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The Assessment of Safe Nursing Care (ASNC): Development and Psychometric Evaluation

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The Assessment of Safe Nursing Care (ASNC): Development and Psychometric Evaluation

Aim. To develop an instrument for the assessment of safe nursing care (ASNC) within the Iranian context and psychometrically evaluate its reliability and validity.

Background. There is a need for a valid and reliable instrument to assess how nurses employ the components of safe nursing care in clinical practice in non-Western countries.

Methods. This methodological study was conducted in two phases: (a) a qualitative phase of instrument development, and (b) a quantitative phase of psychometric evaluation of the Assessment of Safe Nursing Care (ASNC). The instrument's content validity was assessed by experts in the field of safe nursing care. The reliability of this instrument was examined by using internal consistency reliability and intra-rater reliability analysis. Exploratory factor analysis was then conducted to establish the instrument's initial construct validity.

Results. The instrument developed was a questionnaire with 32 items. The Cronbach's alpha of the scale was 0.92 and Intra-class Correlation Coefficient for intra-rater reliability was 0.78. Exploratory factor analysis resulted in a four-factor solution: (a) nursing skills, (b) assessing the patient's psychological needs, (c) assessing the patient's physical need, and (d) nurses' teamwork. The four factors accounted for 63.54% of the observed variance.

Conclusion. The ASNC can be applied to a wide variety of settings due to the broad range of methods utilized to generate items and domains, its comprehensive consideration of the principles of safe care, and its initial reliability and validity.

Implications for Nursing Management. The ASNC can help nurse managers assess whether clinical nurses are prepared to apply their safe care skills in clinical practice. It can also be used by clinical nurses to assess their own and peers' practice to detect potential areas for improvement in nursing care and help nurse managers with planning appropriate quality improvement programs.

Keywords: assessment, instrument, nursing care, nurse manager, safe care, psychometric evaluation

Introduction

According to the World Health Organization [WHO], patient safety is the level of care at which negative effects do not result in relation to the patient's health in the process of health care delivery (WHO 2014). Accordingly, safe nursing care has been described as the prevention of harm that could be caused by practice errors. Furthermore, it also involves interventions for maximizing the possibility of the early detection of errors (Angood et al., 2009, National Quality Forum [NQF] 2009).

Safe nursing care is the main component of nursing care quality (Austin *et al.* 2014, Australian Nursing and Midwifery Council [ANMC] 2014). There is a need for the development of strategies to optimize the safety of care and prevent any harm during nursing practice (Considine & Currey 2014).

In comparison to other health care professionals, nurses carry the highest level of responsibility for structures and processes to assure patient safety twenty-four hours a day (Fasoli 2010, Jenaro *et al.* 2011). Through independent and informed decision-making in the workplace, and by exercising their full scope of practice, nurses can work to further ensure the provision of safe nursing care (Vaismoradi *et al.* 2012a).

Safe nursing care systems are characterized by nursing interventions focused on measures to prevent practice errors and any unintended consequences of the provision of nursing care (Considine & Currey 2014, Manias *et al.* 2015). Nurses' contribution to safe nursing care has extended to nurse managers' duties such the coordination and integration of the multiple aspects of quality care, especially monitoring and assessing those skills required to reduce preventable practice errors (Hughes 2008, Munroe *et al.* 2013).

'Assessment of safe care' is a new concept in nursing literature (Abdou & Saber 2011). It is suggested that any change in how nurses exercise their role requires an assessment by nurse managers of nurses' accountabilities, and consideration of any gap between current and ideal nursing practice (White *et al.* 2015).

This type of assessment helps nurse managers identify hazards, minimize the chances of harm and prevent errors. For instance, working practices can be changed and/or updated to make care safer, or more appropriate equipment might be used to minimize risks (Aro *et al.* 2012, Black *et al.* 2011, Rashvand *et al.* 2015). An assessment might indicate the need for specific staff

development activities and also involve the patient by making them more aware of risks and ways they can avoid or minimize them (Vaismoradi *et al.* 2012a, 2015). Assessing the safety of nursing care enables nurses to bring risk-prone situations in the workplace to the attention of health care managers' and may also lead to cost saving (Considine & Currey 2014, Haycock-Stuart & Kean 2012, Munroe *et al.* 2013)

Improving performance and reducing nurses' workplace stress and the potential for burnout are additional advantages of the development and application of safe nursing care assessment instruments in clinical practice (Van der Doef *et al.* 2012). Moreover, the results of such an assessment can be used to design educational programs to assist nurses to empowerment themselves and also offer necessary policy and strategic recommendations for the amelioration of obstacles to safe patient care (Poghosyan *et al.* 2010, Gu *et al.* 2015).

Background

It is noted that instruments have been designed according to various cultures' rules, regulations, and health care values governing those communities. It is paramount that health care professionals need to acknowledge that culture may influence the application of standardized instruments and conclusive decisions should be automatically accepted if based on the results are based on instruments from another culture (Gasparino & Guirardello 2009). Therefore, the translation of an instrument may not have all the criteria necessary for the evaluation of safe nursing care in different cultures. Moreover, an instrument from another culture could only be used after the application of stringent methodological procedures of cultural adaptation (Gasparino & Guirardello 2009, Vaismoradi et al. 2014).

Therefore, there was a need to an instrument that would consider the Iranian culture and context such as teamwork, physician-centeredness, national guidelines, and the process of conducting care and treatment procedures in clinical practices (Vaismoradi *et al.* 2012b). In addition, one of current instruments designed to assess safe nursing care has focused directly on the assessment of safe nursing care based solely on the nurse's performance.

