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Original article

Understanding the nurse-patient relationship: A predictive approach to caring interaction

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ABSTRACT

Background: Caring nurse-patient interaction has been linked to improvements in patient health outcomes, empowerment, and security.
Aim: To design a predictive model of caring interaction, based on the development of the Nursing Interactions in Caring _ Competence Assessment for Nursing Professionals (NIC_CA-Prof) tool.
Methods: A cross-sectional psychometric study was carried out. Descriptive data analysis and exploratory factor analysis were performed. To design the predictive model, partial least squares regression analysis was used in consistent mode.
Findings: The sample consisted of 544 nurses with a mean age of 45.9 years old (Standard Deviation = 10.7 years). Exploratory factor analysis yielded 19 items and four factors. A predictive model of four linearly related composites was validated: basic nursing care, therapeutic relationship, problem management, and adaptation.
Conclusions: The predictive model provides a visual depiction of the linear and temporal development of the phases of caring interaction, showing the effect of one phase on the next.

Summary of relevance

Problem or issue
Identification of interrelated composites that predict the establishment and development of the nurse-patient relationship. Describe the attitudes and behaviours that are related to each composite.

What is already known
Nurse-patient interaction is the basis of nursing care and improves health outcomes. Behaviours and attitudes related to a construct can be learned and trained.

What this paper adds
Design of the key interrelated elements in nurse-patient interaction, obtaining a predictive model, based on nurse-patient interaction competency assessment. The scale (NIC_CA-Prof) assesses knowledge, skills, and attitudes related to caring interaction.

1. Introduction

The nurse-patient relationship is a key aspect in the development of nursing care, without which it is difficult to understand the professional goal that drives nurses, which is caring itself (Olshansky, 2007). Furthermore, it has been related to improvements in patient health levels, increased empowerment, and feelings of security and confidence (Olson, 1995; Schwartz-Barcott et al., 1994; Williams & Irurita, 2004).

Likewise, this nurse-patient relationship has been conceptualised as a key element of holistic care, together with physical and psychosocial dimensions, as outlined in the Fundamentals of Care theory proposed by Feo et al. (2018a) and Kitson (2018). Therefore, establishment of the nurse-patient relationship is a core dimension in the development of fundamental care, intrinsically related to the discipline of nursing. In fact, it has recently been reconceptualised as a caring interaction, since the actions, emotions, and nonverbal communication of the patient influence those of the nurse and vice versa, also considering that very purpose of nursing as a discipline is care itself (Allande, Siles, et al., 2020).

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In addition to this dimension, aspects related to physical and physiological needs and psychosocial aspects of the person must be taken into account (Feo et al., 2018b). Thus, nursing care should be holistic (Jasemi et al., 2017) and focus on the person and his or her family members, also in line with McCormack and McCance's contributions to the middle range theory of person-centred care (McCormack & McCance, 2006). Hence, there is strong agreement between most theories and the framework regarding the importance of the nurse–patient relationship (Mudd et al., 2020).

With regard to contemporary humanistic and interactionist theories of caring, Watson's model, called the Theory of Human Caring, is particularly important. This theory is structured in 10 Carative Factors, which the author renamed the Caritas Processes a few years later (Watson, 2008). Her philosophical assumptions were based on the humanistic psychology approach, developed by prominent figures such as Rogers and Maslow, as well as on the phenomenological models created by Yalom, Whitehead, and Chardin, among others. Based on these phenomenological proposals, the nurse-patient relationship approach is based on a succession of different moments, all related to each other, and with a certain tendency towards a higher level of emotional complexity (Watson, 2008).

