

ORIGINAL ARTICLE

Attitudes towards pressure ulcer prevention: a psychometric evaluation of the Swedish version of the APuP instrument

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Key words

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Abstract

The primary aim was to conduct a psychometric evaluation of the Attitude towards Pressure ulcer Prevention (APuP) instrument in a Swedish context. A further aim was to describe and compare attitudes towards pressure ulcer prevention between registered nurses (RNs), assistant nurses (ANs) and student nurses (SNs). In total, 415 RNs, ANs and SNs responded to the questionnaire. In addition to descriptive and comparative statistics, confirmatory factor analyses were performed. Because of a lack of support for the instrument structure, further explorative and consecutive confirmatory tests were conducted. Overall, positive attitudes towards pressure ulcer prevention were identified for all three groups, but SNs reported lower attitude scores on three items and a higher score on one item compared to RNs and ANs. The findings indicated no support in this Swedish sample for the previously reported five-factor model of APuP. Further explorative and confirmative factor analyses indicated that a four-factor model was most interpretable: (i) Priority (five items), (ii) Competence (three items), (iii) Importance (three items) and (iv) Responsibility (two items). The five-factor solution could not be confirmed. Further research is recommended to develop a valid and reliable tool to assess nurses' attitudes towards pressure ulcer prevention working across different settings on an international level.

Introduction

The development of research-based instruments has contributed to more in-depth research in the field of nursing, which expands basic knowledge as well as clinical use to enhance quality and safety in nursing care. Pressure ulcer care is one such important area of responsibility for nurses in which the body of research-based knowledge is growing. This study aims to test a valid and reliable research instrument to examine nurses' attitudes towards prevention of pressure ulcers.

Background

The prevalence of pressure ulcers remains rather high despite excellent and vast knowledge on the benefits of preventive actions and what preventions could be implemented. In Europe, prevalence estimates of pressure ulcers have been reported

to range from 9% to 18% in different settings (1–4). It is possible to avoid the occurrence of most pressure ulcers (5), and

Key Messages

- instruments have been developed to measure attitudes towards pressure ulcer prevention, but extensive evaluation of reported psychometric properties is scarce
- the factor structure of the instrument Attitudes towards Pressure ulcer Prevention could not be confirmed in a Swedish sample and instead a four-factor solution was found to fit the data best
- the findings indicate that the original instrument was not ideally suited to represent the attitudes of a Swedish sample of nurses and nursing students

several initiatives have been undertaken to reduce the prevalence rate. For example, pressure ulcer prevalence is an established quality indicator and is accepted as a nursing sensitive outcome measure (6). In Sweden, for example, information on pressure ulcers is part of a national quality register named Senior Alert, which has led to a heightened awareness of pressure ulcer risk and the need for systematic work to reduce the number of pressure ulcers, both in hospital- and in home-based care. However, there is a somewhat low compliance with pressure ulcer prevention guidelines (1,7). Nurses' knowledge and attitudes have been identified as important factors determining nurses' actual clinical practice in relation to pressure ulcer care, and a previous study have reported that knowledge and attitudes might influence compliance with guidelines (8). Nurses' attitudes towards and knowledge about pressures ulcer prevention have gained an increased research interest (9), and standardised instruments of knowledge and attitudes towards pressure ulcer prevention have been developed, providing important information about underlying factors. An example of a standardised instrument is the Attitude towards Pressure ulcer Prevention (APuP) instrument (10). Nurses' knowledge regarding risk factors and preventive methods has been seen to vary considerably in different settings (11,12) and reported to be related to education level (10,13).

Intention to perform certain activities can be predicted from factors such as social norms, perceived behavioural control and attitudes towards the specific behaviour (14). However, a complex relationship exists between attitudes, personality and behaviour, and the research findings are in some aspects somewhat inconclusive (15). Nurses' positive attitudes towards pressure ulcer prevention are not sufficient to influence their behaviour. Lack of both time and staff were factors identified to negatively affect preventive practices as well as make these practices more haphazard and erratic (16). Conversely, Beeckman *et al.* (17) found positive correlations between nurses' attitudes and the application of adequate prevention measures for pressure ulcers. Additional training on pressure ulcer prevention, however, did not lead to higher attitude scores, and nurses' knowledge did not show any correlation with the use of prevention measures (17). Furthermore, registered nurses (RNs) in Belgian nursing homes have been reported to have higher attitude scores towards pressure ulcer prevention, that is they had more positive attitudes than assistant nurses (ANs) (12). Moreover, a report from an intensive care setting showed no differences between RNs and ANs in their attitudes towards pressure ulcers (18). In a multi-faceted intervention comprising decision support for pressure ulcer prevention, nurses' attitude scores were significantly higher in an intervention group than in controls (19).