As a result, a new instrument was developed in this study to assess safe nursing care based on the nurse's performance with both the consideration of designated characteristics of assessment of safe nursing care and the particular culture of the Iranian health care systems. It is

intended that this instrument may also be applied with nurses working in health care systems with similar cultural characteristics.

Aim

The aim of was to develop an instrument for the assessment of safe nursing care (ASNC) within the Iranian context and psychometrically evaluate its reliability and validity.

Methods

This study was conducted in two phases. In phase 1, the ASNC was developed through the analysis of available data, review of the literature, and semi-structured interviews with a sample of nurses (n=16). In phase 2, the psychometric properties of the developed instrument were examined in relation to the instrument's reliability and construct validity (**Figure 1**).

Phase 1. Development of the ASNC

Analysis of available data

The first of the three steps in the development of the instrument involved the incorporation of data from a grounded theory study exploring the process of providing safe nursing care in the Iranian health care system (Vaismoradi *et al.* 2012b). Briefly, this study defined safe care as the application of knowledge and skills to provide quality care so as to reduce the possibility of any harm to the patient. In this definition, safe nursing care process has been explained based on five primary domains: 'prioritising patients' needs', 'sharing nurses' concerns with clinicians', 'developing own care routines', 'adapting nurses' practice with safety requirements' and 'assuring safety as the patient right' (Vaismoradi et al, 2012a, b). In this study, these domains were considered the primary domains of the ASNC. Also, the content of the grounded theory study was analysed using an inductive qualitative content analysis (Graneheim & Lundman 2004) with the aim of extracting items appropriate to the assessment of safe nursing care in the identified five areas (**Table 1**). The researchers considered the data of the grounded theory study in drafting a preliminary instrument to objectively assess safe nursing care. This analysis resulted in fifty-seven items.

Review of international literature

Authors conducted a search for published research on instruments that assessed of the safety of nursing care. Databases that provided the highest yield of citations from a previous research on the study topic were chosen to compile an initial list of articles and abstracts. A

variety of search terms were used to create a comprehensive collection of studies on the assessment of safe care for the initial list. The key terms included 'patient safety' and 'safe care' combined with 'assessment' and 'evaluation' in databases of CINAHL, PubMed (including Medline), British Nursing Index, EMBASE, PsycINFO, and GoogleScholar. In addition to English language databases, the authors reviewed the Persian language databases, documents and articles to add to the depth and variation of the results. Furthermore, a manual search was conducted in the well-known journals that would publish articles relevant to assessment of safe nursing care to maximize coverage.

The inclusion criteria were: all English and Persian studies related to the assessment of safe nursing care, published and available online in peer-reviewed journals, from 1990 and 2015. As a result, fourteen instruments were found that were considered for inclusion for the item generation process (**Table 2**).

During the literature review, items related to the assessment of safe nursing care were sorted under the five domains of the previously identified grounded theory study in accordance to their relationship to each domain. Some items that was not fit to these domains was placed under a new domain called "staff welfare". The opinions of the research team and other experts who were knowledgeable in the field of safe nursing care were sought to compare and delete duplicative items that resulted from the review of the literature. This review resulted in 92 items.

Semi-structured interviews

A qualitative study was conducted to incorporate the perspectives of Iranian nurse educators involved in the education of safe nursing care that may not have been considered in previous studies (Rashvand *et al.* 2015). According to the National Council of State Boards of Nursing [NCSBN] (2012) in the U.S.A., nurse educators' perspectives are required for the identification of safe nursing care assessment criteria in clinical practice. Moreover, there is an interactive connection between nursing education and clinical practice in terms of training knowledgeable clinical nurses based on a well-established and sound nursing curriculum (Hughes 2008, Tella *et al.* 2014, Vaismoradi 2012c) that highlights the significance of nursing education in the assessment of safe nursing care.

Face to face, semi-structured interviews were conducted with 16 nurses, including instructors, clinical nurses, and nurse managers. The sample was selected purposively to achieve

maximum variation (ex. years of nursing experience and types of roles) and, thus, obtain a broad and varied perspective on the assessment of safe nursing care through the participation of these key informants (Streubert & Carpenter 2010). The major questions of the interviews were: (i) How do you assess safe nursing care, and (ii) Who can ensure that safe nursing care is provided to patients? Data collection continued until data saturation was reached. The analysis of the data from the interviews used directed content analysis because this study aimed to compare the data with the previously identified domains and related items (Graneheim & Lundman 2004). The codes and categories extracted from this qualitative study were then compared with the items that emerged from the grounded theory study. The data also was checked for credibility, transferability, dependability and conformability establishing the trustworthiness of the data (Lincoln & Guba 1985). As a result, thirty-four additional items were defined (**Table 3**).

In summary, in the first phase of this study 183 items were generated. Fifty-seven items were developed from the grounded theory study. Ninety-two items resulted from the literature review, and thirty-four items were generated from the semi-structured interviews.

Phase 2. Validity and Reliability

Face validity

Face validity was conducted to investigate participants' understanding and comprehension regarding the ASNC's items (Fitzner 2006). The nurses, who participated in the qualitative study, were requested to provide comments about the 'relevancy', 'ambiguity', and 'difficulty' of the items. Also, the participants were asked to provide a feedback about the ASNC and offer additional recommendations for its improvement. According to their suggestions, typographical errors were rectified. Moreover, the ASNC was evaluated by ten nurses who were asked to evaluate and score the importance of each item on a 5-point Likert scale for the calculation of 'Item Impact Score' (Impact Score = Frequency (%) × Importance). An impact score of 1.5 or above was considered satisfactory (Broder *et al.* 2007).