To evaluate the level of competence within caring interaction, there are certain tools available that assess some of its elements, such as communication or empathy (Watson, 2009). In this sense, a recent conceptual analysis of the nurse-patient relationship has identified other attributes, such as intimacy, professional ethics, compassion, or intersubjectivity (Allande et al., 2021), which are not considered by all existing measurement scales (Feo, Kitson & Conroy 2018c). However, it is worth noting that the Caring Behaviour Assessment (CBA) scale and the Nyberg Caring Assessment (NCA) scale were based on the Nursing Theory of Human Caring (Watson, 2009). Other tools include the Caring Ability Inventory (CAI) scale, based on Mayeroff's Ethics of Care theory, the Caring Efficacy Scale (CES), based on Bandura's Social Learning theory and the Nursing Theory of Human Caring, and the Caring Nurse-Patient Interactions (CNPI), based on Jean Watson's Theory of Human Caring (Cossette, Coté & Pepin, 2006; Cossette et al., 2005, 2008; Watson, 2009). The latter was produced using a rigorous process of cultural adaptation and construct validation, in an extensive sample of nursing undergraduate students in Canada. It presented optimal psychometric properties (Cronbach's alpha 0.97, correlations between subscales 0.53–0.89, and Pearson coefficients between −0.02 and 0.32, indicating a low bias between the subscales and social convenience (Cossette et al., 2005, 2006, 2008).

Taking into account this background, and the lower consistency and lack of explicit articulation around how nurses can and should establish, manage, and close off the nurse-patient relationship (Mudd et al., 2020), there is a better description and prediction of what and how nurses should perform in the development of caring interaction. Along these line, our research group developed a cultural adaptation of the CNPI-70 item scale (Cossette et al., 2006), and it was translated into Spanish (Allande, Macías & Porcel, 2020). Although there is a short version (Cossette et al., 2008), the long version was selected in order to consider all possible behaviours and attitudes, as the short version had been abbreviated by means of confirmatory factor analysis in a sample from Canada, which is culturally different from the Spanish sample.

The aim of the present study was to develop a predictive model of caring interaction in registered nurses, based on the development of the Nursing Interactions in Caring _ Competence Assessment for Nursing Professionals (NIC_CA-Prof) tool.

The hypotheses formulated to design the predictive model, based on the theory of Jean Watson, were as follows:

1 The first step in establishing the nurse-patient relationship is related to the basic care of the person with a particular health problem.
2 Establishing the nurse-patient relationship means consolidating the therapeutic relationship.
3 The nurse-patient relationship is further developed by the nurse's role in the management of health issues.
4 The nurse-patient relationship can be said to stabilise when the person is able to adapt to their health situation.

2. Methods

2.1. Design

A descriptive, cross-sectional, psychometric study was carried out in two phases:

1) Descriptive study of the data collected, after implementation of a pilot test to assess the comprehensibility of the items and the average response time.
2) Exploratory psychometric analysis and implementation of the regression algorithm for the design of the predictive model.

2.2. Measurements

Cross-cultural adaptation was performed of the CNPI-70 scale items into Spanish (Allande et al., 2020), in a previous study, following the classic methodology proposed by Epstein, Miyuki and Guillemin, 2015: translation into Spanish by four translators, expert panel for the selection of the best of the four translations for each item and Likert scale response descriptors, backtranslation of the preliminary version into English, and aspect validity study by a new bilingual expert.

The Spanish translation version of the CNPI questionnaire, with optimal face and content validity, was the starting point for the present study. It is made up of 70 elements, classified into the 10 Carative Factors of Watson's Theory of Human Caring (Watson, 2008), and its scoring is measured on a Likert scale from 1 (not at all competent) to 5 points (extremely competent) (Allande et al., 2020). The scale score is obtained by calculating the mean score (from 1 to 5 points).

2.3. Participants

The inclusion criterion for the selection of participants was to have carried out health care work in any field of nursing in Spain. All participants had to indicate their willingness to participate in the study and their anonymity to access the survey items.

The sample size for the field study was calculated based on the number of items in the questionnaire and considering five individuals per item (Beavers et al., 2013; Fox et al., 2009; Ramada et al., 2013). Thus, for a total of 70 items, a value of 350 subjects was obtained.

To ensure the sample was representative of the registered nurse population in Spain, a suitable sample size was estimated from the total number of registered nurses in Spain, 316,094 (Economy Department of the Spanish Government, 2020). A total of at least 328 subjects were estimated, with a confidence level of 95%, precision of 2.5%, a proportion of 50%, and expected loss of 25%.