The prevalence of pressure ulcers is high despite the existence of extensive research-based knowledge about the benefits of preventive care measures as well as national efforts to highlight the existence of the problems and the importance of reducing it (e.g. by considering pressure ulcer prevention as patient safety work). However, there is a need for more research-based knowledge on attitudes towards pressure ulcer prevention from a variety of settings and populations, as well as to assess the robustness of measuring methods. This study aimed to conduct a psychometric evaluation of the APuP in a Swedish context. A

further aim was to describe and compare attitudes towards pressure ulcer prevention between RNs, ANs and student nurses (SNs). The following research questions were addressed: Are there any differences between students' and nurses' attitudes towards pressure ulcer prevention? Can the five-factor structure of the APuP instrument be confirmed in a Swedish sample? If not, what does the factor structure of the APuP look like in a Swedish sample and is it reliable?

Methods

Design

An instrument validation study was designed to describe and compare attitudes between groups of nurses (RNs, ANs and SNs) as well as to test the validity of the instrument. The study is part of a multicentre study investigating knowledge and attitudes associated towards pressure ulcers and prevention of pressure ulcers in groups of RNs, ANs and SNs.

Sample

RNs and ANs, from two county councils in the middle of Sweden, working in surgical, orthopaedic, medical and palliative wards in one of three hospitals (one university hospital, one central hospital and one general hospital), were asked to participate in the study. RNs in Sweden have a university degree with a Bachelor of Science in Nursing; ANs have an exam from upper secondary school. Furthermore, all SNs in their last semester of a 3-year Nursing Bachelor's Programme (180 credits) at two universities were invited to participate. The total population consisted of 577 persons, of whom 418 (72%) completed the questionnaire. Three questionnaires were excluded because of missing background data. Thus, the final sample was 415 persons: 196 RNs, 97 ANs and 122 SNs (Table 1).

Instrument

The APuP instrument was developed by Beeckman *et al.* (10) who after an initial literature review identified eight possible subscales. A double Delhi procedure with two separate expert groups was used resulting in a 32-item questionnaire. The content validity index of the items was reported between 0.87 and 1.00 (10). The instrument was then distributed to a convenience sample of RNs and SNs to evaluate construct validity and stability. The final factor analysis yielded a five-factor solution comprising 13 items reporting psychometric validity. The five factors suggested by Beeckman *et al.* were as follows: (i) personal competency to prevent pressure ulcers, (ii) priority of pressure ulcer prevention, (iii) impact of pressure ulcers, (iv) responsibility in pressure ulcer prevention and (v) confidence in the effectiveness of prevention (10,19) (Table 2). Each item was rated on a four-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree).

The instrument, as well as each of the five factors, was considered to be robust and conceptually sound with supporting psychometric properties supporting the argument. The instrument yields a sum score representing a total attitude score obtained by summarising the 13 items after reversing the

Table 1 Demographic characteristics of registered nurses (RNs), assistant nurses (ANs) and student nurses (SNs)

	Total (n=415)		RN (n=196)		AN (n=97)		SN (n=122)	
	N	%	N	%	N	%	N	%
Gender*								
Female	383	92.3	183	93.4	87	89.7	113	92.6
Male	29	7.0	13	6.4	8	8.2	8	6.6
Age, mean (SD)	38 (12.2)		39 (11.9)		47 (11.3)		31 (7.9)	
Education								
Bachelor degree	125	42.7	123	63.3	2	2.1	0	
Master degree	5	1.7	4	2.0	1	1	0	
Specific education (in wounds)								
In-service training (1–4 hours)	141	48.1	95	48.5	46	47.4	NR	
In-service training (≥1 day)	61	20.8	30	15.3	31	31.6	NR	
University course	8	2.7	7	3.6	1	1.0	NR	
Work experience*								
<5 years	49	16.7	40	20.4	9	9.3	NR	
5–10 years	62	21.2	46	23.5	16	16.5	NR	
>10 years	165	56.3	100	51.0	65	67.0	NR	

NR, not relevant.

