

Designing and Psychometric Evaluation of Questionnaire of Influencing Factors of Nursing Students' Clinical Judgment: A Mixed Method Study in an Iranian Context

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Abstract

Background: Identification of the influencing factors of nursing students' clinical judgment (CJ) facilitates the achievement of this important educational outcome. However, no tool is so far designed to assess it in the field of clinical education in Iran.

Objectives: The current study aimed at designing sequential exploratory mixed method in 3 phases.

Methods: It was a mixed method study. The 1st phase included reviewing literature, analyzing the relevant studies in Iran, and a qualitative content analysis. In the 2nd phase, validity and reliability of the tool were investigated.

Results: In the study, after assessing the face, content, and construct validity, 4 factors and 38 items obtained. Content validity ratio (CVR) ranged from 0.45 to 1.00 and content validity index (CVI) ranged from 0.6 to 1.00. Internal consistency of the total scale was good with Cronbach's alpha coefficient 0.92, and intraclass correlation coefficient (ICC) was 0.95 that indicated good stability. In the construct validity by exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) index was higher than 0.90 and also the Bartlett test of sphericity was significant (P value < 0.001). Concerning the cumulative percent of the variance, the 4 factors determined 44.8% of the total variance.

Conclusions: The developed questionnaire in the current study was a suitable tool to assess the factors influencing the CJ of undergraduate nursing students.

Keywords: Evaluation, Nursing Students, Factors Influencing, Judgment, Questionnaire

1. Background

The mission of nursing education is to create mental and performance skills through effective integration of the theoretical knowledge with the practical experiences of nursing students to enable them access relative competencies for clinical decision-making. One of the most important purposes of the nursing education programs is to improve the complex mental processes such as clinical judgment (CJ). In fact, the CJ predisposes the context for decision-making and leads to problem-solving (1).

Developing CJ depends on several influencing factors such as the context and culture of the clinical environment (2, 3). Inattention to the influencing factors to develop judgment in clinical education, and ineffective CJ, result in undesirable outcomes such as inappropriate, expensive, and unsafe and low-quality clinical interventions that also lack ethical considerations (2). Yuan et al., believed that insufficient educational opportunities in the clinical environments are the affecting factors of CJ (4). Garb believed

that cognitive and social factors including client characteristics and context were the underlying factors of CJ in psychiatric practice (3). Safety strategies such as simulation and guided debriefing allow students to learn from their errors and apply those lessons to the live care setting (5). Nevertheless, in spite of the importance of CJ as one of the fundamental consequences of the ideal clinical education in the nursing students (6), nursing instructors often do not have access to the suitable tools to assess the influencing factors of CJ in nursing students.

It is certain that the existence of reliable and valid tools to investigate the current conditions and recognize the influential factors on the CJ in the clinical environments provide the required data in the field of the facilitating factors and obstacles of this process. Through using such tools, in addition to investigating and identifying the current barriers and facilities, the clinical nursing instructors may provide required facilities to form and develop this significant clinical process in nursing students by timely plan-

ning and interventions. However, despite the significance of tools to examine the CJ in nursing education, only a few studies are conducted in the field of CJ in Iran, and they are merely in the nursing field (7-11), and no tools or studies address the design of a tool to assess the influencing factors of CJ in the nursing students as well as nurses.

In other countries, regarding the use of simulation educational strategies, most studies addressed the effect of this educational strategy on the development of the CJ in nursing students (12, 13). In the context of Iran's nursing education, the students spend a lot of time in real clinical environments to achieve the clinical skills, and simulation is not usually used as a common strategy in the clinical education curriculum (14). As the design of this questionnaire was considered a priority in Iran's nursing education system, the current study designed and validated a tool to assess the influencing factors of CJ in nursing students.

2. Objectives

The current study aimed at designing and validating the influencing factors of nursing students' CJ.

3. Methods

The current mixed method study was conducted in 2 inductive and deductive phases. It was conducted through analyzing available data, review of literature, and a qualitative study. In the 2nd phase, the psychometric evaluation of the tool including the validity and reliability was examined.