2.4. Data collection

The sample was selected over a period of 4 months (April–July 2020), by means of non-probabilistic snowball sampling. An online questionnaire was created with the Google Forms© application, which contained information about the study, items related

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to the study variables, and informed consent. The link to the questionnaire was distributed on the Internet by email and social media belonging to official nursing groups. These were identified with the collaboration of the General Council of Nursing of Spain, which voluntarily disseminated them using different applications (WhatsApp, Facebook, Twitter, and LinkedIn) among those members who had agreed to be contacted for research purposes. The predictive model was designed and tested in August and September 2020.

2.5. Ethical considerations

Permission was obtained from the Research Ethics Committee of the Andalusian Regional Government (Ref. NIC_CA-Prof_2020) and the General Council of Nursing in Spain.

All subjects were informed of the purpose of the study and the possibility of participating in the study on a voluntary, anonymous, and confidential basis, once they accessed the link to the questionnaire. In addition, all subjects had to give their consent by means of a specific box they had to tick to continue filling out the form.

2.6. Data analysis

Descriptive analysis of univariate and bivariate data was implemented together with an exploratory factor analysis (EFA) using IBM SPSS software (IBM Corporation, 2019). Concerning the EFA, criteria of maximum likelihood and varimax rotation were applied (Barrett, 2006). Thus, the factor structure of the NIC_CA-Prof tool was obtained, as well as the total variance explained by it. In addition, Cronbach's alpha values were calculated for the total and for each one of the factors.

Subsequently, a partial least squares regression (PLS) algorithm was performed using Smart PLS 3© software (J. Hair et al., 2011; Ringle et al., 2014). The purpose of this structural equation model is to predict relationships between composites (formerly factors), quantified as effect sizes (F^2). In addition, it provides reliability values (Rho A, α Cronbach and composite reliability), predictability of dependent variables, and of the model itself (Q^2) (Chin et al., 2003). Likewise, the PLS algorithm (PLSc) was used to correct the correlation between pairs of composites, in relation to the measurement error (Hair, Hult and Ringle, 2017), and to emulate the results of the covariance-based structural equation method, in terms of accuracy in parameter values (Dijkstra & Henseler, 2015). Concerning the study of collinearity between items, the programme calculates the variance inflation factor (VIF) (Fornell & Larcker, 1981; Hair et al., 2017; Henseler et al., 2015, 2016). The algorithm also calculates the coefficient of determination R^2, which measures the amount of variance that is explained by the other composites above. In addition, the SmartPLS 3© programme (Ringle et al., 2014) also determines the standardised root mean square residual values (SRMR) and the average variance extracted (AVE). Finally, to obtain the discriminant validity between composites, we calculated the Forner and Larcker criterion and a new parameter, the heterotrait-monotrait (HTMT) coefficient (Henseler et al., 2015). The critical values of the fit parameters provided by the PLSc to be considered an optimal model are: SRMR <0.08, AVE ≥0.5, HTMT ≤ 0.85, VIF <3.3, and Rho A, Cronbach's α, and Composite Reliability >0.7. Additionally, F^2 must be >0.2, Q2 >0, and R2 <0.7 (H. Hair et al., 2019).

3. Findings

3.1. Phase 1: Descriptive study

The pilot test did not report the need for any changes in the wording of the items, in relation to the comprehensibility of the

items, and reported an average survey response time of 17 minutes.

The total sample consisted of 544 active registered nurses in Spain. The results showed a mean age of 45.9 (SD = 10.7 years), with the majority of the sample being women (78.1%). Of the total sample, 42.3% had obtained a university degree in nursing, 14.3% a bachelor's degree in nursing, and 23.2% had a master's degree. 81.6% of the sample did not carry out research activity, and 48.6% did not teach either. Furthermore, 58.5% carried out their healthcare activity in primary care, and the mean number of years of professional experience was 22.3 (SD = 11.1 years; Table 1).