*If the number does not add to 415, there are internal missing data.

Table 2 Factors and items in the instrument Attitudes towards Pressure ulcer Prevention (APuP)

Factors	Items
Competence	1. I feel confident in my ability to prevent pressure ulcers 2. I am well trained to prevent pressure ulcers
Priority	3. Pressure ulcer prevention is too difficult. Others are better than I am* 4. Too much attention goes to the prevention of pressure ulcers* 5. Pressure ulcer prevention is not that important* 6. Pressure ulcer prevention should be a priority
Impact	7. A pressure ulcer almost never causes discomfort for a patient* 8. The impact of pressure ulcers on a patient should not be exaggerated* 9. The financial impact of pressure ulcers on society is high
Responsibility	10. I am not responsible if a pressure ulcer develops in my patient* 11. I have an important task in pressure ulcer prevention
Effectiveness	12. Pressure ulcers are preventable in high-risk patients 13. Pressure ulcers are almost never preventable*

*Negatively worded item.

scale point for the negatively worded items in the instrument (Table 2). The five factors generate a maximum possible score of 52, with higher scores indicating a more positive attitude. A mean attitude score of >75% of the highest possible score was regarded as satisfactory in this study, in accordance with Beekman *et al.* (17).

Procedure

Permission for translation and use of the instrument was sought and granted from the developers. Three experts in pressure ulcer prevention in the present research group translated the original English version into Swedish using a modified version of the back-translation model suggested by Brislin (20). A bilingual translator performed the back-translation. A review of the translated instrument was performed by another expert on pressure ulcers that led to no differences in opinion regarding meaning and translation. Data were collected between January and February 2012, with a questionnaire also covering questions on pressure ulcer knowledge. A member in the

research group presented information to the SNs about the study. RNs and ANs were approached via written information sent to nurse managers at the hospital wards. Answering the questionnaire was taken as informed consent to participate in the study. The questionnaire was completed at the site without any opportunities to gather other information or to interact with other students or colleagues.

Data analysis

Data were analysed with IBM SPSS Statistics Version 20.0 and IBM SPSS Amos 20. To confirm the APuP in a Swedish context, sum scores were calculated to obtain a total attitude score after the negatively worded items were reversed. Descriptive data are presented using frequencies, means, standard deviations, medians and ranges. Non-parametric statistics was used for analyses because of the qualitative nature of the data and because of non-normal distributions. The Kruskal–Wallis test was applied to test for potential differences between groups

followed by the Mann–Whitney as post hoc test. A significance level of <0.05 (two sided) was selected for all tests.

A confirmatory factor analysis of the five-factor model by Beekman *et al.* (10) was conducted. Two estimation methods were used: the maximum likelihood method and the generalised least square method. Maximum likelihood is sensitive to violations of normality, but the method of generalised least squares is more robust against violations of this assumption. Criteria used for determining goodness-of-fit were the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). The value regarded as a good fit for the GFI and AGFI was >0.90 (21), CFI >0.95 and RMSEA <0.06 (22). A model with a poor fit will score >0.10 on the RMSEA (23). Furthermore, an exploratory factor analysis was conducted using principal component analysis with orthogonal rotation (Varimax with Kaiser normalisation), using eigenvalues >1 as criterion for selection of variables. Furthermore, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was used to assess whether the set of items in the correlation matrix was suitable for principal component analysis. KMO values >0.70 indicate that inter-item correlations are high enough to justify that the factor analysis is suitable (24). Cronbach's alpha coefficient was used to test internal consistency where values >0.70 are assumed to be sufficient in a general sense (25), even though there is not a clear consensus. However, values <0.60 were considered inadequate.

Ethical considerations

The study was approved by the heads of the departments at the three hospitals and the programme management of the nursing education at the two universities. Information about the study was provided to potential participants, including information about the voluntary nature of participation, that all participants would remain anonymous and that the content of their responses would remain strictly confidential. Participants' responses to the questionnaire were regarded as informed consent to participate in this study. The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki. The Swedish national laws (2003: 460) and guidelines were strictly followed. In accordance with Swedish requirements, ethical approval was not required because the study concerned the participants' work and did not involve their health.

