers accepting values of up to 0,60.

The values of the Cronbach alfa coeficients for the 6 stages of analysis of the internal consistency as well as the trust intervals for each stage of analysis of the internal consistency are presented in table 3.

Tabelul 3. The Cronbach alfa coefficients for the 6 stages of analysis of the internal consistency

Variant	Cronbach alfa	Trust Interval (95%)
1 (cu 20 items)	0,536	0,463 – 0,602
2 (cu 18 items)	0,542	0,473 – 0,605
3 (cu 17 items)	0,575	0,511 – 0,634
4 (cu 16 items)	0,584	0,521 – 0,642
5 (cu 15 items)	0,596	0,536 – 0,652
6 (cu 14 items)	0,613	0,556 – 0,667

The data source in table 3 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

We can notice an increase in the internal consistency from one stage to the other so that for the final stage which is formed from 14 items (items: 23, 25, 26, 28, 29, 30, 31, 36, 39, 41, 43, 46, 48 and 50), the value of the Cronbach alfa coefficient succeeds in exceeding the 0.60 threshold. Taking into account the fact that the set of questions was focused only on the nurses' knowledge in a well defined area of knowledge, that of pressure ulcer prevention, we can conclude that a part of the respondents answered randomly, being uncertain of the right answer, this fact negatively influencing the Cronbach coefficient value. Even so, the value of 0,613 can be considered acceptable in the context of a nurses' knowledge deficiency in the field of pressure ulcer prevention and management.

c. ***The factorial analysis for the knowledge scale***

An exploratory analysis was performed to try to simplify the complex sets of variables by grouping into subscales/ dimensions and to detect the structure of the relation between the variables. The value of the Kaiser-Meyer-Olkin index (KMO = 0,597) as well as the level of the Bartlett sphericity test (549,035; Sign.=.000), suggested the existence of one or more mutual factors, which justified the initiation of a procedure of factorial reduction. Therefore, an exploratory factorial analysis was performed, made by extracting the main components of the 14 selected items, which showed a grouping into 6 main factors, by respecting the Kaiser-Eigenvalues ≥ 1 criteria. The variance explained by each of the 6 factors as well as the mutual variance (of the 6 factors altogether) are presented in table 4.

Table 4. The variance explained by each of the 6 factors and the cumulative variance

Factor	Eigen-values	% of variance	% cumulative
1	2,38	10,93	10,93
2	1,58	10,72	21,65
3	1,27	10,68	32,33
4	1,11	9,98	42,31
5	1,07	9,90	52,21
6	1,02	8,10	60,31

The extraction method: the analysis of the main components
The rotation method: Varimax with Kaiser normalization

Table 5. The saturation of the items for each of the 4 factors

Factor	Item	Saturation coefficient
1	29	0,691
	30	0,794
	50	0,503
2	26	0,591
	48	0,762
3	25	0,539
	31	0,612
	36	0,704
4	23	0,828
	43	0,585
5	39	0,474
	41	0,554
	46	0,746
6	28	0,872

The saturation for the 6 factors is presented in table 5
The data source in tables 4 and 5 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

An analysis of the commonalities of all the 14 items was made based on the factorial analysis, as you can see in the table below. The values presented in table 6 are high enough to support the hypothesis that the 14 items have mutual parts of variance, an aspect that can justify their grouping into one scale, the knowledge scale. The values of the mutual variance are between 0,792 and 0,465.

2.4.3. The statistical analysis of the items that form the scale of the nurses' attitudes towards pressure ulcer prevention and management (items 51 – 68)

a. ***The difficulty and discrimination indexes regarding attitudes***

The calculating of the difficulty and the discrimination indexes for the attitude scale showed that there is a necessity to remove the items that had high values for the difficulty index (item 53 d=0,95 and D=0,10 and item 58 d=0,83 and D 0,30), because under the circumstances of participating in a training program, we could have 100% right answers. The other items obtained acceptable values between 0,12 and 0,76.

Table 6. The mutual variances of the 14 knowledge items

Item	Initially	Extraction
23	1,00	0,718
25	1,00	0,515
26	1,00	0,465
28	1,00	0,792
29	1,00	0,717
30	1,00	0,655
31	1,00	0,559
36	1,00	0,605
39	1,00	0,520
41	1,00	0,532
43	1,00	0,682
46	1,00	0,560
48	1,00	0,602
50	1,00	0,523

The extraction method: the analysis of the main components

The data source in table 6 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

b. *The assessment of the internal consistency for the attitude scale*

The analysis of internal consistency or calculating the Cronbach alfa coefficient was initially applied for the 16 items, then the number of items was reduced by removing one more item (64), which presented a smaller coefficient of correlation with the total score of the scale. The values of the Cronbach alfa coefficients for the 2 stages of analysis of the internal consistency are presented in table 7.

