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Translation, Cultural Adaptation, and Psychometric Validation of the Persian Version of the Clinical Reasoning Competency Scale (CRCS) for Nurses in Iran

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Abstract

Background & Objectives: Evaluating nurses' clinical reasoning skills is essential for identifying areas in need of enhancement in professional competency and for informing targeted educational interventions. Accordingly, the present study aimed to translate and rigorously evaluate the psychometric properties of the Persian version of the Clinical Reasoning Competency Scale (CRCS).

Materials & Methods: A cross-sectional and multicenter design was employed in this methodological study. A total of 1100 nurses were recruited through convenience sampling from seven hospitals in Iran. Following the translation of the original CRCS into Persian, psychometric properties were systematically assessed in accordance with the COSMIN guidelines.

Results: Exploratory factor analysis revealed that the factor loadings for all 22 items ranged from 0.62 to 0.88, with each loading achieving statistical significance. Moreover, the analysis identified three principal factors including plan setting, intervention strategy regulation, and self-instruction which collectively accounted for 60.52% of the total variance. The analysis yielded an overall Cronbach's alpha of 0.89, demonstrating CRCS possesses strong internal consistency. At the subscale level, the Cronbach's alpha coefficients were notably robust: 0.97 for plan setting, 0.96 for intervention strategy regulation and 0.94 for self-instruction

Conclusion: The Persian version of CRCS has been validated as a reliable and well-founded tool. Consequently, it represents a valuable instrument for nurse managers seeking to assess clinical reasoning competency, thereby facilitating the identification of developmental needs and guiding the implementation of targeted interventions to enhance clinical reasoning and overall professional performance.

Keywords: Clinical reasoning competency, Psychometric validation, Persian version

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Introduction

Nursing is a cornerstone discipline in the context of medical sciences, encompassing a comprehensive range of responsibilities that extends beyond direct patient care to include health promotion, patient and family empowerment, life-sustaining interventions,

and the preservation of overall well-being (1). In today's increasingly complex and dynamic healthcare environment, nurses must possess sophisticated clinical reasoning skills to address emerging challenges and optimize patient outcomes (2). Clinical reasoning is widely recognized by medical education scholars as an essential component of professional competency, particularly in nursing and medicine (3). Moreover, robust clinical reasoning capabilities enable nurses to successfully navigate the complexities of clinical practice and effectively manage patient care challenges (4).

As a cognitive process, clinical reasoning underpins clinical judgment, decision-making, nursing care quality, and professional competency. It provides a systematic framework for information gathering, patient assessment, intervention planning and implementation, and continuous evaluation through reflective learning (5,6). Research has demonstrated that deficiencies in clinical reasoning among nurses can lead to inadequate illness severity assessment and poor intervention prioritization (7-9). Conversely, well-developed clinical reasoning skills significantly enhance the quality of patient care and improve clinical outcomes (10).

The effective evaluation of clinical reasoning among nurses requires assessment instruments to demonstrate both strong psychometric properties and cultural appropriateness for the target population. Validated instruments are crucial not only for accurate competency assessment but also for addressing ethical considerations in both clinical practice and research contexts (11). In response to this need, Bae et al. (2023) developed and validated the Clinical Reasoning Competency Scale (CRCS), a 22-item instrument comprising three subscales: plan setting (eight items), intervention strategy regulation (11 items), and self-instruction (three items) (12).

Considering these, the accurate assessment of nurses' clinical reasoning competencies facilitates the identification of developmental needs, guides improvements in educational programs, and ensures the delivery of high-quality care. Given the profound influence of clinical reasoning on nursing practice and the current lack of a specialized assessment tool for Iranian nurses, this study sought to translate the CRCS into Persian version and evaluate its psychometric properties.

Materials and Methods

Research Design

This cross-sectional descriptive study was conducted from July 2023 to February 2024 to translate and evaluate the psychometric properties of the Persian version of the CRCS. The study population comprised practicing nurses from seven hospitals in Fars Province, southern Iran.