Regarding the score obtained in the questionnaire, the mean was 4.19 points, with a range of scores from 1.73 to 5 points (Table 1). The Kolmogorov-Smirnov test, with a value of p = 0.001, revealed that the distribution of scores did not follow normality. Items that obtained mean scores below 4 points were 21 (3.97; SD = 0.88), 25 (3.95; SD = 0.84), and 26 (3.90; SD = 0.85).

In the bivariate analysis, no significant differences were found in the mean score of the NIC_CA-Prof tool for the variables sex (Mann-Whitney U p = 0.59), age (Kendall's Tau b τ = 0.1 and Spearman's Rho r = 0. 15), level of training (Kruskal-Wallis p = 0.63), level of care (Kruskal-Wallis p = 0.15), type of care unit (Kruskal-Wallis p = 0.23), and years of experience (Kendall's Tau_b τ = 0.07 and Spearman's Rho r = 0.11; Table 1).

On the other hand, there are significant differences in the mean score of the NIC_CA-Prof questionnaire for the teaching activity variable (Kruskal Wallis p = 0.001) and the research activity variable (Mann-Whitney U p = 0.001). Thus, the subjects in the sample with teaching activity as clinical trainers obtained a mean score of 4.45 points, which was higher than that obtained by the associate professor (4.22 points) and the associate doctor professor (4.28 points). The group of subjects who did not perform any teaching activity obtained the lowest mean score (4.10 points). However, subjects who conducted research activity obtained a higher mean score of (4.36) than those who did not (4.21) (Table 1).

3.2. Phase 2: Psychometric analysis and predictive model design

The Kaiser-Meier-Olkin test obtained a value of 0.95 and the Bartlett test of sphericity obtained a statistically significant value (p < 0.0001). Using EFA, a dimensional matrix of 19 items and four factors explaining 64.5% of the variance was extracted. The four factors were named by the research team, considering the semantic content of the items that comprise them, as well as the contributions of Watson's Theory of Human Caring, on which they are based. Basic Nursing Care, Therapeutic Relationship, Problem Management, and Adaptation (Table 2). From a total of 70 items, 51 were eliminated because they had weights with a value lower than 0.4 or were redundant because they shared more variance between them than directly explained by a common factor (Lloret-Segura et al., 2014). The reliability study yielded a Cronbach's α value = 0.9.

After identifying the theoretical relationships between the four factors, based on Watson's model and its theoretical foundation, a partial least squares regression analysis (PLSc) was run to test the hypotheses of the predictive model (see Fig. 1). The 19 items extracted by EFA were included in the initial parameter calculation with PLSc, although items 3, 7, 23 and 27 were subsequently removed from the model due to collinearity and/or weights below 0.4. To study the content validity of the 15 final items, an interrelation of these items with the Caritas Factors of Watson's model is proposed, based on her theoretical conceptualisation (Watson, 2008; Willis & Leone-Sheehan, 2017; Table 3).

To obtain the predictive model of caring interaction, a path diagram was designed that related the four composites (previously called factors), keeping their names. In the design of the relation-

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Table 1
Description of the sample profile.

Sex	Male	n = 119 (21.9%)	Total sample N = 544
	Female	n = 425 (78.1%)	
Age	Mean	45,9	
	Standard deviation	10,7	
Level of training	Nursing diploma	n = 230 (42.3%)	
	Nursing degree	n = 78 (14.3%)	
	University master's degree	n = 126 (23.2%)	
	Other master's degree	n = 8 (1.5%)	
	Expert diplomma	n = 48 (8.9%)	
	Doctorate	n = 25 (4.6%)	
RESEARCH ACTIVITY	Yes	n = 100 (18.4%)	
	No	n = 444 (81.6%)	
TEACHING ACTIVITY	No	n = 264 (48.6%)	
	Yes: Clinical trainer	n = 202 (37.1%)	
	Yes: Associated teacher	n = 75 (13.8%)	
	Yes: Associated doctor professor	n = 3 (0.5%)	
Level of health care	Primary Care	n = 204 (58.5%)	
	Hospital care	n = 318 (37.5%)	
	Both	n = 22 (4%)	
Type of centre	Primary care	n = 187 (34.4%)	
	Hospital: Medical ward	n = 83 (15.3%)	
	Hospital: Surgical ward	n = 75 (13.8%)	
	Critical care / A & E	n = 80 (14.7%)	
	Out-of-hospital emergencies	n = 18 (3.3%)	
	Mental health	n = 13 (2.4%)	
	Maternity-Children's ward	n = 24 (4.4%)	
	Patient management	n = 64 (11.7%)	
Years of experience	Mean	22.3	
	Standard deviation	11.1	
NIC_CA-Prof Score	Mean	4.19 points	Maximum score = 5 points
	Range	1.73 to 5 points	