3.1. Phase1: Development of the Influencing Factors of Nursing Students' CJ Questionnaire

3.1.1. Analysis of Data

The 1st step to develop the instrument was analyzing the grounded theory to study and explore the structure of nurses' CJ (9). The current study explained the influencing factors of nurses' CJ based on 11 primary categories: assessment, clinical reasoning, intuition, critical thinking, professional ethics, application of knowledge, applying experiences, using evidence, current conditions and context, organizational culture, and social context. These 11 domains were used as the main categories and as a basis of coding and the analyzing.

3.1.2. Review of the International Literature

The related instruments that assessed influencing factors of nursing students' CJ were reviewed by applying keywords such as psychometrics, nursing students, influencing factors, and CJ. The search was conducted in the following databases: CINAHL, Web of Science, Scopus, Science

Direct, and PubMed. Then, 56 items were extracted and placed in the 11 predetermined categories by a panel of experts.

3.1.3. Qualitative Content Analysis Study

A qualitative directed content analysis was conducted and the primary theory was validated and developed (15). In a purposive sampling, individual interviews were conducted with 7 2nd- to 4th-year undergraduate nursing students, 6 faculty members of nursing, and 4 clinical instructors. The informed consent was obtained from participants in terms of recording their voices. Data collection continued until data saturation was achieved. Coding and analyzing the texts were carried out based on the predetermined categories (16). This qualitative study identified 70 items. Generally, in the phase of development of the questionnaire, 146 items were found.

3.2. Second Phase: Validity and Reliability

3.2.1. Face Validity

A total of 10 nursing students were interviewed to determine the relevancy, ambiguity, and difficulty of the items. The difficulty in understanding the items, inaccuracy in the meanings, and coordination of the items with the dimensions of the questionnaire were determined.

3.2.2. Content Validity

At 1st, for content validity ratio (CVR) and determination of the necessity of each item, 11 experts were asked to answer the questions on a 3-option Likert scale: 1 = essential, 2 = useful but not essential, and 3 = unessential. Also, to determine the content validity index (CVI), the experts answered all items concerning the 3 criteria of clarity, relevancy, and simplicity on a 4- option Likert scale. The S-CVI/Ave of all items was calculated based on the average of content validity index scores. Polit and Beck considered the score of ≥ 0.9 as the condition of accepted S-CVI/Ave (17).

3.2.3. Reliability Assessment

The internal consistency was confirmed using the Cronbach's alpha coefficient. Furthermore, the stability of this questionnaire was obtained through test-retest method and intraclass correlation coefficient (ICC) test. Therefore, 13 students were asked to answer the questionnaire and 2 weeks later, they were asked to answer the same questions again.

3.2.4. Construct Validity

The construct validity was assessed by the exploratory and confirmatory factor analysis. Before starting the exploratory factor analysis (EFA), the Kaiser - Mayer - Olkin (KMO) was used to determine the sufficiency of the number of samples, and the Bartlett test was employed to assess the appropriateness of EFA method and to determine the correlation between the items (18). Scree plot determined the number of factors of the questionnaire. In addition, to clarify the construct of the factors, varimax rotation was used. Confirmatory factor analysis (CFA) by the semiparametric least squares (SLS) and weighted SLS estimation was conducted to assess goodness-of-fit of the extracted model.

3.2.5. Setting and Samples

The study population was the nursing students from 2 state nursing schools in Guilan University of Medical Sciences, Guilan, Iran (a university in the North of Iran), as well as a private nursing school in the Islamic Azad University, Rasht branch (a Northern city in Iran). The total number of students, according to the inclusion criteria was 400. Since the acceptable sample size was 5 to 10 samples for each of the items of the questionnaires (17), 400 questionnaires were distributed and the data were collected by census method. Finally, 370 completed questionnaires were returned over a 2-month period (from July to September 2016). The inclusion criterion in this part was 2nd- to 4th-year bachelor degree nursing students (3rd to 8th semester). There were no exclusion criteria.

