

Implementation of the Nurse Professional Competence Scale in the Republic of Croatia

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Research

Keywords: Competence of nurses, Validation, Psychometric properties

Posted Date: May 12th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-475940/v1>

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Abstract

Purpose: The purpose of this research was to evaluate the psychometric properties of the Nurse Professional Competence Scale in Croatia, in order to implement it as a valid and reliable tool for the evaluation of nurses' competence.

Design: Psychometric instrument validation study.

Methods: The validity of the contents and construction, as well as internal consistency, and affirmative factor analysis were measured. Nurse Professional Competence Scale has been distributed to 311 nurses who completed undergraduate or graduate nursing studies. All participants completed an online survey. The data was collected between April and July 2020.

Results: The six-factor structure (Nursing care, Value-Based Nursing, Medical and Technical Care, Care Pedagogics, Documentation and Administration of Nursing Care, and Development, Leadership and Organization of Nursing Care) of the Nurse Professional Competence Scale has been confirmed by confirmatory factor analysis. Cronbach's alpha equals to 0.92.

Conclusions: Psychometric properties of the Nurse Professional Competence Scale in the Republic of Croatia show that the scale is reliable and valid as a measurement instrument, and can be used as such in research to assess the quality of professional competencies of nurses.

Introduction

With the accession of the Republic of Croatia to the European Union and in accordance with the recommendations for the harmonization of the education system and competencies of nurses, projects of coordination (IPA "Raising the knowledge and skills of nurses and midwives and harmonizing their educational curricula with Directive 2005/36/EC", "Development of standards of occupation/qualification with improvement of health care study programs HR 3.1.15-0051", and "Educating mentors for nurses and midwives in the health care system in Croatia and implementation of the education curriculum compliant with Directive 2005/36 / EC") were implemented, and all relevant education and health care systems in Croatia participated to them. After harmonizing the education program with the Directive and after creating the national curriculum of nurses and implementing the program over the past 5 years, the need for the assessment of professional competencies and education of nurses in Croatia arose.

By reviewing the available scientific papers, and since there is no validated scale in Croatia, the Nurse Professional Competence Scale was selected, as it is based on national competencies as well as the competencies of nurses in Croatia. The aim of the research is to standardize and implement the Nurse Professional Competence Scale in Croatia through the scientific project of the University of Rijeka (uniri-pr-biomed-19-6).

Background

Education and competencies of nurses are one of the human resources concerns in all health care systems around the world [1].

Competencies are a set of demonstrable knowledge and skills that enable and improve efficiency or successfulness of a certain activity. The term “competence” first appeared in an article by R. W. White in 1959, as a concept for motivation [2]. The development of competence is the objective of each educational program and is determined in different levels of education. Some competencies are specific to a particular discipline, while others are common to all educational programs. It is common for competence development to take place cyclically and in an integrated manner throughout education [3].

For the nursing profession, competencies are essential because they can guarantee high quality and efficiency of the health care provided [4], and they maintain the social value and status of the nursing profession.

The basic competencies of the nursing profession include basic behavioural guidelines as well as mastering advanced practice skills. Nurse competencies include, above all, characteristics such as tenderness, willingness to help, careful observation and judgment, efficiency, dexterity and responsibility. Other competencies include nursing, communication and cooperation skills, management, self-development, innovation, research and adaptation to stress [5]. In the professional development of nurses, it is desirable to encourage and develop moral thinking, critical thinking skills, as well as social adaptability, but the nurses should also be enabled and prepared to identify and properly respond to ethical dilemmas from the health care area [6]. The World Health Organization requires all Member States to report and implement their plans to improve the knowledge of nurses and programs to improve their professional competence [7, 8].

Several reforms have been implemented in Europe in the education of nurses with the aim of harmonizing curricula and education programs among all members of the European Union, with the aim to facilitate the mobility of workers in order to meet the requirements of demand and supply in the dynamic labour market of the European Union. However, differences remain across Europe in nurse education [9]. As a member of the EU, the Republic of Croatia has adopted a national curriculum that complies with the standards of higher education of nurses (Croatian Classifications Framework) and with the Directive 2005/36/EC, through various projects aimed at harmonization. The Directive 2005/36/EC defines in detail the minimal conditions for education of nurses, and determines that the education consists in 4600 hours of theoretical and clinical training. However, the field of professional nursing competencies in terms of education is not defined by the Directive, but it requires compliance through different country-specific documents [7, 10].

