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A clinical reasoning skills development plan for coronary care nurse: an action research



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Abstract

Background Clinical reasoning (CR) skills are among the most important nursing competencies for providing safe and effective care in critical care units. Development of CR skills in nursing needs a well-designed interactive process for change to effectively support clinical competence promotion. The aim of this study was to develop CR skills among coronary care nurses through an action plan.

Methods This participatory action research study was conducted in 2021 based on the framework of Hart and Bond (1995). Study setting was the coronary care unit of a leading heart center in Rasht, Iran. An action plan was designed and implemented with three main components, namely efficiency of nursing education, effective nursing management, and personal professional development. The results of the plan were provided to participants and strategies for improving the plan were determined. Quantitative outcome assessment was performed using the Nurses' Clinical Reasoning Skills Checklist and the Nurses' Clinical Reasoning Scale and data were analyzed through the Wilcoxon's test. Qualitative outcome assessment was performed through focus group discussions and data were analyzed through conventional content analysis.

Results The mean scores of CR skills significantly increased after the action plan and participants were satisfied with the plan. The four main categories of the outcomes of the plan were improvement of the thinking process, improvement of professional commitment, improvement of professional competence, and improvement of interprofessional communications. The challenges of the plan were limited efficiency of educational courses on the nursing process, incoherence in nursing documentation, mentors' inadequate supervision and instructions, and mentors' role pressure.

Conclusions The CR skills action plan can improve coronary care nurses' CR skills and their competency in making sound clinical decisions and providing safe and quality care services.

Keywords Clinical reasoning, Nurse, Coronary care unit, Action research

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Background

Coronary care unit (CCU) is a key unit in hospitals for critical coronary care delivery to patients with unpredictable and complex conditions. Nurses in CCU face patients with rapidly changing health conditions. Patient conditions in this unit may improve or may rapidly be aggravated [1]. Therefore, CCU nurses need to rapidly and accurately assess their patients' conditions and make prompt and sound participatory clinical decisions based on the available data. Sound clinical decision making in turn depends on sound clinical reasoning (CR) [2].

CR in nursing is "a holistic and recursive cognitive process that has a dynamic and flexible nature to perceive the patient's condition, select the best practice to respond to the situation, and learn from the situation" [3]. According to the Hoffman's model, CR has a set of various skills that help nurses carefully assess and analyze patient situation, establish nursing diagnoses, determine the best actions, and evaluate outcomes in order to improve patient health [4]. Acquisition of CR skills is a key step in professional competence development in nursing. CCU nurses with good CR skills can accurately assess, analyze, and interpret patient situation, establish better diagnoses, access better care options, provide quality care, and improve patient outcomes [2].

Despite the importance of CR skills to patient outcomes and its significant effects on nurses' professional practice in critical conditions, Informal observations of main researcher shows that nurses do not have adequate CR skills for safe and quality care delivery. Implementation of CR skills development in Iran is associated with personal, educational, professional, and interprofessional barriers [5]. Therefore, appropriate strategies are needed to develop CR skills among nurses [1]. CR skills development can be facilitated through the clarification of the CR process using appropriate educational and simulationbased strategies. Evidence shows that CR development largely depends on the collaboration of educational specialists and nurses and hence, nursing education authorities need to employ appropriate programs to improve nurses' understanding of CR importance and develop their CR skills [6].

However, Recent studies have shown that there are no structured and effective programs for improving nurses' CR skills in Iranian hospitals. Most previous studies into CR skills in nursing were conducted on nursing students and dealt mainly with the effects of learning styles, educational strategies and models on CR skills development [6–9]. Qualitative studies into CR also mainly explored CR-related perceptions [10, 11] and the process of CR development, but did not focus on any process of change to develop CR skills. Some action research studies also attempted to develop nursing students' CR skills [9, 12], though the difference in objectives and the field

of education research, prevent transferability of research findings. Therefore, comprehensive studies with holistic views are needed to provide firmer evidence respecting CR skills development among nurses.

Methods

Aim

The aim of this study was to develop CCU nurses' CR skills through an action plan.

Design

This participatory action research was conducted in 2021 based on the framework of Hart and Bond (1995) [13]. Action research is a participatory action plan focused on appropriate knowledge and based on a joint collaboration within a mutually accepted framework in order to identify and clarify key problems, determine solutions to the problems, develop practical knowledge, plan for action, and empower participants respecting the intended phenomena.