3.2.6. Statistical Analysis

SPSS version 16.0 and the linear structural relations (LISREL) were employed for the statistical analyses. Descriptive statistics including frequencies, means, and standard deviations were used for both the item- and dimension-level analyses. For CVR calculation based on the modified Lawshe table (2014), the minimum acceptable was 0.63 (19). CVI was calculated and its minimum acceptable value was 0.79 (17, 20). The acceptable Cronbach's alpha coefficient and ICC values for the new instrument were ≥ 0.70 . In factor analysis, KMO ≥ 0.9 and a significant Bartlett test (≥ 0.05) were acceptable. The scree plot was used to determine the number of factors. In varimax rotation, factors loadings ≥ 0.3 were considered suitable. CFA was used to release model fit indices including Chi-square/df < 5 , root mean square error of approximation (RMSEA) with a cut off value of .08, comparative fit index (CFI), normed fit index (NFI), and incremental fit index (IFI) > 0.9 (21).

3.3. Ethical Considerations

The protocol of the current study was confirmed by the ethics committee of the Welfare and Rehabilitation Sciences University, Tehran, Iran, (code No: R.USWR.REC.1394.387). The oral consent of the subjects to participate in the study was obtained.

4. Results

A total of 74 codes and 20 related items were obtained from the analysis of the basic grounded theory in the current study (9). Out of the extracted review studies, 20 related tools were gathered and totally 56 items obtained from this part. Also, 70 items were achieved by the qualitative content analysis.

4.1. First Draft of the Questionnaire

At the end of the 1st phase of the study, a pool of 146 items was created. The research team assessed and reviewed the items in 3 phases. Accordingly, after integrating and eliminating the repeated cases, the questionnaire with 60 items entered the psychometric evaluation phase.

4.2. Face and Content Validity

In the face validity, 3 items were eliminated due to their irrelevancy and ambiguity and 57 items remained. In CVR, 12 items were removed (< 0.63). The CVR mean value (SCVI/Ave) was 0.93. In CVI, 2 items were eliminated and Kappa agreement coefficient was between 0.66 and 0.49. The impact score range for all of the items was ≥ 1.5 . Finally 43 items entered the construct validity stage.

4.3. Construct Validity

The majority of the participants were female (67.3%), single (88.6%) with the mean age of 22 ± 3.14 years (Table 1). In EFA, the KMO index was higher than 0.90, that indicated the adequacy of data for factor analysis; also, the Bartlett test of sphericity was significant (P value < 0.001). Scree plot indicated respectively 3 and 8 factors. As it caused repeated factor loading in a large number of items and labeling was difficult, after a few turns exploratory factor analysis and selection of the factors, finally four factors were selected as the most logical condition (Figure 1). Principal component analysis via varimax rotation was used (Table 2) and 5 items were eliminated due to lack of compatibility with the desired factor. Hence, the number of items became 38 (Figure 2). Furthermore, all indices obtained from the confirmatory factor analysis showed an acceptable strong goodness-of-fit for each factor and the model (Table 3). Path diagram of CFA of the questionnaire is shown in Figure 3.

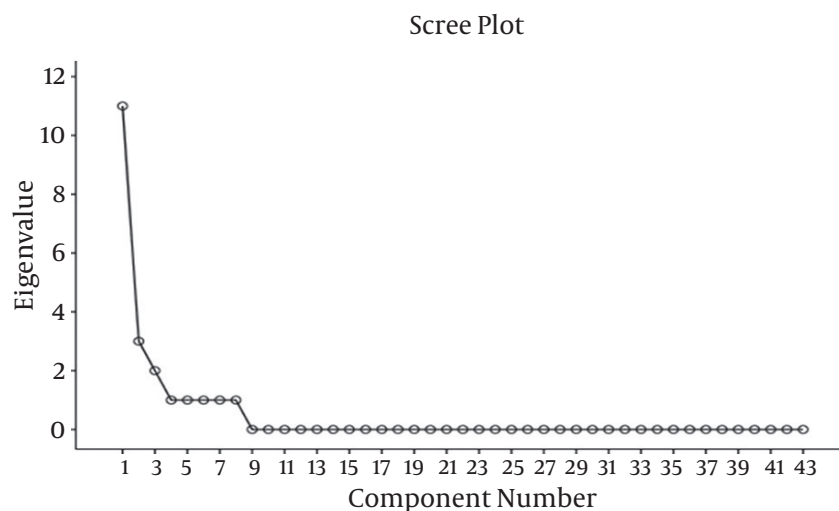


Figure 1. Scree Plot to Determine the Number of Constructing Factors of the Questionnaire