In Croatia, the competencies of nurses, according to the level of education, are regulated by the Nursing Act, and, together with responsibility and ethics, they are defined by the Ethical Code of Nurses following international guidelines (International Council of Nurses). The Nursing Act in the Republic of Croatia lists competencies for nurses with basic education, with a bachelor's degree and those with a master's degree, divided into eight components 1. Responsibility, 2. Ethical practice, 3. Principles of providing nursing care,

4. Health promotion, 5. Evaluation, 6. Health care planning, 7. Implementation of procedures, 8. Education [5].

The high level of acquired competencies through education affects the quality and safe health care provided by nurses [1], which contributes noticeably to reducing mortality and adverse events in patients within hospital facilities [11].

The process of competence development lasts throughout the professional development of nurses [12] and therefore it is necessary to evaluate acquired competencies throughout education and to continue throughout the nursing career [13]. In the last decade, several tools have been developed to assess the competencies of nurses and nursing students [14–20], however, no tools have been developed or tested so far to be used in the Republic of Croatia.

Therefore, we decided to test the Nurses Professional Competence Scale (NPC) [20] in order to be used for assessing competencies of nurses in the Republic of Croatia.

The NPC scale assesses the capability level of nurses when performing various tasks in the field of nursing care. The scale contains 35 statements grouped into 6 clusters: 1. Nursing care; 2. Value-Based Nursing; 3. Medical and Technical Care, 4. Care Pedagogics; 5. Documentation and Administration of Nursing Care; 6. Development, Leadership and Organization of Nursing Care.

The use of the scale identifies the level of acquired nursing competencies as well as skill gaps in clinical practice and the quality of nurse education programmes [20].

All instruments used for assessment must be appropriate, reliable, valid and accurate [21]. Therefore, this paper aims to assess the validity of the structure and consistency of the NPC scale in the Republic of Croatia.

Methods

4.1 Study Design

The validation study included several steps, the process of translation and adaptation of the NPC scale was done according to the instructions of the authors of the original scale [22] and according to the instructions of the World Health Organization [23].

Exploratory factor analysis has been implemented by analysing the main axis, factor loading, confirmatory factor analysis, χ^2 test and the reliability of the NPC scale.

4.2 Instrument

The original NPC scale was developed by the Swedish research team under the World Health Organization (education program standardization strategy) and based on formal competence

requirements of registered nurses in Sweden (what society expects from nurses: professionalism, holistic approach, competence and ethical behaviour) [4, 24].

The scale consisted of 88 statements divided into eight nursing competence areas: nursing care, value-based nursing, Medical and technical care, Teaching and support; Documentation and IT; Legislation in nursing and safety planning; The leadership of nursing and nursing care development; education, monitoring of staff and students; with a measure of internal consistency and reliability (Cronbach alpha value ranging from 0.75 to 0.94) [4], thus confirming its validity as an instrument. In order to facilitate its application in estimates and further research, a shorter form of the NPC scale was developed in 2017 with 35 statements divided into six areas with Cronbach alpha ranging from 0.71 to 0.86. The reduction of the original scale was done using the Pearson's correlation coefficient and by analysing the main components where the statements scored less than 0.4 in factor loading [25]. The six areas in the shorter version of the NPC scale are 'Nursing Care', 'Value-based Nursing Care', 'Medical and Technical Care', 'Care Pedagogics', 'Documentation and Administration of Nursing Care', and 'Development Leadership and Organization of Nursing Care'.

4.3 Sample

The number of subjects was based on 311 nurses who completed undergraduate or graduate studies in nursing, of which 42 (14%) were male subjects and 269 (86%) were female subjects. The subjects belong to the area of clinical practice, primary, secondary and tertiary health care, and social care system. The average age of subjects is 44 (SD = \pm 13.04), and the average number of years of work experience in health care is 18.7 (SD = \pm 10.16).