Results

Attitudes towards pressure ulcer

The summed mean attitude score for the whole sample was 46 (maximum score 52, median 47, range 31–52), equivalent to 89% of a maximum 100%. The summed attitude score was equivalent in all the three groups of RNs, ANs and SNs (46, median 47). Although no significant differences were noted between groups for the summed attitude scores, significant differences of the distribution between groups were found for four items in the instrument. Specifically, SNs had lower confidence in their ability to prevent pressure ulcers (item 1) than ANs ($P=0.001$) and RNs ($P\leq 0.001$). Furthermore, SNs rated their

own training (item 2) as less rigorous than ANs ($P=0.020$) and RNs ($P=0.020$), and they found pressure ulcer prevention to be too difficult (item 3) in comparison with ANs ($P=0.002$) and RNs ($P=0.004$). Finally, SNs thought that they had a more important task in pressure ulcer prevention (item 11) than RNs ($P=0.023$) (Table 3).

Confirmatory analysis

The results of the confirmatory factor analysis of the five-factor solution showed that the goodness-of-fit of the model was not adequate. Values for CFI, GFI and AGFI in the maximum likelihood solution were too low to be acceptable (Table 4). Furthermore, the RMSEA value of 0.13 was too high to be acceptable. Values for the generalised least squares solution for CFI, GFI, AGFI and RMSEA were slightly better, but still not quite near the recommended levels (Table 4). These findings indicate that the proposed five-factor model for the APuP instrument (17) could not be confirmed in this Swedish sample. No factor loadings are shown because of the poor fit of the model to the data. Consequently, the analysis of the factor structure continued with an explorative factor analysis.

Exploratory factor analysis

Exploratory factor analysis extracted a four-factor solution with eigenvalues ≥ 1.0 , explaining 54% of the total variance. The KMO measure of sampling adequacy for this set of variables was 0.72, indicating an adequate sample size. Bartlett's test of sphericity was significant ($\chi^2=762$, $df=78$, $P<0.001$), indicating sufficient inter-correlation between the items. The identified factors represent four specific domains: (i) *Priority* (five items), (ii) *Competence* (three items), (iii) *Importance* (three items) and (iv) *Responsibility* (two items) (Table 5). Item 9 loaded almost equally on two factors (factors 1 and 4) but was placed in factor 1. The reliability estimation and internal consistency (Cronbach's alpha) for the four factors ranged from 0.41 to 0.60 (0.63 for the total scale).

The psychometric evaluation was continued with a confirmatory factor analysis of this four-factor model. The goodness-of-fit of this model was still not satisfactory. In this analysis, values for CFI, GFI and AGFI in the maximum likelihood solution were higher but too low to be acceptable (Table 6). Moreover, the value for RMSEA was lower (0.10) than in the previous confirmatory factor analysis but too high to be worthy of acceptance.

Discussion

In this study, internal consistency and construct validity of the APuP instrument were investigated. A further aim was to describe RNs, ANs and SNs' attitudes towards pressure ulcer prevention in a Swedish context.

The level of attitude score (89%) reported here indicates a more positive attitude than found in previous findings (62–78%) (11,16–18). Some of these previous studies used a questionnaire developed by Moore and Price from 2004 in which reported medians have been recalculated here to percent figures in relation to the maximum score of 55. This

Table 3 Differences in attitudes between sub-groups

	Total (n = 415)		RN (n = 196)		AN (n = 97)		SN (n = 122)		P-value
	m	SD	m	SD	m	SD	m	SD	
1. I feel confident in my ability to prevent pressure ulcers	3.1	0.57	3.2	0.51	3.2	0.57	2.9	0.61	<0.001
2. I am well trained to prevent pressure ulcers	2.8	0.63	2.9	0.60	2.9	0.68	2.7	0.64	0.008
3. Pressure ulcer prevention is too difficult. Others are better than I am*	3.2	0.72	3.3	0.66	3.3	0.80	3.0	0.73	0.001
4. Too much attention goes to the prevention of pressure ulcers*	3.7	0.62	3.6	0.62	3.7	0.70	3.7	0.54	0.264
5. Pressure ulcer prevention is not that important*	3.9	0.44	3.9	0.44	3.9	0.49	3.9	0.41	0.248
6. Pressure ulcer prevention should be a priority	3.6	0.65	3.6	0.71	3.7	0.67	3.7	0.54	0.331
7. A pressure ulcer almost never causes discomfort for a patient*	3.9	0.55	3.8	0.66	3.9	0.39	3.9	0.46	0.290
8. The impact of pressure ulcers on a patient should not be exaggerated*	3.7	0.71	3.7	0.74	3.7	0.66	3.6	0.71	0.229
9. The financial impact of pressure ulcers on society is high	3.3	0.89	3.3	0.88	3.2	0.95	3.3	0.84	0.755
10. I am not responsible if a pressure ulcer develops in my patient*	3.7	0.61	3.7	0.71	3.8	0.57	3.8	0.44	0.948
11. I have an important task in pressure ulcer prevention	3.8	0.52	3.8	0.59	3.8	0.53	3.9	0.33	0.020
12. Pressure ulcers are preventable in high-risk patients	3.7	0.58	3.6	0.63	3.7	0.47	3.7	0.57	0.557
13. Pressure ulcers are almost never preventable*	3.8	0.64	3.7	0.74	3.7	0.63	3.9	0.41	0.411