Table 2
Exploratory factor analysis: rotated factor matrix.

CNPI items	Problem management	Adaptation	Basic nursing cares	Therapeutic relationship
ITEM_3	0.542			
ITEM_4	0.705			
ITEM_5	0.725			
ITEM_6	0.707			
ITEM_7	0.737			
ITEM_8	0.638			
ITEM_9	0.630			
ITEM_10	0.580			
ITEM_11			0.539	
ITEM_12			0.858	
ITEM_13			0.590	
ITEM_19				0.573
ITEM_20				0.640
ITEM_21		0.529		
ITEM_23		0.716		
ITEM_24		0.682		
ITEM_25		0.824		
ITEM_26		0.739		
ITEM_27		0.521		

ships, the hypotheses described for the present study, based on Watson's Theory of Human Caring, were considered at all times (see Fig. 1).

The values of the fit parameters provided by the PLSc method were generally significant ($p < 0.05$): SRMR = 0.04 (critical value <0.08), and AVE between 0.59 and 0.78 (critical value ≥0.5). Discriminant validity was confirmed with HTMT values between 0.67 and 0.85 (critical value ≤0.85), and by the Forner and Larcker criterion. The VIF values were all between 1.6 and 2.6 (critical value <3.3), demonstrating the lack of collinearity between the 15 items. Reliability analysis obtained values between 0.8 and 0.9 for the parameters Rho A, Cronbach's α, and Composite Reliability (critical value >0.7). Additionally, the effect sizes of the relationships between the composites were all >0.2 (critical value >0.2), demonstrating the considerable strength of impact of one composite on another. The cross-redundancy study (Q2) was found to be between 0.24 and 0.4 for each composite, indicating a good predictability of the estimated model (critical value >0). In relation to the weights of each item in its composite, all of them were between 0.7 and 0.9. In the specific case of each composite, the R2 values (see Fig. 1, with values inserted in each composite) were between 0.58 and 0.71, indicating considerable levels of variance explained by the composite.