The research was conducted from April to July 2020. All the respondents received a link by email explaining the purpose of the survey and the modality of participation. The participation in the survey is voluntary and based on the participant's consent and the respondents have the right to quit without any consequences at any time.

4.4 Data collection

By opening the link(<https://www.1ka.si/a/277615?preview=on>) and by completing the electronic survey, nurses agreed to participate in the research. The questionnaire re-describes the purpose and the objective of the survey and the rights of each participant in this survey. The survey was available at the link for four months from April to July 2020, during which time the respondents had the opportunity to complete the questionnaire. Every two weeks, respondents received a reminder of the availability of the survey via e-mail. After completing each questionnaire, all the collected data was stored in the database on the webserver 1ka.si, and after four months the questionnaire was closed and data was exported from the databases into the JASP program for conducting statistical analysis. The anonymity of all participants was guaranteed because the database contained only responses from respondents without first and last names. The collected data was kept on the account 1ka.si protected by a password and the researcher was the only one who had access to the database and the responsibility for it.

4.5 Assessment of psychometric properties

Scale evaluation process started with the translation of the original scale into Croatian language. Experts from the nursing area in Croatia were included in the translation phase, making sure that the translation of certain elements would not be literally translated, but it respects linguistic equivalence. The Croatian version was then back-translated into English by an English translator. The translated questionnaire in Croatian was then sent to 10 nurses for validity assessment. All suggestions were further analysed and accepted in the changes to the translation and to the scale.

Confirmatory factor analysis (CFA) assessed the validity of the construction. Kaiser-Meyer-Olkin (KMO) test was applied to all the variables for assessing sample suitability. KMO ranges from 0 to 1, with values less than 0.5 indicating the inadequacy of the correlation matrix for factor analysis, i.e. a value of 0.6 is recommended as the minimal acceptable level for good factor analysis [25]. Factor loading > 0.71 is considered excellent, > 0.63 very good, > 0.55 good, and > 0.45 sufficient. According to the recommendations of the authors, only the loading higher than 0.32 should be analysed [25]. Then, the chi-squared test (χ^2), the Root Mean Square Error of Approximation (RMSEA) and the Comparative fit index (CFI) were used [26]. In the case of a large sample, the researchers recommend using RMSEA [26]. The values for RMSEA that were < 0.08 were reported as acceptable, and the values that were < 0.06 were reported as good. For CFI, the acceptable value is > 0.90 [27]. The scale reliability was tested by calculating Cronbach Alpha coefficients. The closer the Cronbach Alpha coefficient was to the value 1, the more reliable was the scale. The values that were ≥ 0.90 can be considered excellent [28]. JASP Team (2020) was used to analyse data. JASP (Version 0.14) [Computer software].

Results

The study included 311 nurses who completed undergraduate or graduate studies in nursing in the Republic of Croatia. There is no uniform opinion on the sample size in the research that would be suitable for factor analysis, but it should be noted that the minimum number is at least 100 or 3 to 20 times higher than the number of variables [29].

5.1 Data quality

The average response value for the proposed items ranged from 2.41 to 6.31 (standard deviations from 0.86 to 2.10), median from 2 to 7 (responses to all items are shown in the Likert scale ranging from 1 to 7).

5.2 Construct validity

5.2.1 Principal axis factoring (PAF)

A six-factor structure was obtained by principal axis factoring, which explained the 60.1% of variability in the responses to the items. KMO Kaiser-Meyer-Olkin test - shows the proportion of variance which is common, i.e., can be explained by latent factors. The KMO value must be above 0.5 for the correlation

matrix to be suitable for factorization the value is .94, which is a prerequisite for further analysis. Factor loadings ranges from 0.02 to 0.84 (Table 1). Factor names are translated from the English version of the questionnaire. As in the English version, several (5) items are linked to more than one factor. By examining the item content and by comparing them with the English version of the questionnaire, these items are included in the factor according to the original questionnaire.