Table 7. The Cronbach alfa coefficients for the 2 stages of the analysis of the internal consistency

Variant	Cronbach alfa	Trust Interval (95%)
1 (with 16 items)	**0,713**	0,676 – 0,747
2 (with 15 items)	0,714	0,678 – 0,748

The data source in table 9 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of the 713 general nurses.

You can notice the fact that by removing the item no. 64 we do not obtain an increase of the internal consistency, therefore we consider that we can keep all the 16 items, taking into account the fact that the value of the Cronbach alfa coefficient is a good value.

c. ***The factorial analysis of the attitude scale***

The value of the Kaiser-Meyer-Olkin index (KMO = 0,627) as well as the level of the Bartlett sphericity test (1041,067; Sign.=.000), suggest the existence of one or more mutual factors, which justifies the applying of a factorial reduction procedure.

The variance explained by each of the 7 factors, as well the mutual variance (of the 7 factors altogether) are presented in table. 8.

Therefore, an exploratory factorial analysis was performed on the 16 selected items, through the method of extracting the main components, which showed a grouping into 7 main factors (Tabel 11), by respecting Kaiser criteria – Eigenvalues ≥ 1.

Table 8. The variance explained by each of the 7 factors and the cumulative variance

Factor	Eigenvalues	% din varianță	% cumulativ
1	2,03	12,71	12,71
2	1,65	10,34	23,05
3	1,36	8,55	31,60
4	1,25	7,84	39,44
5	1,20	7,50	46,94
6	1,16	7,24	54,18
7	1,14	7,16	61,34

The extraction method: the analysis of the main components

The rotation method: Varimax with Kaiser normalization

The variance explained by each of the 7 factors, as well the mutual variance (of the 7 factors altogether) are presented in table. 8.

Table 9. The Saturation of the items for each of the 7 factors

Factor	Item	Saturation coeficient
1	56	0,599
	60	0,419
	65	0,729
	66	0,736
2	61	0,652
	62	0,791
	63	0,701
3	55	0,545
	57	0,762
4	51	0,558
	52	0,822
5	64	0,667
	67	0,733
	68	0,673
6	59	0,645
7	54	0,847

The data source in tables 8 and 9 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

Just like in the case of the knowledge scale, the analysis of commonalities was performed on the 16 items, which we consider to be grouped into one scale (tab. 10), a hypothesis supported and proven by the values presented in table 10. We can notice that these values are high enough, the mutual variance recording values between 0,731-0,519, a fact that justifies the grouping of these items into one scale, called the attitude scale.

2.4.4. The statistical analysis of the items that are a part of the scale of the nurses' practice in the field of pressure ulcer prevention and management *(items 69– 95)*

a. *The difficulty and discrimination indexes of the practice scale*

Table 10. The mutual variances of the 16 items regarding attitudes

Item	Initially	Extraction
51	1,00	0,564
52	1,00	0,730
54	1,00	0,731
55	1,00	0,467
56	1,00	0,542
57	1,00	0,711
59	1,00	0,629
60	1,00	0,662
61	1,00	0,485
62	1,00	0,648
63	1,00	0,519
64	1,00	0,593
65	1,00	0,588
66	1,00	0,644
67	1,00	0,624
68	1,00	0,677

The extraction method: the analysis of the main components

The data source in table 12 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

In the case of questions regarding practice, the decision of removing certain items is based firstly on the values of the discrimination index. Not having questions regarding knowledge and attitudes (which can be labeled as *hard* or *easy*), the difficulty index represents more of an indicator of the variability of the answers and so it would be suggested to remove those questions for which the index tends to be towards 0 or 1 (expressing a very reduced variability). Therefore, in this analysis stage, we will remove only the items with a negative discrimination index (D): items 87 and 88 recording D values of -0,04 and -0,06, respectively.

c. ***The evaluation of the internal consistency for the practice scale :***

The calculating of the Cronbach alfa coefficient was initially applied to all the 27 items, and then for 25 items that remained after the selection. The values of the Cronbach alfa coefficients for the 2 stages of analysis of the internal consistency are presented in table 11.