Setting and sample

Study setting was the CCU of a heart center, Iran. This hospital is a leading heart center in Iran and a referral center for patients with cardiovascular disease in the north of Iran. This hospital has 180 active beds. Based on nature of the patient-provider relationship in CCU, tertiary and quaternary care is provided. The healthcare providers, provide medical services such as evaluation, diagnostics, provision of treatment or onward referrals to the next level of care.

Participants were recruited through purposive sampling was used. Study participants were twenty CCU nurses, CCU head nurse, dean of the CCU, three clinical nursing faculties, and two cardiologists, as well as the educational and clinical supervisors, nursing manager, educational deputy, manager, and dean of the hospital—33 in total. Nurses' inclusion criteria were bachelor's degree or higher in nursing, work experience more than three years in cardiac nursing, and agreement for participation. The nurses' inclusion criteria were considered for dean of the CCU, Nursing management team, nursing faculties and cardiologists.

Action plan

Two action research cycles were followed in this study. Action research has six stages, namely problem identification and statement, plan for action, action for change, observation and evaluation, feedback, and plan for further actions. In the first stage of the first cycle to explain the problem, the main researcher (TH) focused on the Barriers to the development of CR skills among coronary care nurses. Data were collected using semi-structured interviews and were analyzed using conventional

Components	Steps
Efficiency of nursina	An integrative literature review on CR skills
education	development in nursing; Creating the list of CCU
	nurses' educational needs based on the results
	of the literature review and need assessment;
	Developing a CCU educational booklet based
	on the main syllabus of coronary care nursing
	education; Developing evidence-based clinical
	guideline based on the newest cardiac nursing
	textbooks and guidelines; Determining the
	most appropriate strategies and models for
	educating CR skills in nursing; Development and
	psychometric evaluation of the Nurses' Clinical
	Reasoning Skills Checklist; Assessing nurses' CR
	skills using the Nurses' Clinical Reasoning Skills
	Checklist and the NCRS at the beginning of the
	study; Conducting educational workshops on
	thinking skills in nursing, the nursing process,
	and management of cardiovascular disease to
	empower nurses; Assessment of nurses' CR skills
	using the checklist and the scale after the action
	plan; Providing and discussing the findings
Effective nursing	Conducting a qualitative study and determining
management	the strategies to promote effective management;
	Holding regular weekly sessions with the nursing
	manager and CCU nurses; Valuing professional
	nursing practice through written incentives
	by the hospital dean; Promoting participatory
	care through joint planning, joint interventions,
	and group evaluation; Supporting quality care
	delivery based on the expected responsibilities;
	Recruitment of experienced staff to perform
	responsibilities; Balanced distribution of nursing
	staff in all work shifts based on patients' condi-
	tions and needs; Determining the requirements
	of nursing documentation based on the regula-
	tions of the Ministry of Health and excluding un-
	necessary documentations; Designing structured
	nursing documentation sheets with the collabo-
	ration of the educational committee of the study
	setting; Providing and discussing the findings
Personal profession-	Conducting a qualitative study and determin-
al development	ing the challenges of and the strategies for CR
	skills development; Selecting two experienced
	and competent CCU nurses as mentors by the
	nursing manager; Conducting educational work-
	shops on professional commitment and ethics;
	Supervising and guiding nurses practice in
	providing standard and ethical care; Conducting
	educational workshops on using the nursing pro-
	cess, supervising the use of the nursing process
	by the nead nurse and supervisors; incentive for
	nuises who actively engaged in using the hurs-
	ing process; conducting educational workshops
	on interpersonal and professional communica-
	tion skills; Making the necessary arrangements
	to ensure the continuity of the participatory care
	plan, Fronung nuises with the opportunity to
	faculties: Providing and discussing the findings

content analysis. The four main categories of the barriers to CR skill development among nurses were limited fessional development, inefficient educational prom, ineffective professional interactions, and limited ofessional self-efficacy. In the second stage of the first cle, in order to find strategies to improve CR skills ong coronary care nurses, we conducted a qualitative dy and the strategies were obtained in semi-struced interviews with 16 participants and were analyzed ough conventional content analysis. Then, the deterned strategies were prioritized through quantitative oring by 24 participants in three focus group discusns. The Suitability, Feasibility, and Flexibility matrix s used for scoring. The main three strategies of CR ll improvement were improvement of the efficiency of rsing education, effective management in nursing, and velopment of professional nursing. The mean scores these categories in the possible range of 3-9 was 8.20, 4, and 7.83, respectively. Then, the main components the CR skills development plan were determined and plan was developed in six sessions. Session members re the study authors, two experienced CCU nurses, U head nurse and dean, a clinical nursing faculty, the acational and clinical supervisors, nursing manager, acational deputy, manager, and dean of the study setg. Responsibilities, activities, necessary time for each ivity, participants, resources, equipment, costs, and luation method for each activity were also determined the sessions (Table 1). The problem identification and tement and the plan for action stages were reported ewhere [1, 5].