Sample Size

In accordance with established methodological guidelines for exploratory factor analysis, recommend between three and ten participants per scale item (13), the research team adopted a conservative approach by selecting 50 participants per item to enhance the robustness of the findings. Through convenience sampling, a total of 1,100 nurses were recruited from the participating hospitals for the exploratory factor analysis.

Inclusion and Exclusion Criteria

Study participation was contingent upon meeting the following criteria: voluntary participation, Farsi language proficiency (native or fluent), absence of diagnosed or self-reported mental health conditions, a minimum of one year of professional nursing experience, and completion of informed consent documentation. Participants were excluded if they failed to complete more than 50% of the questionnaire items or withdrew from the study.

The Clinical Reasoning Competency Scale

The CRCS, originally developed and validated by Bae et al. (2023), consists of 22 items distributed across three primary subscales: plan setting (eight items), intervention strategy

regulation (11 items), and self-instruction (three items). Each item is evaluated on a 5-point Likert scale ranging from 1 ("Completely disagree") to 5 ("Completely agree"). The instrument has demonstrated robust psychometric properties, with a Cronbach's alpha coefficient of 0.92 indicating strong internal consistency. Test-retest reliability has been established with a correlation coefficient of $r = 0.76$ ($p < 0.001$), and item-total correlations have ranged from 0.44 to 0.624 (12).

Phase 1: Translation of CRCS

The translation process adhered to the World Health Organization (WHO) standard guidelines for forward-backward translation (14). The initial phase involved independent forward translations of the original CRCS from English to Farsi by two bilingual translators with expertise in nursing and clinical reasoning. These translations underwent review and refinement by an expert panel comprising specialists in nursing, education, and English language studies. Subsequently, two native English speakers fluent in Farsi, who were unfamiliar with the original instrument, independently performed back-translations into English. The back-translated version was submitted to the original developers for verification. To ensure cultural appropriateness and linguistic clarity, a pilot study involving 50 nurses was conducted, enabling the identification and resolution of potential ambiguities before finalizing the Persian version.

Phase 2: psychometric analysis of CRCS

Following the translation process, the psychometric properties of the Persian CRCS underwent rigorous examination, with particular emphasis on content validity, reliability (internal consistency and stability), and construct validity (exploratory factor analysis). This comprehensive evaluation adhered to the COSMIN (COnsensus-based Standards for the selection of health Measurement Instruments) criteria (15).

Face Validity

Qualitative Face Validity

The qualitative assessment involved in-depth, face-to-face interviews with 15 experts specializing in nursing and instrument development. These discussions focused on evaluating the clarity, comprehensibility, and relevance of the CRCS items to ensure their appropriateness for the target population.

Quantitative Face Validity

For the quantitative evaluation, panel members rated each item's significance using a 5-point Likert scale (ranging from 1 = "Not important at all" to 5 = "Very important"). The impact score was subsequently calculated for each item, with those exceeding 1.5 being retained in the final version (16).

Content Validity

Qualitative Content Validity

The qualitative content validation process engaged 30 experts, comprising 15 specialists in nursing and instrument development (10 with doctoral degrees and five with master's degrees) and 15 practicing nurses. These experts conducted a comprehensive assessment of the scale items, examining their wording, syntactical structure, clarity, and cultural appropriateness within the Iranian nursing context.

Quantitative Content Validity

The quantitative content validation involved expert assessment of each item's usefulness and necessity using a 3-point Likert scale (from "Not necessary" = 1 to "Necessary" = 3). Subsequently, thirty participants evaluated the revised CRCS version, rating each item's relevance on a 4-point Likert scale ranging from "Irrelevant" (1) to "Completely relevant" (4) (17). The content validity index (CVI) was calculated for individual items and the overall scale. In this study, a content validity ratio (CVR) greater than 0.33 and CVIs exceeding 0.8 were considered acceptable (18).

Construct Validity (Exploratory Factor Analysis)

The study employed Exploratory Factor Analysis (EFA) with Varimax rotation to assess whether the instrument effectively measured its

intended construct. The optimal factor structure required eigenvalues greater than 1 and factor loadings of at least 0.4. Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) test, which required a value exceeding 0.7, while Bartlett's test confirmed the appropriateness of factor analysis ($p < 0.05$). The construct validity evaluation included 1,100 nurses, maintaining a ratio of 50 participants per item. All items demonstrated factor loadings above the minimum threshold of 0.4, and consequently, no items were eliminated from the scale (19).