Content validity

The aim of the content validity part of the instrument development process was to determine whether the items adequately addressed the construct of safe nursing care (Fitzner 2006). A panel of experts, consisting of eleven nurse managers, nursing faculty members and nine specialists in the field of safe nursing care were asked to determine Content Validity Ratio

(CVR) and Content Validity Index (CVI), respectively. They assessed the grammar, wording, item allocation, and scaling indices (Gungor & Beji 2012).

To calculate the CVR, the expert panel was invited to evaluate each item using a three point Likert scale: 1 = essential, 2 = useful but not essential, and 3 = unessential. Then, according to Ayre and Scally's table, items with CVR scores of 0.63 or above were selected (Ayre & Scally 2014).

To calculate the CVI, based on Polit *et al.*'s (2007) recommendations, the same panel evaluated the items according to a 4-point Likert scale with regard to 'relevancy'. A CVI score of 0.78 or above was considered satisfactory.

Pre-pilot version

The researchers read each item independently and then held thorough discussions, as a team, regarding the meaning and quality of each item to be included in the final instrument. After deleting duplicate items, there were 130 items in total. Thirty-seven items were deleted due to close and/or overlapping meanings. In addition, thirty-six items were deleted as they were not found t to not address safe nursing care specifically. All items related to "staff welfare", resulting from the literature review, were deleted because they were beyond the scope of our study. Therefore, fifty-seven items remained.

All items were checked and the expert panel's recommendations were incorporated into the instrument. Additional items were deleted as a result of the face and content validity phases. During the face validity phase, six items had an impact score of less than 1.5 and were deleted. As a result of the content validity phase, seven items with a numerical CVR of less than 0.63 were deleted. Two items had a numerical CVI of less than 0.78 and were also deleted. In summary, forty-two items remained (**Figure 2**). The ANSC using a 5-point Likert scale (always = 5, often = 4, sometimes = 3, rarely = 2, never = 1) was then finalized.

Reliability

During the evaluation of the ANSC's internal consistency, a Cronbach's α coefficient of 0.7 or above was considered satisfactory (Litwin 1995, Schneider 2004). In addition, the ANSC was then completed by a small sample of nurses (n = 30) twice within a two week interval to examine the consistency of the scale by calculating Intra-class Correlation Coefficient (ICC)

where an ICC of 0.4 or above was considered acceptable. This period was considered appropriate to avoid memory recalls and the possibility of changes in the sample (Waltz *et al.* 2010).

Construct validity

An exploratory factor analysis (EFA) was conducted to examine the factor dimension of the ASNC. This analysis was designed to reduce the number of items, explore patterns of the factors' structure stability and provide information for further refinement of the instrument (Hinkin 1995, Westen & Rosenthal 2003).

Evaluating the ASNC

In keeping with the proposed applicability of the ASNC by both nurse managers to assess clinical nurses and also clinical nurses to assess their own and peers' practice, the sample consisted of both nurse managers and clinical nurses. A random sampling method was used to choose the participants as having similar demographic characteristics to the participants in the qualitative study (Rashvand *et al.* 2015) from the five teaching hospitals affiliated with a university of medical sciences. Surgery and internal medicine wards were sampled. Of these wards, fifteen wards were randomly selected. Of the sixty available nurses working on these wards, each head nurse and nurse supervisor was asked to choose four to six nurses randomly, and observe and assess their practice by using the safe nursing care assessment instrument. Therefore, the sample consisted of nurses that were evaluated by head nurses (n=154) and supervisors (n=82), and clinical nurses (n=64) as peer assessment and). It meant that a total of 335 assessments were performed by head nurses, clinical nurses and supervisors. Since it has been suggested that, to conduct EFA, the sample size should be at least five times more than the number of items (Polit *et al.* 2007), this number satisfies that requirement.

Inclusion criteria for the participants were: (a) a bachelor degree in nursing as the minimum requirement for employment in both public and private health care settings (Vaismoradi et al. 2014) and (b) interested in participating in this study. Over a three month period, each nurse, head nurse and nurse supervisor observed a nurse practicing and then completed the questionnaires.

Data analysis

The SPSS software for Windows version 16.0 was used to perform all statistical analyses (SPSS Inc, Chicago, USA, 2008). Both item- and subscale-level analyses were conducted using descriptive statistics including frequencies, means and standard deviation.

The item content validity Ratio (CVR) was calculated. According to Ayre and Scally's table, items with CVR scores of 0.63 or above were selected (Ayre & Scally 2014). The item content validity index (I-CVI) was calculated by totalling the ratings of three and four and this figure was then divided by the total number of raters. Items with a mean score of 0.78 or above were retained (Polit *et al.* 2007). The researchers made a decision to delete or revise items scoring below 0.78.

Cronbach's alpha coefficients and item analysis, including item-to-total correlations, were calculated for internal consistency. The acceptable Cronbach's alpha coefficient value for new instruments is 0.70, intra-rater reliability of the scale between the nurses' evaluators was tested with inter class correlation (ICC). The ICC acceptable value for new instruments is 0.70 and over almost perfect. (Hu & Bentler 1999). The instrument's factor structure was extracted using the principal component analysis with varimax rotation. The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were used to assess the appropriateness of the sample for the EFA (Martınez-Gonzalez et al. 2001). Eigenvalues above one and a scree plot were used to determine the number of factors. Factor loadings equal or greater than 0.5 were considered appropriate (Nunnally & Bernstein 2001).

Ethical considerations

The Research Council and the Ethics Committee affiliated with the University of Medical Sciences approved the study research proposal and corroborated its ethical considerations. The participants were all informed about the purpose of the study, and were assured that their names would remain anonymous. It was also emphasized that participation in this study was voluntary, and they could withdraw at any time without any penalty. Lastly, individuals who agreed to voluntarily participate in this study signed a written consent form.