n the third stage, the action plan was implemented. this stage, the barriers and the facilitators to CR skills velopment were identified and discussed with the horities of the study setting. Moreover, necessary respondence with top managers and authorities was changed by the nursing manager and the dean of the dy setting. Periodical reports of the progression of action plan were written, the plan was continuously ervised, and necessary feedback was given to particints. Reflection and feedback giving helped determine effects of the action plan on participants' percepns and practice and identify and correct the shortnings of the plan. Data collection instruments in this ge were the Nurses' Clinical Reasoning Skills Checklist d the Nurses' Clinical Reasoning Scale (NCRS). The rses' Clinical Reasoning Skills Checklist was develed through an extensive literature review and based the CR model of Hoffman [14]. The checklist has items scored on a three-point 1-3 scale and its total ore is 22-66. The final score of the checklist was calculated using Likert's law and the 44 was considered as the boundary between well and poor clinical reasoning skills. The Nurses' Clinical Reasoning Scale (NCRS), developed

by Liou et al., is a valid and reliable scale for CR assessment. This scale has 15 items scored on a five-point 1–5 scale and its total score is 15–75 with higher scores indicating greater CR skills. The scale-level content validity index of this scale was 0.97 and its Cronbach's alpha was 0.95 [15]. The main researcher (TH) translates the NCRS into Persian and evaluate its psychometric properties [16].

In each stage of the implementation of actions and strategies, the main researcher (TH), being present in the coronary care unit, used the observation and focused group discussion methods to assess the actions performed. All taken actions were continuously monitored and revised throughout the study. This formative evaluation focused on assessing the accuracy and the effectiveness of the CR skills development strategies. Results were written as periodic reports. Group discussion sessions were held focusing on the evaluation of the action plan. The purpose of this meetings was to assess the strengths and the weaknesses of the plan, more specifically focus on the plan, and determine and reduce its weaknesses. Besides formative evaluation, summative evaluation was performed using both quantitative and qualitative methods. Quantitative summative evaluation was performed using the Nurses' Clinical Reasoning Skills Checklist and the Nurses' Clinical Reasoning Scale and results were reported as mean and standard deviation (Mean ± SD). Within-group comparisons respecting the mean score of CR were made using the Wilcoxon's test at a level of less than 0.05. Qualitative summative evaluation was also performed through two focus group discussions with CCU nurses, CCU head nurse, dean of the CCU, two cardiologists, as well as the educational and clinical supervisors, nursing manager, educational deputy, manager, dean of the hospital and research assistants. Focus group discussions were guided using an interview guide. At the beginning of each focus group discussion, participants were informed about the aims and were asked to discuss about the barriers and facilitators to CR skills development and its data were analyzed through conventional content analysis. In this phase, the researchers operationalized saturation as the point during data collection and analysis at which linking the concepts of two consecutive focus groups revealed no additional new categories.

In the fifth stage, the results of the previous stages were discussed. Data in this stage were collected through two focus group discussions. Group discussion session was held with the presence of researcher, CCU nurses, CCU head nurse, dean of the CCU, as well as two supervisors, nursing manager, manager, and dean of the hospital. Results were reviewed and exchanged, and the participants were encouraged to reflect on the content, process, and premise of the plan based on their perceptions and actual experiences. The researchers asked them to provide feedback on all CR skills development action plan components.

In the sixth stage, the data collected in the fifth stage were discussed in a group discussion by the same participants. The strengths and the weaknesses of the plan were identified, the necessary revisions were determined, and participants' recommendations and new solutions for completing and reviewing the plan were assessed.