Table 1
Factor loadings of principal component analysis

	F1	F2	F3	F4	F5	F6	A
Nursing Care (5 items)							0.92
Do you independently apply the following nursing process phases: observation and evaluation (nurse anamnesis, status and nurse objectives)?	0.73						
Do you assess the patient's basic human needs?	0.81						
Do you assess the patient's physical and specific needs?	0.83						
Do you document the patient's physical status?	0.82						
Do you document the patient's psychological status?	0.58						
Value-based Nursing Care (5 items)							0.83
Do you communicate with patients, relatives and staff with respect, sensitivity and empathy		0.51					
Do you show respect for patient's autonomy, integrity and dignity?		0.69					
Do you make use of patients' and relatives' knowledge and experience?		0.51					
Do you show openness and respect for different values and beliefs?		0.45					
Do you make use of the knowledge and experience of the team and others, thus contributing to an integral patient overview?		0.43					
Medical and Technical Care (6 items)							0.76
Do you manage drugs properly by applying pharmacology knowledge?			0.52				
Do you administer prescriptions independently?			0.07				
Do you give clear instructions / prescriptions?			0.79				
Do you use assessment, knowledge and skills when informing and providing safety and well-being to the patient during examination and treatment?			0.66				

	F1	F2	F3	F4	F5	F6	A
Do you follow up on patient's conditions after examinations and treatment?			0.02	0.51			
Do you handle medical equipment according to existing legislation and safety routines?			0.33				
Care Pedagogics (5 items)							0.90
Do you provide support and guidance to patients and relatives to enhance optimal participation in patient care and treatment?				0.73			
Do you inform and educate patients and relatives individually, taking into account time, form and content?				0.80			
Do you inform and educate groups of patients and relatives taking into account time, form and content?				0.84			
Are you sure that information given to the patient is understood by the patient and relatives?				0.69			
Do you motivate the patient through dialogue to adhere to treatments?				0.42			
Documentation and Administration of Nursing Care (8 items)							0.88
Do you make use of the patient's relevant data?					0.15		
Do you use information and communications technology (ICT) as a support in nursing care?					0.17		
Do you document according to current legislation?					0.53		
Do you implement actions in compliance with current legislation and guidelines?					0.64		
Do you handle sensitive data correctly and safely?					0.66		
Do you observe work-related risks and prevent them actively?					0.51		
Do you continuously engage in professional and personal development?					0.53		

	F1	F2	F3	F4	F5	F6	A
Do you systematically manage, prioritize, delegate and coordinate health care within the team according to the patient's needs and according to different competencies of your co-workers/ staff?					0.21		
Development, Leadership and Organization of Nursing Care (6 items)							0.83
Do you act adequately in the event of unprofessional conduct among employees?					0.43	0.25	
In the event of a serious incident within or outside the institution, do you apply the principles of emergency medical care?					0.42	0.19	
Do you apply new knowledge, thus promoting nursing care in compliance with science and evidence-based practices?					0.45	0.27	
Do you plan, advise, inform and collaborate with other members of the care chain?					0.48	0.34	
Do you teach, supervise and evaluate students?						0.73	
Do you supervise and teach your coworkers / staff?						0.79	

5.2.2 Confirmatory factor analysis (CFA)

The six-factor structure of the NPC Scale has been tested by a confirmatory factor analysis (Fig. 1). The model was tested by the Maximum Likelihood method on the sample N = 257. Correlations between factors are allowed, and just like in the English version, the item error variances “do you assess the patient's basic human needs” and “Do you assess the patient's physical and specific needs?”; “Do you document the patient's physical status?” and “Do you document the patient's psychological status?”; “Do you administer prescriptions independently?” and “Do you give clear instructions / prescriptions?” are mutually correlated. These items are included in the same factor and by examining their content, it has been judged that it is reasonable to allow mutual correlations. Model fit was tested by an χ^2 test ($\chi^2 = 1557.27$; $df = 542$; $p < 0.01$) which is expected on larger samples. On the other hand, the RMSEA value (root mean square error of approximation, parsimonious measures, should be equal to or less than 0.05) is 0.085 (95% confidence interval 0.080–0.090) and indicates a satisfactory fit of the model. CFI (comparative fit index, incremental fit - a model of interest is compared to that which implies the independence of latent variables, and it should be as close as possible /or greater than/ 0.95) is 0.84 and,

as in the English version, has not reached the recommended value of > 0.90 . Estimates of saturation factor are shown in Table 2 (together with the data from the English version of the questionnaire).