Reliability

The reliability assessment of CRCS encompassed both internal consistency and stability measures. Internal consistency was evaluated using Cronbach's alpha coefficient, calculated from a sample of 200 participants, with values exceeding the established threshold of 0.7, demonstrating high reliability. Stability was assessed through test-retest analysis, wherein the scale was administered to 200 nurses at two time points separated by a two-week interval. The Intra-class Correlation Coefficient (ICC) exceeded 0.80, indicating robust temporal stability of the instrument (20).

Results

The study sample comprised 1,100 nurses, with female participants constituting the majority (63%). Participant ages ranged from 22 to 53 years, with a mean age of 35.66 years (SD = 6.21). The mean duration of professional nursing experience was 11.46 years (SD=6.22). Comprehensive demographic characteristics are presented in Table 1.

Face validity

The face validity assessment, conducted by practicing nurses and experts in nursing and instrument development, yielded unanimous agreement regarding the clarity, comprehensibility, and relevance of all items to the study objectives. All items achieved impact scores above 1.5, substantiating their significance and justifying their inclusion in the final scale version.

Content Validity

The quantitative content validity assessment involved expert evaluation of item necessity and relevance using a 3-point Likert scale (1 = "Not necessary" to 3 = "Necessary"). Subsequently, 30 participants evaluated the revised CRCS using a 4-point Likert scale (1 = "Irrelevant" to 4 = "Completely relevant").

Table 1. Frequency distribution of demographic characteristics (n=1100)

Variable		Number	Rate (%)
Gender	Male	413	37.55
	Female	687	62.45
Education Level	Bachelor's degree in nursing	1025	93.18
	Master degree in Nursing	60	5.45
	PhD degree in Nursing	15	1.36
Ward	Surgical	60	5.45
	Internal	152	13.81
	ICU	131	11.90
	CCU	94	8.54
	Neurology	83	7.54
	Emergency	227	20.63
	Infection	99	9
	Pediatric / NICU	81	7.36
	Dialysis	55	5
	Post -CCU	30	2.72
	Psychology	28	2.54
	Oncology	60	5.60

ICU: Intensive Care Unit, CCU: Coronary Care Unit, NICU: Neonatal Intensive Care Unit

Content validity indices were calculated for individual items and the overall scale, with Content Validity Ratio (CVR) values exceeding 0.33 and CVI values surpassing 0.8, meeting the predetermined acceptability criteria (17, 18).

Construct Validity

The exploratory factor analysis commenced with the KMO measure of sampling adequacy, yielding a value of 0.91, which confirmed the sample's suitability for factor analysis.