*Negatively worded item.

Table 4 Goodness-of-fit indices for confirmatory factor models estimated by two methods: the maximum likelihood method (ML) and the generalised least squares method (GLS).

Model	CFI	GFI	AGFI	RMSEA
Five-factor model ML	0.362	0.818	0.752	0.127
Five-factor model GLS	0.321	0.904	0.870	0.083

AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation.

calculation was done to increase the possibility for comparison. No differences in attitudes were identified in this study on a summarised general level between RNs, ANs and SNs. This finding contradicts studies in which RNs have been reported to have more positive attitudes than ANs (12), but supports the findings from an intensive care setting that did not find any differences between RNs and ANs (18). However, there were differences at the item level, with students reporting lower attitude scores in their ability to prevent pressure ulcers and in the level of their own training. Furthermore, SNs believe it was more difficult to prevent pressure ulcers than RNs and ANs. This result is interpreted as a logical finding, taking into consideration that the experience of SNs' is more limited and that they are still in the process of completing their education. The SNs also thought that they had a more important task in pressure ulcer prevention compared with RNs and ANs, which might reflect the theory practice gap often described between education and clinical practice. Central areas of responsibility for nurses, e.g. pressure ulcer prevention, are focused and trained during nursing education but might to some extent receive a lower priority after graduation depending on the complexity of a nurse's responsibility. Medical and administrative tasks might be prioritised instead or requested by the health care organisation. Another explanation of the differences in attitudes between SNs on the one hand and RNs and ANs on the other might be that the responsibility of nurses is more clearly focused and taught in the current nursing education.

Despite different wording of the questions, the finding that almost all (85%) respondents disagreed with the statement

'pressure ulcers are almost never preventable' ($m = 3.8$) is in line with a previous study, where 76% of the respondents agreed, or strongly agreed, that 'most pressure ulcers could be avoided' (16). Furthermore, the statement 'pressure ulcer prevention should be a priority' was agreed upon by a majority (>70%) of the respondents ($m = 3.6$), which is a higher rating than Moore and Price reported. In their study, 51% of the respondents agreed, or strongly agreed, with the statement, 'In comparison with other areas of nursing care, pressure ulcer prevention is a low priority for me' (16). In a qualitative study by Athlin *et al.* (26), RNs reported that pressure ulcers as well as preventive interventions had relatively low importance among RNs. Preventive interventions for pressure ulcers were more regarded as a task for ANs. However, final responsibility was claimed by the RNs because of their higher educational level. In this study, the RNs had generally positive attitudes (at about the same level as the ANs), which may indicate a higher status for the task compared with that reported by Athlin *et al.* (26). Furthermore, the RNs attitudes related to their own responsibility were very positive.

As attitudes are implicated in affecting behaviour (14), it is plausible that an individual with attitudes that are more positive is more likely to perform the tasks. Beeckman *et al.* (17) found positive correlations between nurses' attitudes and the application of adequate prevention measures for pressure ulcers. Drawing on that finding, the nurses in this study should be more inclined to implement adequate prevention measures. Very positive attitudes were identified in this Swedish sample, whereas other Swedish studies from similar contexts using qualitative approaches found that pressure ulcer prevention had relatively low priority and low status (26–28). What is being actually measured with an attitude scale? A question can be raised as to what extent the responses to attitude questionnaires really reflect true attitudes or whether they are merely more socially acceptable responses. The highly skewed responses towards the positive end of the scale might support this notion. Respondents answering attitude surveys can possibly quite easily recognise what answer reflects positive attitudes, and perhaps do not want to reveal their true opinion about the matter.