Table 2
Factor Loading estimate (Croatian NPC scale and the Swedish NPC scale)

	Factor loading	Factor Loading In the Swedish Sample
Nursing Care (5 items)		
Do you independently apply the following nursing process phases: observation and evaluation (nurse anamnesis, status and nurse objectives)?	1.00	1.00
Do you assess the patient's basic human needs?	0.89	0.89
Do you assess the patient's physical and specific needs?	0.92	0.85
Do you document the patient's physical status?	0.94	1.02
Do you document the patient's psychological status?	0.89	0.99
Value-based Nursing Care (5 items)		
communicate with patients, relatives and staff with respect, sensitivity and empathy	1.00	1.00
Do you show respect for patient's autonomy, integrity and dignity?	0.77	0.92
Do you make use of patients' and relatives' knowledge and experience?	1.10	0.88
Do you show openness and respect for different values and beliefs?	0.65	0.56
Do you make use of the knowledge and experience of the team and others, thus contributing to an integral patient overview?	1.06	1.08
Medical and Technical Care (6 items)		
Do you manage drugs properly by applying pharmacology knowledge?	1.00	1.00
Do you administer prescriptions independently?	0.39	1.23
Do you give clear instructions / prescriptions?	1.17	1.15
Do you use assessment, knowledge and skills when informing and providing safety and well-being to the patient during examination and treatment?	1.10	1.27
Do you follow up on patient's conditions after examinations and treatment?	0.98	1.27
Do you handle medical equipment according to existing legislation and safety routines?	0.97	1.25

	Factor loading	Factor Loading In the Swedish Sample
Care Pedagogics (5 items)		
Do you provide support and guidance to patients and relatives to enhance optimal participation in patient care and treatment?	1.00	1.00
Do you inform and educate patients and relatives individually, taking into account time, form and content?	1.21	1.13
Do you inform and educate groups of patients and relatives taking into account time, form and content?	1.24	0.96
Are you sure that information given to the patient is understood by the patient and relatives?	0.89	1.09
Do you motivate the patient through dialogue to adhere to treatments?	0.82	0.87
Documentation and Administration of Nursing Care (8 items)		
Do you make use of the patient's relevant data?	1.00	1.00
Do you use information and communications technology (ICT) as a support in nursing care?	1.47	0.89
Do you document according to current legislation?	1.24	0.89
Do you implement actions in compliance with current legislation and guidelines?	1.14	1.22
Do you handle sensitive data correctly and safely?	0.92	1.25
Do you observe work-related risks and prevent them actively?	1.19	0.95
Do you continuously engage in professional and personal development?	1.03	0.80
Do you systematically manage, prioritize, delegate and coordinate health care within the team according to the patient's needs and according to different competencies of your co-workers/ staff?	1.48	1.00
Development, Leadership and Organization of Nursing Care (6 items)		
Do you act adequately in the event of unprofessional conduct among employees?	1.00	1.00
In the event of a serious incident within or outside the institution, do you apply the principles of emergency medical care?	0.85	1.59

	Factor loading	Factor Loading In the Swedish Sample
Do you apply new knowledge, thus promoting nursing care in compliance with science and evidence-based practices?	1.08	1.26
Do you plan, advise, inform and collaborate with other members of the care chain?	1.12	1.28
Do you teach, supervise and evaluate students?	1.41	2.33
Do you supervise and teach your coworkers / staff?	1.50	2.22

5.2.3 Reliability

The reliability was measured as an internal consistency coefficient (Cronbach alpha) of the six identified factors. It ranges from 0.76 to 0.92 (Table 1).