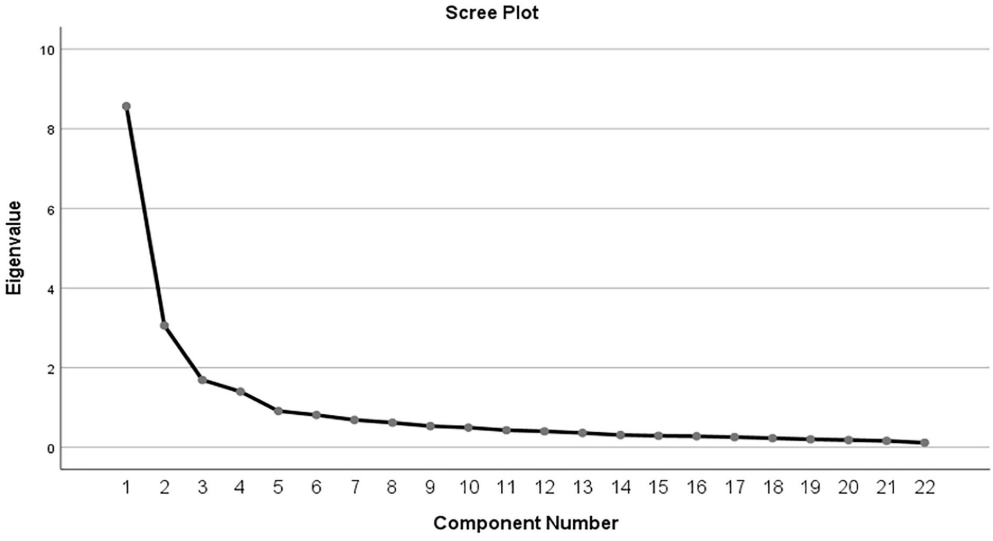


Figure 1. Scree plot of exploratory factor analysis for Persian version of CRCS

Table 2. Varimax factor loadings of the items of the instrument (n =1100)

Factors' names	Item	Factor loading
Component 1: Plan Setting	Identify the other method other to solve the patient's problem.	0.86
	Reflect the anything wrong with the plan before intervention.	0.89
	Repeatedly reflect the process of solving the patient's problem	0.77
	A different perspective on patient's health problems	0.68
	Identify a better way to solve the problem even after solving the patient's problem.	0.72
	Compare the results of the patient's problem solving with the target level.	0.70
	Provide integrative interventions considering the patient and situation (e.g., family and environment).	0.70
	Evaluate the nursing intervention.	0.74
	A process of sufficient deliberation for interventions.	0.71
	Collect additional data to close the gap between the information.	0.81
	Continuously check the missing parts in solving the patient's problem	0.73
Component 2: Intervention Strategy Regulation	Relate the knowledge to the information	0.77
	Prioritize problem solving strategies.	0.81
	Discover important problems based on the data	0.69
	Distinguish the importance of the data.	0.68
	Comprehensively grasp the relationship between the patient data.	0.71
	Understand the overall patient situation.	0.89
	Analyze the cause of an error during nursing care.	0.69
	Find any problems in the care and correct them immediately.	0.67
Component 3: Self-Instruction	Look for answers to questions don't know on my own.	0.94
	Invest extra time to encounter problems to acquire don't know about the field of work.	0.69
	Interested in acquiring new information related to the field of work.	0.92

All items demonstrated factor loadings of 0.4 or higher, warranting their retention in the scale (19). The analysis revealed three distinct factors: plan setting (items 1-11), intervention strategy regulation (items 12-19), and self-instruction (items 20-22), collectively accounting for 60.52% of the total variance (χ^2 = 7981.274; P < 0.001). The three-factor structure was further supported by the scree plot illustrated in Figure 1. Individual item factor loadings ranged from 0.67 to 0.94, as detailed in Table 2.

Reliability

To assess the internal consistency of the instrument, Cronbach's alpha coefficients were calculated for each factor (subscale) and for the overall instrument using a sample of 200 participants. Cronbach's alpha values exceeding 0.7 were deemed acceptable (20). The analysis yielded an overall Cronbach's alpha of 0.89, demonstrating that the CRCS possesses strong internal reliability. At the subscale level, the Cronbach's alpha coefficients were notably robust: 0.97 for plan setting, 0.96 for intervention strategy regulation, and 0.94 for self-instruction (Table 3).

To evaluate the scale's temporal stability, a test-retest reliability analysis was conducted, revealing an intra-class correlation coefficient (ICC) of 0.92 for the complete scale (p < 0.05). The subscale-specific ICC values further confirmed the instrument's stability, with coefficients of 0.92 for plan setting, 0.95 for intervention strategy regulation, and 0.85 for self-instruction (Table 4).

The finalized version of the Clinical Reasoning Competency Scale consists of 22 items, with responses recorded on a 5-point Likert scale ranging from "Never" (1 point) to "Always" (5 points). The instrument yields a total score ranging from 22 to 110, with performance categories established as follows: scores of 22-55 indicate poor competency, 56-80 reflect average competency, and 81-110 demonstrate satisfactory competency.

Discussion

The present study aimed to translate the Clinical Reasoning Competency Scale (CRCS) into Persian and evaluate its psychometric properties among clinical nurses in Iran. It should be emphasized that the range of specialized, high-quality instruments currently available to systematically assess nurses' competence in clinical reasoning remains rather limited. Nonetheless, the literature identifies three notable tools that have been employed in empirical investigations to gauge this competence, each of which merits detailed and systematic consideration.