Results

The participants' general characteristics

Of the 335 questionnaires collected in this study, questionnaires were excluded due to incomplete answers by the participants (n=25, 7.46 %), or following the participant's decision to

withdraw from the study (n= 10, 2.98%). Three hundred questionnaires were finally included in the psychometric evaluation. **Table 4** details of the participants' demographic characteristics.

Psychometric evaluation of the ASNC

Reliability

The instrument's Cronbach's alpha was 0.92. The ICC was 0.78, indicating a suitable stability of the questionnaire (**Table 5**). Before checking the instrument's structure validity, the Cronbach's alpha for thirty participants was conducted, resulting in the score of 0.91, indicating good internal consistency.

Construct validity

An EFA was conducted, using a principal components analysis as the method of factor extraction, for the identification of the underlying factor structure of the ASNC. The Kaiser–Meyer Olkin coefficient was 0.967, and the Bartlett test of sphericity was statistically significant ($\chi 2$ = 9.978 E3; df = 681, P < 0.001) indicating that the properties of the correlation matrix justified the conduction of a factor analysis (Martınez-Gonzalez *et al.* 2001). In addition, the sample size was found adequate as the variable to subject ratio was 1:7.

An oblique factor rotation identified four latent factors. The extraction was based on scree plot visual interpretation (**Figure 3**) and Kaiser's criterion for Eigenvalues of equal to or greater than unity. The four factors, comprising thirty-two of the original forty items, explained 63.54% of the total variance. One item was deleted because of a low loading on the factors. According to **Table 6**, two questions, related to psychological needs, were deleted due to having a loading of less than 0.2. (Nunnally & Bernstein 1994, Costello & Osborne 2005). Also, one item from domain 2 were transferred to domain 1 due to its further compatibility with this domain. The factors, their labels, number of items and percentage of explained variance are detailed in **tables 6, 7**.

Discussion

The stages of developing and psychometrically evaluating the ASNC were reported in this study. The items of this instrument were designed based on a grounded theory study in the Iranian context of nursing, a thorough international literature review and the findings of qualitative interviews. The main characteristics of this instrument is that it focuses directly on the assessment of safe nursing care. Therefore, the researchers propose that the ASNC can now be

applied within different countries' health care systems while, at the same time, continuing to examine the instrument's psychometric properties.

Psychometric properties

In terms of reliability, the ASNC demonstrated acceptable internal consistency . Each item was also highly correlated with the total score, suggesting that the items on the ASNC were homogeneous and measured the same overall case assessment's construct. The items of this instrument were adjusted by the EFA, according to the extracted four domains, and their reliability and validity were examined. The EFA identified that the four-factor structure of the ASNC accounted for 63.54% of the total observed variance. As a result, the ASNC met the initial psychometric requirements for content validity, construct validity, internal consistency reliability and ICC.

Overall characteristics of the ASNC

Regarding the components of this instrument in comparison to other instruments (SAQ (Sexton *et al.* 2006), PSCHO (Singer *et al.* 2007), HSOPS (Sorra & Dyer 2010)), the ASNC assesses nurses' performance in relation to the provision of safe nursing care. Although previous instruments have been designed to assess patient safety, none of them have focused directly on the assessment of safe nursing care based on the nurse's performance using an observational method. **Tables 8 and 9** compare the ASNC with other patient safety instruments.

The ASNC can contribute to the improvement of safe nursing care in clinical settings, because it can assess the extent of nurses' application of their safety skills in hospitals. For example, low scores on a specific instrument item could indicate that a nurse needs further development so as to deliver safe nursing care skills related to that indicator. Through such assessment, both clinical nurses and nurse managers can recognize the current status of safe nursing care in a work area, identify deficiencies and skill shortcomings, and plan for removing obstacles to safe practice. Furthermore, clinical nurses and nurse managers can use the ASNC to identify the strengths within themselves and their workforce while identifying areas where support is needed for colleagues in order to provide safe nursing care. Individual professional development plans can then be instituted to work with each nurse to further improve their abilities to provide safe nursing care.

Since the ASNC measures safe nursing care objectively by assessing nurses' skills, it can be used to investigate the effects of safe nursing care educational program on clinical nurses' or nursing students' abilities to provide safe nursing care. Description of the components of safe nursing care identifies the main areas of safe nursing care. These components can then be used to design educational programs with a focus on safe nursing care issues identified by nurse managers. In addition, since the average time to complete this instrument by a participant is about 15 minutes, the ASNC is quick to complete and easy to score.

Limitations and recommendations for future research

Since there was no appropriate and cultural-contextual instrument to assess safe care in the Iranian health care system, concurrent validity could not be examined. However, based on the comparison of the ASNC with other instruments, the comprehensiveness, reliability and validity of the ASNC was supported.

Another limitation is that the study's participants were mainly female nurses. While the number of male nurses in this culture's health care settings is low, this limitation may not have any negative impact on the generalizability within this culture. Future studies with larger samples and nurses from both genders are suggested to further revise the ASNC and improve its broader application. In addition, future studies can establish the sensitivity of the ASNS to changes in knowledge and skills following educational interventions.

Conclusion

The ASNC is useful to gain insights into safety issues, identify strengths and weaknesses and prompt suggestions for improvements. This instrument's characteristics and its application to both clinical and educational practice results from the broad range of methods utilized to generate items and domains, its comprehensive consideration of the principles of safe nursing care, and its acceptable reliability and validity. Although the ASNC is a new instrument and requires further convergent validation, it seems to be a useful measure to assess safe nursing care.