Discussion

Nursing has evolved in the last three decades, and further accelerated development is expected, requiring an increasing number of competencies in order to provide the highest quality and the safest nursing care to the patients [30]. The increase of the education level of nurses' results in introducing new and more complex methods and procedures in health care, based on scientific research, therefore nursing today can be observed also through a scientific and moral dimension. The education for nurses must guarantee that the nurses have acquired defined knowledge and skills during their training and that they can implement their competencies according to their education level [31]. Only competencies in the nursing profession can guarantee high quality and efficiency of the provided health care [11]. It is therefore necessary to evaluate the competencies of nurses among different educational and health care systems. This would make nursing educational programs more compatible and more transparent at a global level.

In order to assess competencies, the measuring instruments must be suitable, reliable and valid [32]. The Republic of Croatia has not had a tool for assessing the professional competencies of nurses so far. The purpose of this study was to evaluate the psychometric properties of the NPC scale in the Republic of Croatia. The scale was developed in order to assess professional competence in nursing, containing 35 statements grouped into six groups (1. Nursing care; 2. Value-Based Nursing; 3. Medical and Technical Care, 4. Care Pedagogics; 5. Documentation and Administration of Nursing Care; 6. Development, Leadership and Organization of Nursing Care) and it is based on the national curriculum [20]. This was the reason for selecting this instrument for validation in the Republic of Croatia, as the other instruments are based on the description of knowledge in practice [15]. The structure and the contents of the scale correspond completely to the competence of nurses in the Republic of Croatia, as prescribed by the Nursing Act and based on the national curriculum.

Research results have shown that the psychometric properties of the NPC scale in Croatia are satisfactory. In order to increase the variability and the reliability of the scale, seven alternative responses have been used for each item. The authors believe that less than 5 alternative responses may lead to the reduction of variations, which can greatly affect the CFA [21]. The six-factor structure of the NPC Scale in the Republic of Croatia has been confirmed by confirmatory factor analysis. The analysis of the main axes explained the 60.1% of variabilities in the responses to items, compared to the original scale where the six-factor structure explained for 53.6% of the total variance [20]. The NPC scale in Croatia has shown excellent reliability both for the items and for the entire instrument.

The validation and implementation of the NPC scale in the Republic of Croatia will contribute to nurses' education quality assessment, and it will clearly define the needs to create new educational programs in accordance with the health care system. The implementation of the NPC scale as a tool in health care quality control can provide a valuable contribution to a high-quality patient care in hospital settings.

Conclusion

The presented procedure for assessing scale reliability and validity created the prerequisites for further research within the scientific project of the University of Rijeka (uniri-pr-biomed-19-6). Its objective was to implement the scale at four nursing faculties in the Republic of Croatia, in order to compare the obtained results with research led so far, where this scale was used, and with the aim to have an insight into professional competence of nurses in Croatia.

The implementation of the NPC scale in Croatia will allow the students, teachers, nurses and their employers to define strong and weak points, as well as possibilities for continuous education for nurses (nursing specialization). NPC can also act as a guideline for the reform of the national nursing curriculum and for acquiring additional nursing competencies in Croatia.

Abbreviations

CFA - Confirmatory factor analysis

CFI - Comparative fit index

KMO - Kaiser-Meyer-Olkin

NPC - Nurses Professional Competence Scale

PAF - Principal axis factoring

RMSEA - Root Mean Square Error of Approximation

Declarations

Ethics approval and consent to participate

The implementation of the study was approved by the Ethics Committee for Biomedical Research at the Faculty of Health Studies in Rijeka (Ur.br. 2170-15-20-1; Class: 602-01/20-01/37). According to the research objective and methods, ethical aspects of research are stressed out, with special attention to informing participants on the research objectives, voluntary consent to take part in the research, ensuring data confidentiality and protecting participants' identity, with an emphasis on the use of obtained data for research implementation and analyses.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research was financially supported by the University of Rijeka (uniri-pr-biomed-19-6).

Authors' contributions

Study conception/design: KI, RK, SB, MB. Data collection:

KI. Data analyses: KI, RK. Drafting of manuscript: KI, RK, SB, MB.