4. Discussion

The NIC_CA-Prof tool is a 15-item scale, with optimal psychometric properties, making it easy to use in clinical settings, as the use of questionnaires with a reduced number of items is recom-
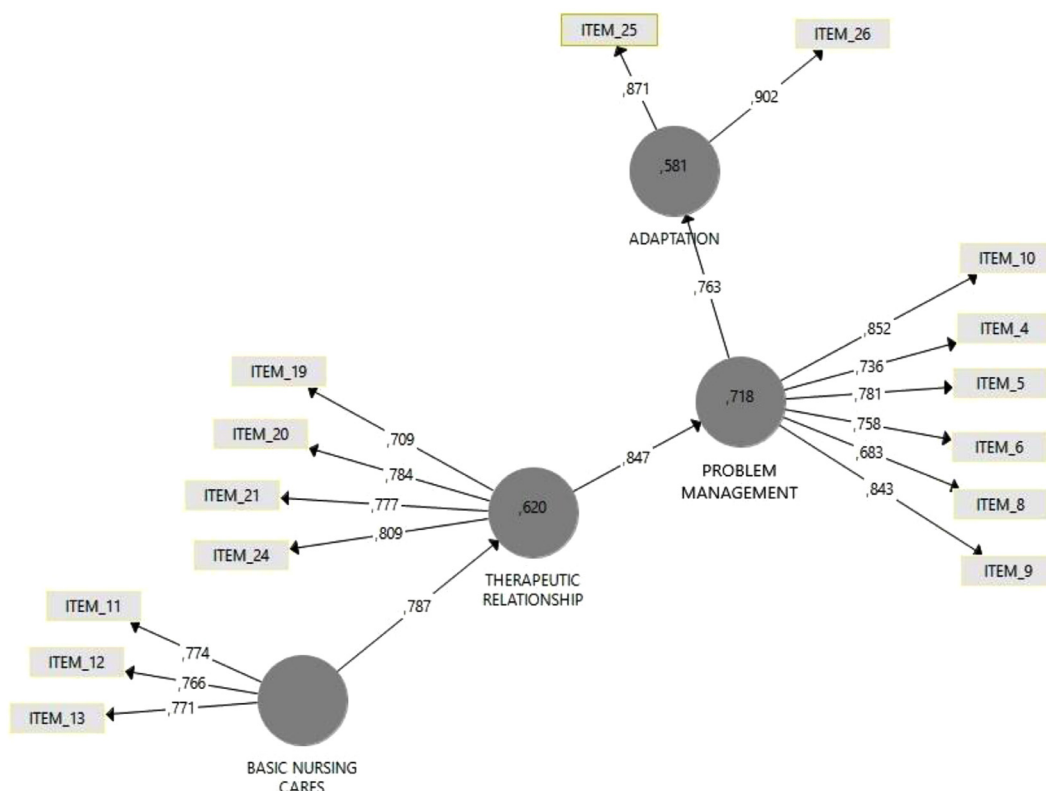
Fig. 1. Predictive model of caring interaction competence.

mended to ensure correct use and measurement of the construct (McDowell, 2009).

A linear relationship was established between them using three relational hypotheses based on Jean Watson's theoretical model and its philosophical foundations, in which the composite 'Basic Nursing Care' was the starting point, leading to the composite 'Adaptation'. One of the cornerstones of Watson's theory was humanistic psychology, with Maslow and Rogers as its leading proponents (Watson, 1997). Therefore, considering Maslow's theory of motivation (Maslow, 1943), physiological needs are found in the first tier of the hierarchy, followed by needs for: safety; love and belonging; self-esteem; and self-actualisation. This author believed that achieving self-actualisation required the prior achievement of self-esteem. According to this line of thought, nursing professionals should meet the 'Basic Nursing Care' composite and then continue to work on the 'Therapeutic relationship' and "Problem management"; otherwise, it would not be possible to work on the 'Adaptation' composite'. In addition, Whitehead's process philosophy, which also supported Watson's model, advocates for the existence of a network of interrelated processes of which each human being is a part; their choices and actions have consequences for others and for themselves (Whitehead, 1978). Taking into account these assumptions, the nurse-patient relationship might be understood as a set of interrelated elements. The composites of the proposed model display linear relationships with each other, and the actions that take place in each one of them have consequences for the next construct, both for the individual and for the nursing professional. Along these lines, Yalom's model, Theory and Practice, as well as T. de Chardin's theory of the Phenomenon of Man, which also informed Watson's philosophy (Watson, 1997), reflect on the concept of life and its development as an experience that involves different moments or states that lead to an understanding of the meaning of life (Yalom, 1980). There is also a human tendency towards higher levels of complexity regarding life pro-

cesses (de Chardin, 1959). Through the prism of both philosophical proposals, the nurse-patient relationship may be understood as a sequence of different moments in life, of interrelated composites, with a certain human tendency towards higher levels of emotional complexity, including the last composite of "Adaptation".

In this regard, the predictive model not only considered the basic needs of care, but also the psychosocial aspects surrounding the person being cared for. It also considers that person's family and surroundings, for example through item 12. Furthermore, the predictive model is founded on holistic person-centred care, developing one of the dimensions of Fundamental Care proposed by Kitson (2018) and McCormack & McCance (2006). Specifically, the dimension of the nurse-patient relationship has been approached by different authors throughout the history of nursing studies, although the proposals are frequently theoretical (Mudd et al., 2020; Pokorny, 2017). The predictive model developed is a first attempt to understand the development of caring interaction, based on the scientific evidence, from the nurse's perspective and grounded in the theoretical foundations of Jean Watson.