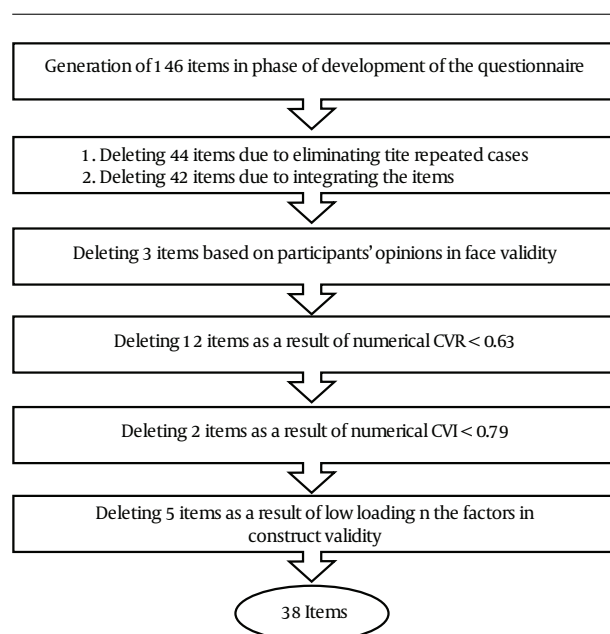


Figure 2. A Summary of the Instrument Development and Psychometric Evaluation

The means of dimensions of the questionnaire were thoughtful monitoring 66.67 ± 12.30 , informational and ethical facilitators 67.50 ± 16.87 , educational and environmental facilitators 59.62 ± 12.65 , collaborative care 41.67 ± 14.43 , and total score 62.50 ± 15.1 . The questionnaire was scored from 0 to 100. Furthermore, ceiling and floor effect of the instrument were determined by calculating the percentage of people who had the highest score of 100 and 0.

Table 1. Demographical Characteristics of the Study Participants (n = 370)

Variables	No (%)
Age (Mean \pmSD, 22.01 \pm 3.14)	
19 - 20	101 (27.3)
21 - 22	173 (46.7)
23 - 24	69 (18.6)
> 24	27 (7.3)
Gender	
Female	249 (67.3)
Male	121 (32.7)
Marriage	
Single	238 (88.6)
Married	42 (11.4)
Semester	
3 - 4	142 (38.4)
5 - 6	117 (31.6)
7 - 8	111 (30)
Nursing school	
Shahid Beheshti University of Medical Sciences, Nursing School	189 (51.1)
East Guilan Nursing School	105 (28.4)
Islamic Azad University, Rasht Branch Nursing School	76 (20.5)

None of the students scored at the floor or the ceiling of the questionnaire.