Table 5 Rotated component matrix of the four-factor solution*

Item (number from original instrument in brackets)	Factor 1 (priority)	Factor 2 (competence)	Factor 3 (importance)	Factor 4 (responsibility)
(4) Too much attention goes to the prevention of pressure ulcers†	0.719	-0.004	0.145	-0.074
(5) Pressure ulcer prevention is not that important†	0.664	-0.028	0.222	-0.005
(6) Pressure ulcer prevention should be a priority	0.527	0.124	-0.089	0.163
(9) The financial impact of pressure ulcers on society should not be exaggerated†	0.484	-0.056	-0.159	0.476
(11) I personally have an important task in pressure ulcer prevention	0.618	-0.124	0.363	0.116
(1) I feel confident in my ability to prevent pressure ulcers	-0.089	0.833	0.081	0.040
(2) I am well trained to prevent pressure ulcers	-0.007	0.812	-0.106	0.056
(3) Pressure ulcer prevention is too difficult. Others are better than I am†	0.401	0.458	0.078	-0.244
(7) A pressure ulcer almost never causes discomfort for a patient	0.091	-0.070	0.736	-0.060
(8) The impact of pressure ulcers on a patient should not be exaggerated†	0.102	0.101	0.587	0.067
(13) Pressure ulcers are never preventable†	0.436	-0.054	0.498	0.343
(10) I personally feel not responsible if a pressure ulcer develops in my patient†	-0.114	-0.119	0.361	0.659
(12) Pressure ulcers are preventable in high-risk patients	0.122	0.127	-0.036	0.753

*Factor 1, priority (Cronbach's alpha 0.60); factor 2, competence (Cronbach's alpha 0.54); factor 3, importance (Cronbach's alpha 0.46); factor 4, responsibility (Cronbach's alpha 0.41).

†Negatively worded item.

Table 6 Goodness-of-fit indices for confirmatory four-factor models estimated by two methods: the maximum likelihood method (ML) and the generalised least squares method (GLS)

Model	CFI	GFI	AGFI	RMSEA
Four-factor model ML	0.629	0.896	0.857	0.098
Four-factor model GLS	0.420	0.915	0.883	0.077

AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation.

Confirmatory analysis

The confirmatory analysis indicated that the proposed five-factor structure of the APuP instrument could not be supported, which suggests poor construct validity. For a majority of the items, the initial factor structure held though some items loaded differently in the sample in this study. Further explorative and confirmative factor analysis indicated that a four-factor solution was a good fit for the data. Several explanations might account for why the original five-factor factor model did not fit the Swedish sample. The samples might vary in some respects, which would represent different populations. The sample of 549 respondents from Belgium and the Netherlands in Beeckman *et al.*'s study (10) consisted to a higher extent of male nurses (15% vs 7% in this study), nursing students (53% vs 29% in this study) and that 7% of the nurses in Beeckman's study did not have any work experience. However, it is not clear what defined an actual work experience. Furthermore, 74% of SNs already had a bachelor degree while the corresponding figure in the Swedish sample was zero.

Apart from differences in sample characteristics, which constitute slightly different populations, there could be cultural differences between Sweden and Belgium and Netherlands in the health care system and nursing education curriculum and basic nursing policies that affect the participants' attitudes and way of thinking about pressure ulcer prevention. The phenomenon of pressure ulcers might be discussed, dealt with and managed in different ways, in different countries and in

different contexts. Subsequently, this might be reflected in varying attitudes towards the phenomenon, with a possibility that the current instrument does not reflect a relevant set of variables to investigate attitudes towards pressure ulcer prevention when crossing cultural and national borders. The translation of the instrument from English to Swedish is considered to be accurate representations of the concepts in APuP and could not explain why the model did not fit.