Regarding content validity, the 15 items of the NIC_CA-Prof represent all the carative factors of Watson's model, except factor 9. This factor, whose definition is the satisfaction of human needs, is conceived by the author as not only physical, but also emotional, relational, and spiritual needs (Watson, 1988). Accordingly, the human needs factor would be represented in the rest of the items of the questionnaire, since the nursing professional's willingness to attend to the emotional and relational needs of the user is evident in all of them. Thus, intrinsically, all the items in the questionnaire represent Carative Factor 9. Something similar occurs with Carative Factor 8, as it is the one with the greatest representation in the items of the questionnaire (see Table 3). Therefore, the creation of caring and supportive contexts always facilitates the development of caring interaction, and is therefore, an important aspect of nursing care (Copanitsanou et al., 2017).

Table 3
Representation of carative factors in the items of the NIC_CA-Prof scale.

Constructs	Original item	NIC_CA-Prof Items	Carative factors
Problem management	4	1. Helping them find motivation to improve their health situation	1, 4, & 5
	5	2. Helping them cope with the stress generated by their condition or health situation	6, 7, & 8
	6	3. Helping them see things from a different point of view	1, 4, & 5
	8	4. Emphasizing and reinforcing their achievements	
	9	5. Helping them to recognize the way to solve their problems effectively	6, 4, & 5
	10	6. Helping them recognise and ask questions about their illness and treatment	6, 7, & 8
Basic nursing cares	11	7. Giving them the opportunity to enhance their self-care abilities	6, 7, & 8
	12	8. Teaching them how to plan and prepare for taking measurements and/or self-care	7 & 8
	13	9. Giving them advice and the means to treat or prevent side effects and/or complications	7 & 8
Therapeutic relationship	19	10. Encouraging them to speak freely about their feelings and emotions	3 & 5
	20	11. Encouraging them to have hope, when appropriate	2 & 8
	21	12. Explaining and helping them understand what their relatives are going through because of their health situation	3 & 6
	24	13. Helping them set realistic goals for their health situation	3 & 6
Adaptation	25	14. Helping them find meaning in their health situation	2, 3, & 10
	26	15. Helping them regain a degree of balance in their lives	2, 3, & 10

In relation to the profile of the nurses who participated in the study, the results coincide with those observed in previous studies in these settings, in which the average age of the professionals is 46, and with a majority participation of women (Lumillo-Gutierrez et al., 2019; Pishgooie et al., 2019). No significant differences were found between the mean scores on the NIC_CA-Prof questionnaire and the gender variable, although the predominance of women is an objective and expected fact. It is worth reflecting on whether there is a need for gender studies on competence in care interaction, as there are differences in the development and execution of nursing care provided based on this variable (Sharma et al., 2016). In light of current data, it is not known exactly what the impact or differences are between men and women with respect to the performance of the behaviours and attitudes associated with the composite of caring interaction.

Regarding the variables of teaching and research activity, it was found that nursing professionals who do not perform these activities (81.6%) obtain a lower score on the NIC_CA-Prof questionnaire than those who do. These results could indicate that nursing professionals linked to teaching and/or research activities update their knowledge and understanding of the fundamentals of the discipline. As a consequence, they might attach some importance to caring interaction during the development of their care activity (Booth et al., 2016). Similarly, it is possible to think that this concern would arise from the responsibility of training future professionals, in addition to the practice of nursing based on scientific evidence (Thupayagale-Tshweneagae et al., 2020).

Considering the mean score obtained on the items of the NIC_CA-Prof questionnaire, it should be noted that the lowest scores were obtained for items 12, 14, and 15 (original items 21, 25 and 26) (see Table 3). It seems that the following skills and attitudes have proved to be the most difficult to execute: (i) making the person understand how those close to them are experiencing their health situation; (ii) guiding them in the search for the meaning they give to that health situation, and (iii) the mental balance to cope with it. It is plausible to assume that professionals encounter more situations where basic nursing care is needed, as opposed to more complex care situations that involve a more emotional nursing intervention with the user (Marchetti et al., 2019). In this sense, the acquisition of competence in the composites described by the model representing the caring interaction is not innate, and must be learned during a specific training process, in this case, undergraduate nurse education (Allande-Cussó et al., 2021; Olshansky, 2007).