Implications for Nursing Management

The ASNC can contribute to the improvement of safe nursing care interventions by nurse managers in clinical settings because nurse managers and others can use the instrument to assess the extent of nurses' application of their safety skills in hospitals. Also, nurse managers can use

the ASNC to recognize the current status of patient safety, identify deficiencies and skill shortcomings, and plan for removing obstacles to safe nursing care. The authors suggest that the ASNC can be used by nurse managers to conduct a comprehensive and up-to-date assessment of safe care in practice. The instrument's ease of use and its simple scoring system increases its utility and its potential for use by busy clinical nurses and nurse managers at all levels. Furthermore, the ASNC can also be used by clinical nurses to assess their own and peers' practice to detect potential areas for improving the safety of nursing care and help nurses managers with planning appropriate quality improvement programs.

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Table 1. An example of items designed based on the reanalysis of existing data

Main theme	Theme	Subtheme	Nurses-patient experiences in relation to safe nursing care	Terms designed in accordance with the experiences of nurses/ patients in relation to the assessment of safe nursing care
Achieving stability in nursing care	Prioritising patients' needs	Compatibility of the care plan with the patient's need	Patient: It is not only taking care about eating and sleeping, but a nurse should provide holistic care	Physical and psychological needs of patients are addressed.
	Sharing nurses' concerns with other healthcare professionals	Unity and integration of healthcare providers	Head nurse: nurse is responsible for the activities of other members of the team and should check all the activities and physician's order and provide required information to the team members to avoid errors	Working co-ordinately with the care team members and checking activities of other team members
	Developing own care routines	.....	Nurse: If I decide independently and if use my knowledge I feel like I can do my job well	Doing nursing care well and deciding independently based on their own knowledge
	Adapting nurses' practice with safety requirements	Environmental requisites for safe nursing care	Nurse: When the ration numbers of patients to nurses is high, nurse' focus for care comes down and may forget some of the nursing actions	Doing nursing care with a focus on procedures
	Assuring safety as the patient right	……	Nurse: To ensure security, the physician should consider the patient a sense of obligation. The nurse should remind it to the physician and others	Monitoring the safety of care delivered by other healthcare team members

Table 2. Available instruments in the field of assessment of safe care

Title of instrument	Authors	Source	No of items (demographics not included) And No of dimensions	Stability	Psychometric evaluation methods
Safety Attitudes Questionnaire (SAQ)	Sexton *et al.* 2006	Based on Flight Management Attitudes Questionnaire (FMAQ)	60 items; 6 dimensions	Cronbach's alpha 0.6 – 0.8	Content validity Exploratory factor analysis Confirmatory factor analysis
Safety Climate Survey (SCS)	Pronovost *et al.* 2003	Based on SAQ	19 items; 9 dimensions	Cronbach's alpha 0.7 – 0.8	Content validity Confirmatory factor analysis
Veterans Administration Patient Safety Culture Questionnaire (VHA PSCQ)	Colla *et al.* 2005	Based on the available tools and literature review	71 items; 13 dimensions	Cronbach's alpha 0.4 – 0.9	Content validity Exploratory factor analysis Confirmatory factor analysis
Hospital Survey on Patient Safety (HSOPS)	Sorra & Dyer, 2010	Based on Agency for Healthcare Research and Quality (AHRQ)	44 items; 14 dimensions	Cronbach's alpha 0.6 – 0.8	Content validity Exploratory factor analysis Confirmatory factor analysis
Stanford Patient Safety Center of Inquiry culture survey Stanford (PSCI)	Wilson *et al.* 1995	Based on the Operating Room Management Attitudes Questionnaire (ORMQ)	89 items; 18 dimensions	Not reported	Content validity
Patient Safety Cultures in Healthcare Organizations (PSHCO)	Singer *et al.* 2003	Based on the PSCI	82 items; 5 dimensions	Cronbach's alpha 0.6 – 0.8	Content validity Confirmatory factor analysis
Safety Climate Scale (SCS)	Brennan *et al.* 1991	Based on FMAQ	10 items; 4 dimensions	Not reported	Content validity
Strategies for Leadership: An Organizational Approach to Patient Safety (SLOAPS)	Wong *et al.* 2002	Based on the Baldrige framework to assess the scope of the convention where patient safety is a strategic priority	58 items; 9 dimensions	Not reported	Content validity
Culture of Safety Survey (CSS)	Weingart *et al.* 2004	Not listed	34 items; 4 dimensions	Cronbach's alpha less than 0.6	Content validity Face validity
Teamwork and Patient Safety Attitudes Questionnaire	Kaissi *et al*. 2003	Not listed	24 items 4 dimensions	Not reported	Face validity
Hospital Safety Culture Questionnaire	Singer *et al.* 2007	Based on ORMQ	99 items 14 dimensions	Not reported	Content validity
Manchester Pati	Pronovost *et al.*	Made By the University	9 dimensions	Not reported	Content

ent Safety Framework (MaPSaF)	2009	of Manchester based on Western theories			validity
Stanford Instrument	Ginsburg *et al.* 2005	Based on ORMQ	30 items 5 dimensions	Not reported	Content validity
Patient Safety C ulture (PSC) Modified Stanford Instrument	Ginsburg *et al.* 2009	Based on ORMQ	32 items 3 dimensions	Cronbach's alpha 0.6 – 0.8	Content validity

Table 3. A sample of interviews with the codes assigned to it and the items extracted from them