Acknowledgements

We are grateful to all the nurses who took the time to participate in the study, and to University of Rijeka for their support, and also to Maja Lazarević Branišelj, Rijeka, Croatia for language revision.

Conflict of interest

No conflict of interest has been stated by the authors.

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Figures

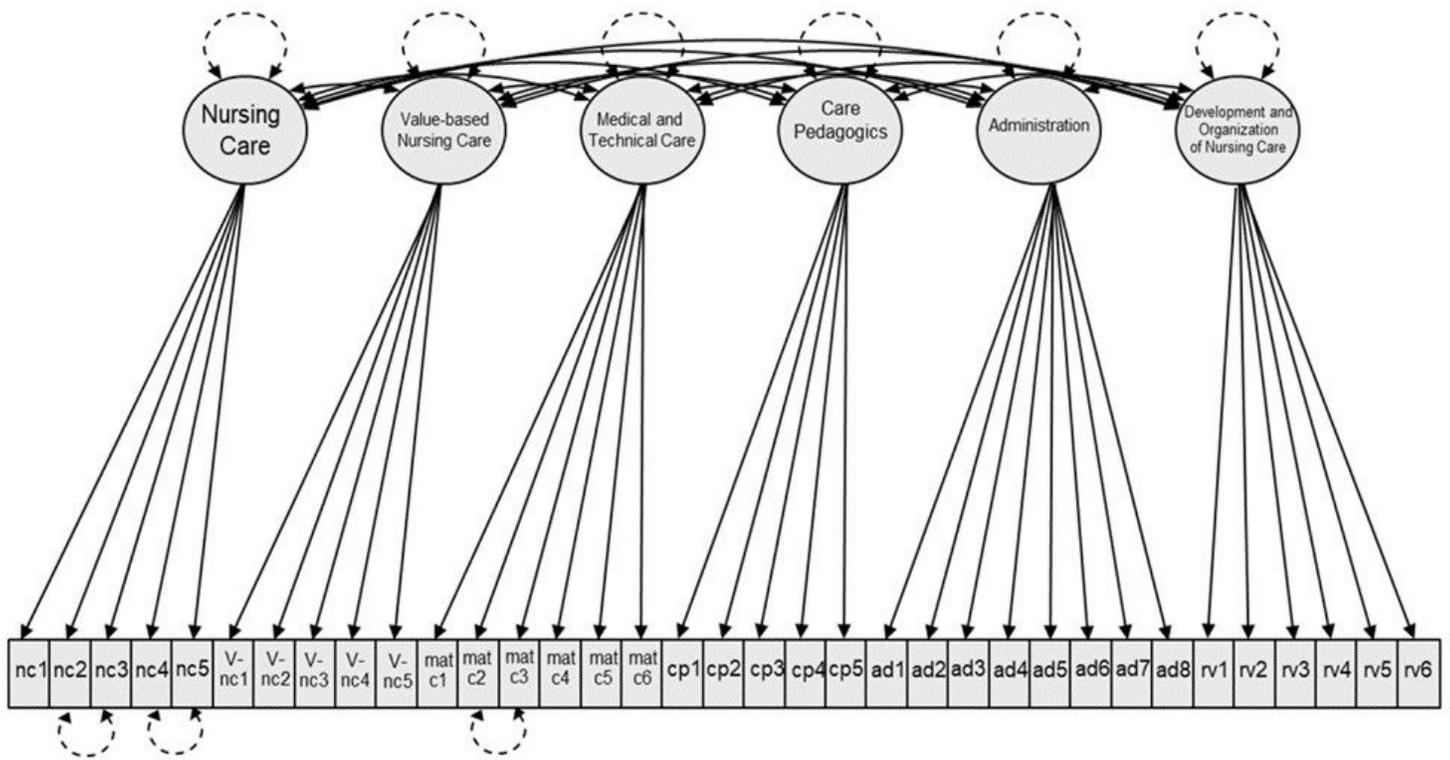


Figure 1

Flow chart presenting the underlying construct of the 35-item NPC-Scale