Table 2. Results of Exploratory Factor Analysis Using Rotated Component Matrix

Factors and Items (% of Cumulative Variance = 44.82)	Rotated Component Matrix			
	1	2	3	4
Thoughtful Monitoring (Factor 1) (Frequency of Variance = 13.22)				
1- By observing the medical symptoms of the patients, I can explain the changes, clinically.	0.64			
2- I can predict possible medical risks in patients by my personal experiences and knowledge.	0.63			
3- By interpreting the objective and subjective data, I can predict the possible risks in the patients.	0.63			
4- I participate in medical discussions to analyze and criticize patients' problems and judge their clinical condition.	0.61			
5- To find the best solution for the patients' problem, I evaluate all available solutions.	0.58			
6- During the internship period, I can identify and criticize the conflicts in the scientific and medical documents.	0.56			
7- To assess the patients with unstable status, I use continuous monitoring techniques.	0.56			
8- By increasing the medical experiences, I can do CJ under unexpected conditions.	0.55			
9- I trust my conscience as a guideline in my professional decision-making.	0.51			
10- To examine the health status of patients, I use assessing and diagnosing skills such as interviews and physical examinations (including observation, palpation, percussion, auscultation, etc.).	0.50			
11- To solve the medical issues, I consider all possible solutions.	0.49			
12- Since I entered the ward, I monitor patients under my supervision in terms of potential risks and medical changes.	0.46			
Informational and Ethical Facilitators (Factor 2) (Frequency of Variance = 12.74)				
1- During taking care of a patient, I consider his/her privacy.		0.78		
2- Before any examinations, I introduce myself to the patients and try to interact with them in a kindly manner.		0.72		
3- In the implementation of nursing processes and judging based on that, I use my experiences in addition to those of the others (teachers, nurses, and more experienced students).		0.65		
4- While I provide the required information to eliminate concerns in the patients, I consider all established measures by their confirmation.		0.64		
5- To diagnose patient's problem, I use different resources (records, the history of patients and families, datasheets, nurses, etc.)		0.63		
6- In order to prevent any pain or injury to the patients, I honestly report any clinical mistakes (errors) to my instructor.		0.63		
7- To answer the questions and participate in medical conferences, I use reliable scientific resources including books, researches, nursing care guidelines, etc.		0.54		
8- My medical experiences improve my CJ ability.		0.54		
9- If necessary, I use medical knowledge of teachers, nurses, and the other students.		0.50		
10- I just apply the experiences that are consistent with the scientific and educational principles in the nursing profession.		0.45		
Educational and Environmental Facilitators (Factor 3) (Frequency of Variance = 12.24)				
1- Teachers provide a desirable learning environment for criticizing and achieving the CJ by respecting and establishing efficient relationships.			0.71	
2- My teachers have up to date specialized knowledge and sufficient skills to deal with different situations in clinical education.			0.67	
3- My teachers are my patterns in CJ and decision-makings.			0.66	
4- I am inspired by the behaviors, organizational, and professional interactions and caring activities of nurses to perform efficient CJ			0.62	
5- In addition to their supports, the medical teachers give me the required independency and authority to make decisions.			0.61	
6- The nurses benefit from suitable communication and behavioral skills with the students.			0.58	
7- In internship training, there is sufficient opportunities and educational facilities for the medical discussions.			0.55	
8- The care routines of the hospital are consistent with the educational and professional purposes confirmed in the theoretical courses of nursing.			0.52	
9- At the internship training, if I cannot perform accurate CJ, I have the opportunity to study scientific resources.			0.50	
10- I am present in the process of shift delivery (at the beginning and end of the shifts) like a member of the clinical team			0.48	
11- I use the national guideline book of nursing care for decision-making in order to perform the nursing interventions.			0.47	
12- Based on the prerequisites of training courses, the theoretical courses are scheduled in such a way to help me in CJ.			0.45	
13- In the wards, I have enough access to the records of the patients.			0.40	
Collaborative Care (Factor 4) (Frequency of Variance = 6.61)				
1- Patients and their families respect me and let me to establish clinical measures and necessary follow-ups.				0.79
2- Patients and their families cooperate with me in decision-making and performing clinical measures.				0.76
3- When I introduce myself as a nursing student to the patients, they give me more authority.				0.61

Table 3. Results of Fit Index Confirmatory Factor Analysis of the Questionnaire (n = 370)

Statistical Index	X2	df	X2/df	NNFI	RMSEA (90% CI)	CFI	NFI	IFI
Goodness	1406.64	659	2.14	0.96	0.06	0.96	0.93	0.96

Abbreviations: CFI, Comparative Fit Index; IFI, Incremental Fit Index; NFI, Normed Fit Index; NNFI, Non-Normed Fit Index; RMSEA, Root Mean Square Error of Approximation; X2/df, Ratio Between X2 and Degrees of Freedom.