Participants accounts	**Codes**	**Item extracted from the qualitative study**
A nurse from the moment of admission must teach all safety tips to the patient.	Patient safety education	Teaching safety tips (for example, lifting the bed side, ...) to the patient
The head nurse should be careful and ask for the experienced nurse to work along with an unexperienced nurse. It's a method to avoid the errors.	Asking for collaboration of experienced nurses with less experienced nurses.	If possible, the views of other members of the team are used in nursing care.
I use my theoretical knowledge that previously educated to me in my practice.	Using nursing knowledge to practice safely	Maintaining competencies, based on current knowledge and expertise, to perform nursing interventions
Nurses should be trained to report errors. When I see my colleague is making a mistake, I her/him works.	Timely report of patient safety errors; Checking the nurse' interventions	Reporting safety incidents to appropriate personnel, based on the organization's policies and procedures Some critical nursing interventions are checked by the second nurse.
The nurse should work in accordance with humanitarian principles and his conscience, and even if nobody controls it, she should do her tasks principally.	Getting things done in accordance with conscience, without external control	Performing nursing interventions without direct supervision

Table 4. Demographical characteristics of the participants

	Variable	n	%
Gender	Female	187	62.34
	Male	113	37.66
Evaluators' position	Head nurse	154	51.34
	nurse	64	21.33
	Supervisors	82	27.33
Degree	Bachelor	255	85
	Master	45	15
Experience (year)	<5	66	22
	10-5	106	35.3
	>10	128	42.7
	Mean (SD) = 10.12 (6.08)		
Hours of work (hours per each month)	<150	34	11.33
	250-150	238	79.33
	>250	28	9.34
	Mean (SD) = 185.12 (41.58)		
Total		300	100%

Table 5. Cronbach's α coefficient and ICC for the safe nursing care assessment instrument and its domains (n =300)

Factor	Number of items	Mean (SD)	Cronbach's α coefficient	ICC (95% CI) (n= 30)
Evaluation of nursing skills	16	62.40(11.44)	alpha=0.95	0.73 (0.38-0.88)
Assessing the patient's psychological needs	4	15.46(3.29)	alpha=0.86	0.71 (0.49-0.86)
Assessing the patient's physical needs	7	29.05(4.43)	alpha=0.89	0.72 (0.48-0.85)
Assessing nurses' teamwork	5	20.46(3.45)	alpha=0.88	0.75 (0.47-0.88)
Total	32	127.57(20.77)	alpha=0.92	0.78 (0.48 -0.85)

Table 6. Factors, items and factor loadings for safe nursing care assessment instrument (n = 300)

Domains Cumulative % = 63.56%	Item	Factor1	Factor2	Factor3	Factor4
Evaluation of nursing skills % of variance = 23.46	1) Double checking nursing interventions for example insulin doses.	0.758			
	2) Attends organizational programs related to patient safety	0.717			
	3) Acting according to safety hospital protocols that are available, such as correct injection instructions, hand washing.	0.697			
	4) Maintains competencies, based on current knowledge and expertise, to perform nursing interventions	0.673			
	5) Reducing the impact of busy and crowded by focus on procedures in part on patient safety	0.669			
	6) Doing the nursing rounds at the bedside	0.691			
	7) Performing nursing interventions without direct supervision.	0.656			
	8) Provides an environment conducive to the safe provision of patient care	0.640			
	9) Performing nursing interventions without direct supervision.	0.639			
	10) Entrusting the responsibility of specific and difficult tasks to experienced nurses or other professionals.	0.608			
	11) Monitors the safety of care provided by other healthcare team members as appropriate.	0.606			
	12) Reports near-miss safety incidents to appropriate personnel, based on the organization's policies and procedures	0.580			
	13) Meetings of the health care team focus on further improving patient safety	0.553			

	14) Advocacy efforts, on behalf of patients, focus on further improving patient safety.	0.520			
	15) Revises nursing interventions based on the evaluation of outcomes and evidence	0.503			
Assessing the patient's psychological needs % of variance = 13.81	1) Expressing sympathy with the patient.		0.743		
	2) Introducing healthcare professionals to the patient on arrival, if the patient is conscious, and not in the immediate need of stabilization[i]		0.702		
	3) Respecting the patient (for example: greeting the patient when entering the patient's room, introducing oneself using a different word depending on whether the person he/she is addressing is older or younger than the nurse)		0.699		
	4) Responding to patient's inquiries.		0.686		
	5) Giving education on patient safety to inexperienced staff.		0.629		
	6) Allowing the patient to meet his/her closest family members in the hospital, if the patient wishes		0.567	0.504	
	7) Seeking patient's comments and perspectives on safety procedures (for example: choosing the injection site, taking vital signs, checking their own medicines, seeking patients' feedback related to nursing interventions	0.535	0.561		
Assessing the patient's physical needs % of variance = 13.78	1) Seeing the patient for basic physical needs such as nutrition, excretion, pain			0.726	
	2) Teaching safety tips (for example, lifting the bed side, ...) to the patient			0.714	
	3) Creating a safe environment in terms of infection control			0.686	
	4) Monitoring fluid balance in a timely manner.			0.634	
	5) Providing privacy during nursing procedures			0.616	
	6) Ensuring all prescribed medicines are administered correctly.			0.508	
	7) Monitoring vital signs in a timely manner.			0.506	
Assessing nurses' teamwork % of variance = 12.49	1) Consistently working with other members of the care team as a coordinated team.				**0.673**
	2) If possible, the views of other members of the team uses in nursing care.				**0.660**
	3) Communicating important				**0.563**

	information to other healthcare team members in a timely manner.	
4)	Seeks assistance from other nurses and staff when warranted	**0.527**
5)	Reports safety incidents to appropriate personnel, based on the organization's policies and procedures	**0.517**

Table 7. The factors, their labels, number of items and percentage of explained variance

Factor	Label	Number of items	Percentage of explained variance
1	Evaluation of nursing skills	16	23.46%
2	Assessing the patient's psychological needs	4	13.81%
3	Assessing the patient's physical needs	7	13.78%
4	Assessing nurses' teamwork	5	12.49%