Limitations of the study

Validation research on developed instruments comprising original data on an ordinal level is not always straightforward. A common tradition in many research areas, nursing included, is to analyse and report findings supported by parametric statistics, regardless of the actual data level from a statistical point of view. The APuP instrument consists of 13 categorical items measuring attitudes on pressure ulcer prevention that provides a data set on an ordinal scale. Despite this statistical insight, the data have been described here using mean values and standard deviations to increase the ease of comparison with previous descriptions of the original instrument. The choice of using mean values was also taken from a pedagogical perspective because median values were equal despite the existence of significant differences. However, non-parametric analyses were still used in the tests of differences between groups. Furthermore, the items were not normally distributed, which was not expected based on the data level and type of questions asked. Even if a summation of ordinal item scores was considered adequate, the distribution of the total score was highly skewed. Skewness has consequences for estimation of parameters and their standard errors, as well as for χ^2 -related measures of goodness-of-fit in the confirmatory factor analysis. Furthermore, the properties of parameter estimates from both maximum likelihood and generalised least squares methods are based on large sample arguments. In this sense, the sample size used in this study for robust and accurate estimates could be questioned. The χ^2 value may have been excessively large so

that the goodness-of-fit statistics indicated poor fit. Other factors that might make it difficult to replicate and verify the factor solution of the original exploratory factor analysis can be the different estimation methods used in the exploratory and confirmatory factor analyses. In the exploratory factor analysis the principal component method was adopted, and in the confirmatory factor analysis the maximum likelihood and generalised least square methods were used. The proposed structure of the instrument APuP, with three items per factor in three factors and two items per factor in two factors in the five-factor model, is not in line with recommendations for exploratory factor analysis. Neither is the instrument structure in the four-factor model suggested in this study, which also comprise relatively few items per factor. Some authors recommend at least three items per factor (29) and the existence of few items per factor might have contributed to the failure to confirm the exploratory factor models. Some differences in the analytical techniques of exploratory and confirmatory factor analysis make it difficult to reach the same conclusions, even if the data sets are the same. Exploratory factor analysis identifies factors that account for significant variance in the data, and confirmatory factor analysis may show that significant additional variance remains (30). Another problem arising from differences in analytic techniques is the commonly used orthogonal rotation procedure, assuming that the factors in the analysis are uncorrelated. Verifying such models by confirmatory factor analysis may result in difficulties in identification of the proposed model. On theoretical grounds, a model allowing for correlation between factors would be sound. We have tested confirmatory factor models with correlated factors. These models had a little better goodness-of-fit, but had other deficiencies and are therefore not reported here. Thus, the failure to verify the construct validity of the APuP and our four-factor model may be related to methodological issues, which calls for a cautionary approach in the interpretation of the findings. For the above-mentioned reasons, the four-factor model that emerged from our exploratory factor analysis should also be interpreted with caution.

Implications for nursing practice

The clinical utility of a scale measuring attitudes towards pressure ulcer prevention could be of interest. Undoubtedly, pressure ulcers remain a common health care problem, which in many cases are preventable if necessary precaution and preventive measures are implemented. Attitudes affect people's thinking, actions and interest, and accordingly, positive attitudes towards pressure ulcer prevention imply an increased will to take action. A valid and reliable instrument measuring attitudes towards pressure ulcer prevention is needed, not only for research purposes but also to support quality work in health care organisations. Knowledge of staff members' attitudes about various care features and work content is of vital importance for nurse managers in their effort to support high-quality care and make best use of the competence of the nursing staff. Attitudes towards pressure ulcer prevention are of interest and warrant serious consideration as how to use the collected competence of the work force. Thus, it could be worthwhile to assess the attitudes of health professionals who support activities in the clinical area dealing with pressure ulcer prevention. The APuP

could be used as a summative instrument in a Swedish care environment, while separate items could be used to describe the attitudes of RNs, ANs and SNs. Nevertheless, further research is recommended to develop a valid and reliable tool to assess nurses' attitudes towards pressure ulcer prevention working across different settings on an international level. The ordinal nature of the variables makes it doubtful to use arithmetic and alternative methods to construct scores, such as median scores or criterion-based scores should be used in future studies.

Conclusion

The findings of this study demonstrate that the original APuP instrument was not ideally suited to represent the attitudes of a Swedish sample of nurses and nursing students. Beekman *et al.*'s (10) five-factor model did not fit the data well; instead, a four-factor solution was derived from the factor analysis. However, even this model did not fit data well. That different studies have resulted in different factor solutions raises questions about the validity of the original tool, as well the ability to represent nurses' attitudes across national, cultural or organisational boundaries.

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