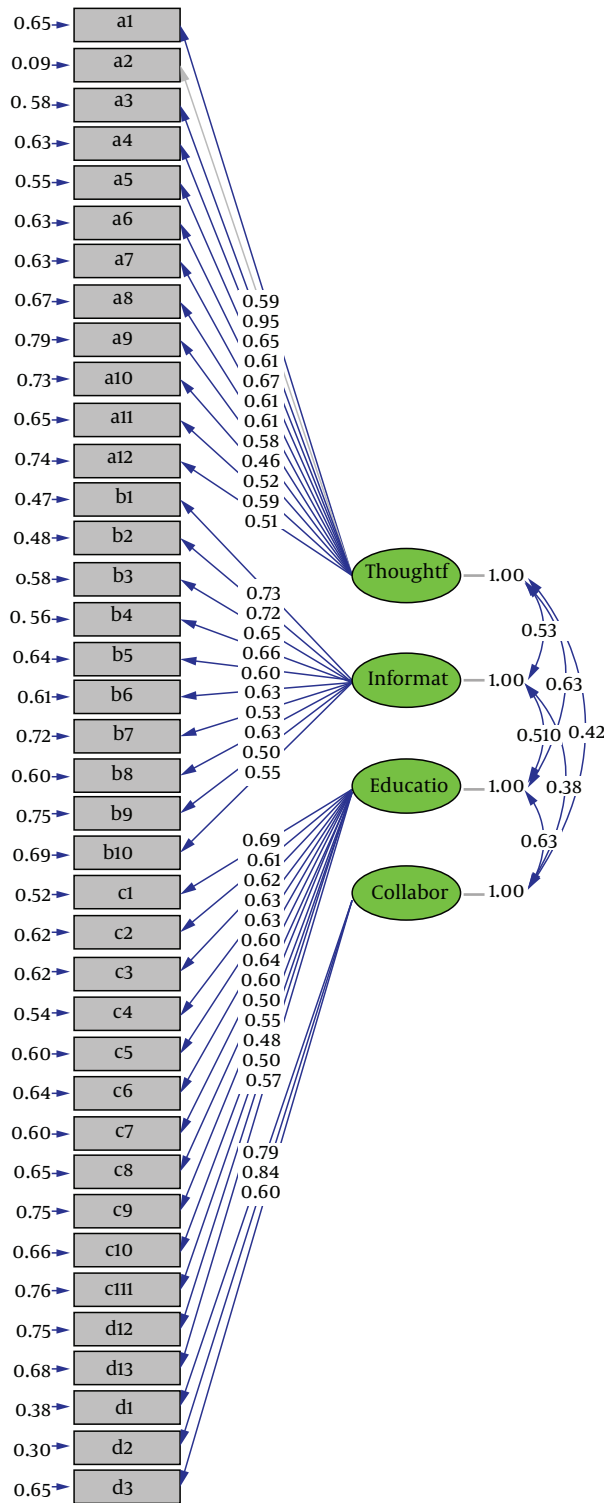


Figure 3. Path Diagram of Confirmatory Factor Analysis of the Questionnaire

4.4. Reliability

To assess the stability, the Cronbach's alpha was conducted before assessing the validity of the instrument. At first, for 49 participants it was 0.91 and in a good range. The value of Cronbach's Alpha of the instrument for 370 samples was 0.92. Before ICC test for the test-retest evaluation, Kolmogorov-Smirnov test was conducted and the results indicated the normal distribution of the data. ICC was 0.95 that indicated a good stability (Table 4).

5. Discussion

The findings of the current study confirmed the psychometric properties of the questionnaire and explained that the current tool can be used to assess the factors influencing nursing students' CJ.

In the current study, CVR was used to examine the necessity of items and CVI was employed to supply the simplicity and clarity of items and consequently, 22 items were eliminated or integrated, respectively. Polit and Beck considered the score ≥ 0.79 as the accepted condition of CVI (17).

The construct validity results of the questionnaire and EFA in the Bartlett test indicated the relationship between the variables. High KMO value confirmed the high quality of factor analysis for the construct validity of the questionnaire. The internal consistency indicated that the items or dimensions of the questionnaire measured similar variables. The ICC indicated a good value (≥ 0.4) (22). The Cronbach's alpha was reported 0.92. It was consistent with those of the studies on validating by the Lasater CJ Rubric in Korea, and Shin et al., that reported the reliability of the tool 0.91 (23). As there was no questionnaire on the influencing factors of CJ in nursing students or nursing, in the discussion section the instruments that were closer to the concept were used.