Table 8. Comparison of safe nursing care assessment instrument and three well-known instruments

Instrument	Focus	Items	Domains	Items similar to ASNC	Reliability	validity
Assessment of Safe Nursing Care (ASNC) (our instrument)	Nurses' performance	41 items	Nursing skills Physical needs Psychological needs team work Ethics		Cronbach's alpha 0.6 – 0.8	Face validity, Content validity, Exploratory factor analysis and Confirmatory factor analysis
Safety Attitudes Questionnaire (SAQ) (Sexton *et al.* 2006)	Employee's attitude	60 items	Teamwork climate Safety climate Perceptions of management Job satisfaction Work conditions Stress recognition	36, 35, 34, 33 3, 13	Cronbach's alpha 0.6 – 0.8	Content validity, Exploratory factor analysis and Confirmatory factor analysis
Patient Safety Climate Healthcare Organization (PSCHO) (Singer *et al.* 2007)	Assessment of patient safety culture	38 items	Senior managers' engagement Organizational resources Overall emphasis on safety Unit safety norms Unit recognition Support for safety Fear of shame Fear of blame Learning Provision of safe care	 25 10 38, 37 38, 37 9, 7	Cronbach's alpha 0.6 – 0.8	Content validity and Confirmatory factor analysis
Hospital Survey on Patient Safety (HSOPS) (Sorra & Dyer 2010)	Assessment of safety climate, attitude and practice	58 items	Communication openness Error feedback Frequency of reported events Handoffs & transitions Management support for patient safety Non-punitive responses to error Organizational learning—Continuous improvement Overall perceptions of patient safety Staffing Supervisor/manager expectations and actions promoting safety	36, 35, 34, 33 38, 37 38, 37 36, 35, 34, 33 38, 37 9,7 25 40, 39, 2	Cronbach's alpha 0.6 – 0.8	Content validity, Exploratory factor analysis and Confirmatory factor analysis

	Teamwork across units	
	Teamwork within units	36, 35, 34, 33

Table 9. Comparison of the ASNC domains with other instruments

Instrument/ domains (subdomains)	**Nursing skills:** **1) Measurement of the standard care routines** **2) direct and indirect assessment of nursing actions** **3) Evaluation of error reporting system**	**Physical needs**	**Psychological needs**	**teamwork**	**Ethics:** **1) Care in accordance with human values** **2) Self-control**
Safe nursing care assessment (ASNC) (Our instrument)	Yes Yes Yes	Yes	Yes	Yes	Yes Yes
Safety Attitudes Questionnaire (SAQ) (Sexton *et al.* 2006)	No No No	No	Yes(in domain of patient safety culture)	Yes(in domain of "work group climate")	No No
Patient Safety Climate Healthcare Organization (PSCHO) (Singer *et al.* 2003)	Yes (in domain of "Unit safety norms") No Yes(in domain of "Fear of the blame" and "Fear of shame")	Yes(in domain of "Overall emphasis on safety")	No	Yes(in domain of "organizational resources")	No No
Survey on Patient Safety (HSOPS) (Sorra & Dyer 2010)	No Yes(in domain of" Supervisor/manager expectations and actions promoting safety") Yes(in domain of "feedback & communication about error", "frequency of events reported" and "no punitive response to error")	Yes(in domain of an overall perceptions of patient safety)	No	Yes(in domain of "communication openness", "handoffs & transitions of patients' information between wards or from a shift to another shift", "teamwork across units" and "teamwork within units")	No No