The current context of international migration, due to labour issues or poverty and social exclusion, has caused all international health systems to care for culturally and linguistically different users (Abubakar et al., 2018). Therefore, for the development of nursing care, not only should the technical and methodological competences of nursing be acquired, but the nurse should also be able to implement and develop caring interaction, considering at all times that this must be transcultural and ethical (Enestvedt et al., 2018). These facts position the study of caring interaction competence among nurses as a necessary quality and safety competence to be acquired; as it would allow not only for the identification of behaviours and attitudes that generate greater difficulty in execution, but also the design of specific improvement strategies and professional development programmes. The objective is none other than the development of transpersonal and transcultural care, socially ethical, and based on respect and understanding of the other. Otherwise, if there is no interaction, there could be a lack of information, and, in turn, the occurrence of adverse effects, which are entirely preventable (Crawford et al., 2017).

Likewise, the study of health outcomes to establish caring interaction has led to an increased sense of safety and physical-spiritual comfort in patients, as well as an improvement in their coping

strategies for health problems and self-empowerment (Baer & Weinstein, 2013; De Almeida et al., 2010; De Andrade et al., 2013; Ellington et al., 2012). In this sense, the lack of expression of one's own needs, due to poor nurse-person interaction, may be related to the occurrence of adverse effects or incidents and, therefore, affect clinical safety (Baer & Weinstein, 2013).

Among the limitations of the study is the fact that there is no other validated tool in nursing professionals that measures exactly the same as the NIC_CA-Prof questionnaire; therefore, it has not been possible to study the validity of the criteria. Moreover, the questionnaire has been designed to study competence in care interaction from a self-perceived point of view. Thus, it is conceivable that complementary self-administered measures, and even nonparticipant observations, could be implemented.

The language of the items is oriented towards the person, but not towards the family or community groups; both are also subjects of care, and also establish care interactions with the nursing professional. Furthermore, 78.1% of the sample was women; therefore, conclusions cannot be drawn about possible gender differences in the development of the competence studied.

Finally, the study was only carried out with nurses in Spain, and therefore, the predictive model designed cannot be generalised to nursing practice in other countries.

Future studies should implement improvements to address these limitations, study the external validity of the tool outside Spain, and measure the impact of the nurse-patient relationship on patient outcomes. In this regard, it is also necessary to further study the development of caring interaction, now from the perspective of the patient and the family.

5. Conclusions

Nurses who carry out research and/or teaching activities, such as clinical trainers, have higher levels of competence in care interaction.

The predictive model of caring interaction among registered nurses is configured by four linearly related composites, whose predictive evidence has been confirmed by the optimal results of the implemented regression algorithm (PLSc).

The findings proposed here allow for the identification of the different elements or phases of caring interaction, whose development and understanding by nurses are necessary for optimal, ethical, and culturally respectful health outcomes.

Authorship contribution statement

Regina Allande Cussó: Conceptualisation (supporting); Software (lead); Writing – original draft (supporting); Writing – review and editing (equal) -review and editing (equal). **Elena Fernández García**: review and editing (equal). **Juan Gómez Salgado**: formal analysis (equal); writing – review and editing (equal). **Ana María Porcel Gálvez**: Conceptualisation (supporting); Writing – original draft (supporting); Writing – review and editing (lead).

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Ethical statement

The authors of the manuscript declare that the research study had the approval of the Research Ethics Committee of the Junta de Andalucía (Ref. NIC_CA-Prof_2020) on 31st of January 2020 and of the General Council of Nursing of Spain on 1st of February 2020.

Likewise, informed consent was requested from all the subjects in the sample, and they were informed that their participation was voluntary. No subjects received financial compensation for their participation, and they could leave the study at any time.

Conflict of interest

None

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