The 1st factor, thoughtful monitoring, included 12 items. The highest factor load (0.64) belonged to the item "By observing the clinical symptoms of the patients, I can explain the reasons for change in their clinical status", and the least factor load (0.46) was related to the item of "From the time I enter the ward, I assess the patient under my supervision in terms of possible risks and clinical changes". These results were consistent with those of the other studies in which focus on observation, patients' monitoring, and continuous assessment were introduced as thoughtful influencing factors to initiate the phase of nursing students' CJ process (13).

The 2nd factor of this questionnaire was "informational and ethical facilitators" with 10 items. The factor loads ranged from 0.45 to 0.78. The current study results

Table 4. Intraclass Correlation Coefficient, Cronbach's Alpha Values, Means, and Standard Deviations of four Factors^a

Dimensions	Number of Items	Mean \pm SD	Cronbach's α Coefficient	ICC (95% CI) (N = 13)	CI = %95		Level of Significance
					Upper	Lower	
Thoughtful monitoring	12	36.72 \pm 5.34	$\alpha = 0.86$	0.931	0.972	0.834	< 001
Informational and ethical facilitators	10	34.70 \pm 4.08	$\alpha = 0.86$	0.926	0.970	0.825	< 001
Educational and environmental facilitators	13	34.38 \pm 7.81	$\alpha = 0.87$	0.880	0.950	0.727	< 001
Collaborative care	3	7.50 \pm 2.43	$\alpha = 0.87$	0.838	0.939	0.642	< 001
Total	38	113.30 \pm 14.61	$\alpha = 0.92$	0.948	0.874	0.979	< 001

Abbreviations: CI, Confidence Interval; ICC, Intraclass Correlation Coefficient.

^aData are expressed as mea \pm standard deviation (SD).

concluded with those of the Tanner CJ model that considered some cases as the essential measures before the first phase of CJ including the objective and subjective data related to the status of patients. In addition, Tanner introduced paying attention to the ethics and values of the patients in certain conditions as the essential measures of nurse for an efficient CJ (2).

The 3rd factor of this questionnaire was "the educational and environmental facilitators" with 13 items, and the factor loads ranged from 0.40 to 0.71. The results of some other studies indicated that clinical settings and educational fields do not develop without sufficient facilities (7, 24). However, it seems that due to variability and complexity, the real clinical education environment is not often suitable to establish CJ in students and nursing instructors that have a basic role in the creation of these facilities.

The 4th factor was called "collaborative care". This factor included 3 items. Its highest factor load in the rotated component matrix was 0.79 and its least one was 0.61. This result was consistent with those of Ashley and Stamp that believed the most important influencing factors of CJ in nursing is establishing appropriate communication within the healthcare team and relationship with the patient in caring decision making (12). It seems that to make an appropriate CJ, the 1st condition is to understand the patients' needs and confide in them to perform clinical measures and continuously monitor them. Therefore, collaborative care can be the 1st step to create CJ.

5.1. Strengths and Limitations

The limitations of the current study were the absence of similar tools in Iran and other countries, and also lack of related studies in Iran. As authors did not find any similar tools in Iran and other countries, the researchers made questionnaire is a new tool and the 1st one to assess the factors influencing CJ in nursing students. Therefore, it is sug-

gested to conduct further studies on CJ and the strategies to develop it in nurses and nursing students.

5.2. Conclusion

The current study was conducted to design and validate a tool to assess the influencing factors of nursing students' CJ, and the obtained results indicated that this questionnaire had acceptable validity and reliability. Through such a questionnaire, policy makers of nursing education in educational centers and universities are able to identify the current conditions in clinical environments and can provide the required context to develop the CJ and improve the clinical education.

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Footnotes

Authors' Contribution: Moluk Pouralizadeh, study design, writing the proposal, collection and analysis of data, and writing the final version of the manuscript; Hamid Reza Khankeh and Abbas Ebadi, study design, supervising qualitative analysis, critical revision of the manuscript for important content and the final version of the manuscript; Asghar Dalvandi, supervising the statistical and qualitative analyses and critical revision of the manuscript.

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