Figure 1. A summary of the study method

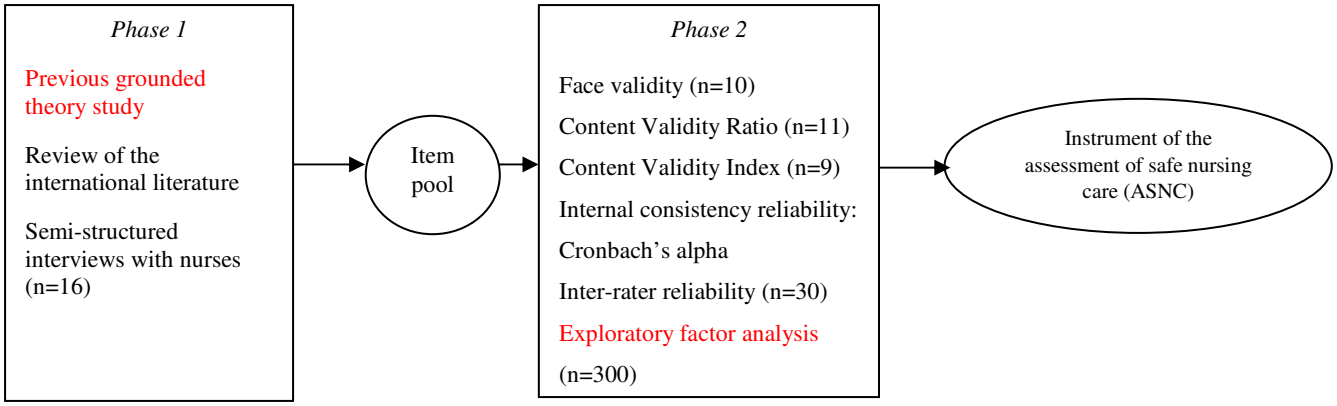
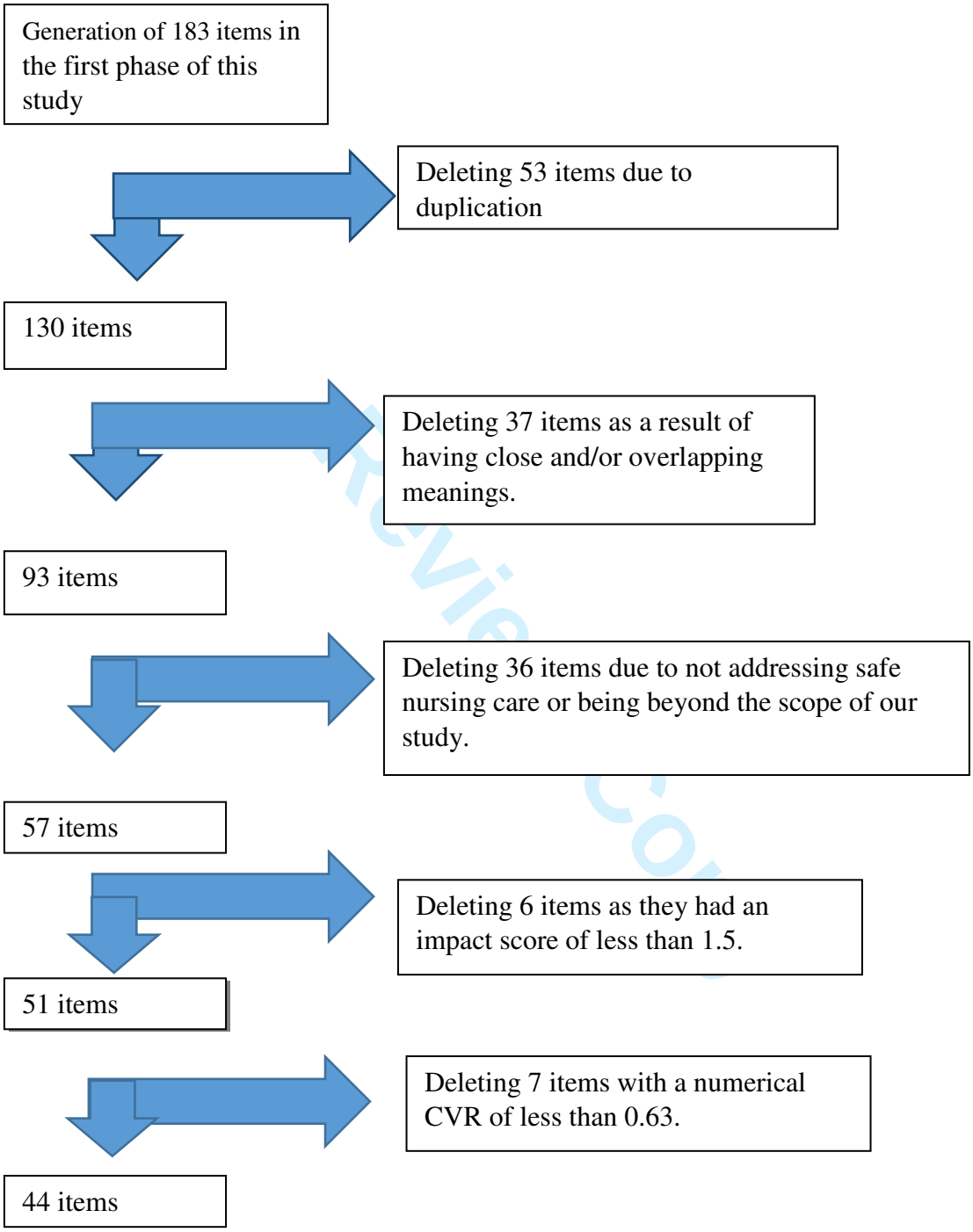


Figure 2: A summary of the instrument development and psychometric evaluation



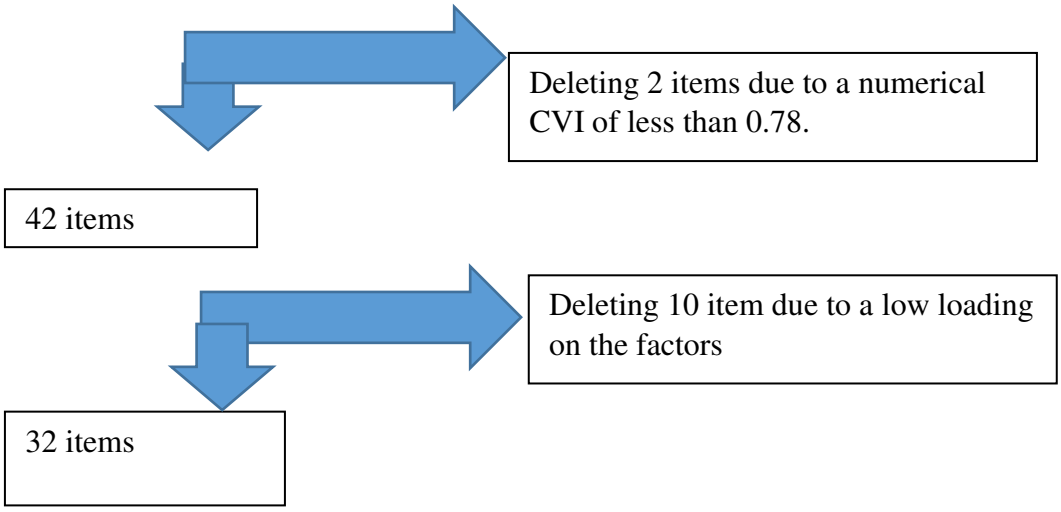

Deleting 2 items due to a numerical CVI of less than 0.78.
42 items
Deleting 10 item due to a low loading on the factors
32 items

Figure 3. Scree plot for the sample in this study (n=300)