Table 11. The Cronbach alfa coefficients for the 2 stages of analysis of the internal consistency

Variant	Cronbach alfa	Trust Interval (95%)
1 (with 27 items)	0,858	0,843 – 0,873
2 (with 25 items)	**0,873**	0,859 – 0,886

The data source in table 11 is represented by the statistical processing of the data collected from the application of the version 2 of the tool on a sample of 713 general nurses.

As you can notice, removing the 2 items leads to a slight improvement of the value of the Cronbach alfa coefficient (0,873), a value that emphasizes a very good internal consistency of the scale regarding practice.

c. The factorial analysis – the practice scale

The value of the Kaiser-Meyer-Olkin index (KMO = 0,900) as well as the level of the Bartlett sphericity test (4888,259; Sign.=.000) suggest the existence of one or more mutual factors, which justifies the applying of a factorial reduction procedure. Therefore, an exploratory factorial analysis was performed through the method of extracting the main components on the 25 selected items, which showed a grouping into 6 main factors (Table 12), by respecting the Kaiser criteria – Eigenvalues ≥ 1. The variance explained by each of the 6 factors, as well the mutual variance (of the 3 factors altogether) are presented in table. 12.

Table 12. The variance explained by each of the 6 factors and the cumulative variance

Factor	Eigenvalues	% of variance	% cumulative
1	6,71	10,40	10,40
2	2,04	10,20	20,60
3	1,31	10,15	30,75
4	1,26	8,58	39,33
5	1,13	7,65	46,98
	1,00	6,89	53,87

Table 13. The Saturation of the items for each of the 6 factors

Factor	Item	Saturation coefficient
1	92	0,56
	93	0,49
	94	0,64
	95	0,76
2	81	0,57
	82	0,73
	83	0,65
	91	0,50
3	73	0,61
	78	0,59
	85	0,54
4	69	0,73
	70	0,55
	71	0,68
	80	0,67
5	72	0,73
	74	0,46
6	76	0,76
	79	0,61
	86	0,46

The extraction Method: the analysis of the main components
The rotation Method: Varimax with Kaiser normalisation
The value of each of the 6 factors is presented in table 13.
Note: the items 75, 77, 84, 89 and 90, having a saturation higher with 2 or more factors simultaneously, were not included in either of the factors.
The source of the data in tables 16 and 17 is represented by the statistical processing of the data collected after the application of

And in this case, the analysis of the commonalities of the 25 items was made through the statistical technique of factorial analysis to demonstrate the grouping of the items into one scale (table 14). The high values of the mutual variance/ commonality between 0,701-0,412 obtained by each item supports the hypothesis that they can be grouped into one scale of practice assessment.

Tabelul 14. The mutual variances of the 25 items referring to practice

Item	Initially	Extraction
69	1,00	0,562
70	1,00	0,593
71	1,00	0,696
72	1,00	0,625
73	1,00	0,463
74	1,00	0,439
75	1,00	0,544
76	1,00	0,701
77	1,00	0,581
78	1,00	0,443
79	1,00	0,531
80	1,00	0.602
81	1,00	0,534
82	1,00	0,594
83	1,00	0,511
84	1,00	0,476
85	1,00	0,536
86	1,00	0,454
89	1,00	0,412
90	1,00	0,494
91	1,00	0,509
92	1,00	0,489
93	1,00	0,528
94	1,00	0,542
95	1,00	0,613

The source of the data in table 14 is represented by the statistical processing of the data collected after the application of the version 2 of the tool on a sample of 713 general nurses.

the extraction method: the analysis of the main components

2.4.5. CONCLUSIONS

Good knowledge of pressure ulcer will lead to good prevention. Taking into account the fact that internationally research indicated a knowledge deficit in the field, there is the necessity to develop a tool for the assessment of the nurses' knowledge and attitudes in the field of pressure ulcer prevention and management socio-culturally adapted to the conditions and the practices and competencies of nurses in Romania. As a part of this study, we developed a valid and reliable tool with psychometric characteristics comparable to those of internationally developed tools, a tool very useful in identifying the nurses' training needs. The tool consists of 75 items with a moderate difficulty index and a filling-in time of maximum 30 minutes. The proven psychometric qualities of the tool recommend it to be used in research activities or in the assessment of knowledge before and after applying the educational program.

Providing a tool for the assessment of specific knowledge represents a first step in improving the practice of care for patients and also an important starting point for the development of an educational program and of a protocol for pressure ulcer prevention and management.

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