The findings provide compelling evidence that the Persian version of CRCS demonstrates robust validity and reliability, comparable to the original instrument. The face validity assessment

Table 3. Cronbach's alpha of subscales and the entire the Persian version CRCS

Factors	Subscale	Items	Cronbach's alpha
1	Plan Setting	11	0.97
2	Intervention Strategy Regulation	8	0.96
3	Self-Instruction	3	0.94
Entire Questionnaire		22	0.96

Table 4. Intra-class correlation coefficient (ICC) values for the domains of the Persian of CRCS

Factor	Dimensions	Mean ±SD	ICC	Confidence Interval	p-value
1	Plan Setting	39.96±6.66	0.92	0.90– 0.97	p<0.05
2	Intervention Strategy Regulation	27.56±5.33	0.95	0.92- 0.99	p<0.05
3	Self-Instruction	9.54±9.15	0.85	0.82 -0.89	p<0.05
Entire Questionnaire (Total)		77.17±11.30	0.92	0.90 - 0.96	p<0.05

revealed that all 22 items achieved impact scores exceeding 1.5, providing strong justification for retaining the complete item set. The content validity analysis yielded Content Validity Ratio (CVR) values ranging from 0.79 to 1, indicating satisfactory content validity (17). Additionally, the instrument demonstrated Item-CVI (I-CVI) values between 0.89 and 1, with the Scale-CVI (S-CVI) achieving a noteworthy average of 0.97 (18). These results compare favorably with the original scale, for which Bae et al. (2023) reported an acceptable CVR of 0.76 (12).

The construct validity of the instrument was further corroborated through exploratory factor analysis, which revealed a three-factor structure accounting for 60.52% of the total variance. exploratory validity phase, the questionnaire structure was found to consist of three dimensions: "plan setting" (11 items), "intervention strategy regulation" (8 items), and "self-instruction" (3 items). The factor loadings, ranging from 0.67 to 0.94, provided strong evidence for the structural adequacy of the instrument. These findings align well with those reported by Bae et al. for the Korean version of CRCS, which similarly yielded three subscales explaining 52.62% of the variance, with factor loadings between 0.57 and 0.88 (12). The instrument also demonstrated excellent reliability metrics, with Cronbach's alpha coefficients ranging from 0.94 to 0.97 for the three subscales and an overall alpha of 0.96 for the complete instrument. The temporal stability of the scale was confirmed by an intra-class correlation coefficient (ICC) of 0.92 for the entire instrument (20). By comparison, the Chinese version of CRCS exhibited somewhat lower but still acceptable reliability, with subscale Cronbach's alpha values between 0.73 and 0.89 and an overall alpha of 0.92. One of the most widely adopted measures in this context is the *Italian Nurses Clinical Reasoning Scale*, a standardized assessment commonly utilized to evaluate clinical reasoning among practicing nurses. It was in a 2023 study conducted in Italy by Notarnicola and colleagues that this scale was applied to appraise three key dimensions: nursing problems related to health, nursing information concerning health, and nursing assessments of health. Evidence supports its robust face validity, sound structural design, and reliability (21). While this instrument is broadly recognized as an effective means of assessing clinical reasoning within both educational and research frameworks, it is important to note that its conceptual foundation lies explicitly in the Levett-Jones theoretical model of clinical reasoning. What distinguishes it from other available measures is not only its higher level of complexity but also the greater cognitive demands it imposes on respondents, making it particularly challenging and, therefore, more discriminating. Another noteworthy instrument is the *Clinical Reasoning Evaluation Simulation Tool (CREST)*, which serves as a pivotal resource for appraising clinical reasoning skills among nursing students. CREST is structured around a ten-item model of clinical reasoning and has demonstrated strong content, construct, and convergent validity. Its internal consistency is particularly high, with a Cronbach's alpha coefficient of 0.92, which confirms its reliability for measuring how simulation-based learning influences both diagnostic reasoning and response-related decision-making (22). It is not merely in academic environments that CREST proves valuable, but also in any context where the structured evaluation of reasoning is critical. Nevertheless, it must be acknowledged that clinical immersion, particularly in high-acuity settings such as critical care, plays a decisive role in sharpening nurses' diagnostic acumen and practical expertise. It is for this reason that there remains an urgent and continuing need to both evaluate and enhance the clinical reasoning competence of critical care nurses through rigorous psychometric validation. A third prominent example is the *Clinical Reasoning Scale among Nursing Students*,

developed and validated in Taiwan by Huang et al. in 2023. This concise instrument comprises 16 items, each rated on a four-point Likert scale. Its content validity index ranges from 0.85 to 1.0, and confirmatory factor analysis results indicate an excellent model fit. Furthermore, the scale exhibits satisfactory internal consistency, with Cronbach's alpha values between 0.78 and 0.89 (23). It is its brevity, clarity, and straightforward administration that make this scale especially practical for evaluating nursing students' reasoning and broader clinical performance. Nevertheless, further tool development and psychometric refinement remain necessary to produce context-specific measures capable of accurately capturing the nuanced reasoning competencies of nurses, particularly those employed in critical care environments.

Implications in Nursing Clinical Practice and Education

Nurses need clinical reasoning competence to provide safe and quality care, especially in complex and life-threatening situations, to make accurate and precise clinical decision making. Without clinical reasoning skills, nurses may make errors in clinical decision-making and provide safe care, and ultimately, patient safety may be compromised. Based on the results of the present study, important components of clinical reasoning competence in nurses were explained. Therefore, nurse managers can use the results of this study to assess clinical reasoning competence in nurses in the clinical environment and, if necessary, implement the necessary planning to improve clinical reasoning competence and critical thinking in nurses. It is also recommended that nursing professors in nursing schools pay special attention to clinical reasoning competence in the curriculum for nursing students so that nursing students in the clinical environment can provide safe care to patients by using clinical reasoning skills and subsequently correct clinical decisions making.

Limitations

Several limitations of the present study warrant consideration. First, the translation and psychometric evaluation of the CRCS were confined to the Iranian context, necessitating replication studies in diverse cultural settings to establish broader generalizability. Second, while the study focused exclusively on practicing nurses, future research would benefit from including nursing students to provide a more comprehensive assessment of the instrument's utility across different stages of professional development. Third, the absence of confirmatory factor analysis in the current investigation represents a methodological limitation that should be addressed in subsequent validation studies.

Conclusion

The findings of this study provide strong evidence for the reliability and validity of the Persian version of the Clinical Reasoning Competency Scale (CRCS). This validated instrument offers nurse managers a valuable tool for assessing clinical reasoning competency among nursing staff, thereby enabling the identification of specific areas requiring development and facilitating the implementation of targeted interventions to enhance professional competence.

Data Analysis

Statistical analysis incorporated both descriptive and inferential methods, with data processing conducted using SPSS software (version 25). The analytical procedures included factor analysis with rotation, correlation analysis, and Cronbach's alpha calculations. A significance level of 0.05 was established for all statistical tests.

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Conflict of Interest

The authors declare that they have no competing interests

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Ethical Considerations

This study adhered to the ethical principles outlined in the revised Declaration of Helsinki governing research involving human subjects. All participants provided informed consent after receiving comprehensive information about the study's purpose, the confidentiality of their personal information, and their right to withdraw from the study at any time without consequences. Rigorous measures were implemented to ensure participant anonymity and data confidentiality throughout the research process. The study protocol received formal approval from the Research Ethics Committees of Fasa University of Medical Sciences, Fars, Iran.

Code of Ethics

IR.FUMS.REC.1402.059

Abbreviations

CRCS: Clinical Reasoning Competency Scale
COSMIN: Consensus-based Standards for the selection of health Measurement Instruments
CVI: content validity index
CVR: content validity ratio
ICU: Intensive Care Unit
CCU: Coronary Care Unit
NICU: Neonatal Intensive Care Unit
KMO: Kaiser-Meyer-Olkin

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