Trustworthiness

The criteria proposed by Herr and Anderson [17] were used to establish trustworthiness. Democratic credibility was ensured through inviting all potential stakeholders to the study. Collaboration among stakeholders facilitated the process of change. Improvement in the patients' outcomes and also empowerment of nurses in unpredictable and complex conditions management assured the outcome validity. To assure process validity, the researchers used the triangulation method to collect data including, focus group discussion, panel of experts and peer checking. For peer checking, the first author performed data collection and analysis and the co-authors controlled and approved data collection and analysis. The control dealt with the focus on the research and confidence in how well the data has addressed the intended focus. The findings of the study were also continuously discussed with the research team and participants and all phases of the study were also precisely documented. The research team confirmed the credibility of the analysis checking for the representativeness f the data as a whole. In addition, At the end of each group discussion, the topics discussed were checked in a summary with the participants, and the findings and steps of the work were recorded in a detailed and auditable form. Moreover, confirmability was ensured through documenting all researchrelated activities so that others can trace the activities. Transferability was also ensured through providing clear descriptions of the study setting, participants, and data collection and analysis.

Ethical considerations

The Ethics Committee of the University of Social Welfare and Rehabilitation, Tehran, Iran (code: IR.USWR. REC.1399.073), approved this study. Necessary permissions for the study were obtained from this university and provided to the authorities of the study setting. All participants were informed of about the study aim, were ensured of data confidentiality and their right to voluntarily withdraw from the study, and were asked to provide written informed consent for participation.

 Table 2
 Comparison of the pretest and the posttest mean

 scores of CR skills using the Nurses' Clinical Reasoning Skills

 Checklist

CR Steps	Num- bers of Items	Range of Scores	Before Mean±SD	After Mean±SD	P value
Awareness of signs and Identification the situation	4	4–12	6.78±0.34	9.92±0.40	0.014
Data orga- nization and Confirmation of problems	8	8–24	16.1±2.45	19.8±1.32	0.034
Establish goals and Implementa- tion of actions	6	6–18	12.06±2.87	15.04±3.37	0.022
Evaluation and Reflection on the process	4	4–12	5.04±1.15	7.26±1.14	0.058

Results

The mean of participants' age was 37.3 years (in the range of 25-52). Participants were mostly female (n = 27), their work experience in CCU was 3–16 years, and their educational degree varied from bachelor's degree in nursing to subspecialty degree in cardiology.

The findings of the third stage

Based on the results, the final clinical reasoning skills checklist with 22 items was presented in four domains: Awareness of signs and Identification the situation, Data organization and Confirmation of problems, Establish goals and Implementation of actions, Evaluation and Reflection on the process. The content validity Index was 0.81 and Scale Content Validity Index was 0.97. Moreover, the reliability of the checklist was confirmed as 0.79 by the Kappa coefficient, which indicated the high level of agreement between the evaluators. Items were scored on a three-point 1–3 scale and hence, the total score of the checklist was 22–66. Scores less than 44 were interpreted as poor CR skills and scores more than 44 were interpreted as good CR skills.

The content validity index of NCRS and its items were 0.97 and more than 0.79, respectively. Exploratory factor analysis revealed an assessment and confirmation factor and an implementation and reflection factor for the scale which together explained 57.30% of the total variance. Confirmatory factor analysis also confirmed this two-factor structure (χ 2/df=2.11, NNFI=0.952, RMSEA=0.053, CFI=0.91, GFI=0.94, IFI=0.95, and NFI=0.96). The Cronbach's alpha and the intraclass correlation coefficient values of the scale were 0.96 and 0.94, respectively.

Assessment the nurses, performance using NCRS and compared the scores with the total scores, revealed that

Table 3	Comparison of the pretest and the posttest mea	n
scores of	CR skills using the NCRS	

NCRS Dimension	Num- bers of Items	Range of Scores	Before Mean±SD	After Mean±SD	P value
Assessment and confirmation	8	8–40	22.37±4.34	30.12±4.47	0.011
Implementation and reflection	7	7–35	20.11±2.85	26.71±2.97	0.047

43.33% had poor clinical reasoning and 56.67% had good clinical reasoning. Quantitative CR skills assessment using the Nurses' Clinical Reasoning Skills Checklist revealed that 29.12% of participants had poor CR skills and 70.88% of them had good CR skills.

The findings of the fourth stage

Statistical analysis revealed significant increase in the mean scores of four domains of CR after the first cycle of the action plan (P < 0.05; Table 2). Moreover, CR skills assessment through the NCRS showed that 25% of nurses had poor perceived CR skills, while 75% of them had good perceived CR skills. Statistical analysis also revealed significant increase in the mean score of self-reported CR skills after the action plan (P < 0.05; Table 3).

In overall, the results of the two group discussions showed that participants were satisfied with the CR skills development action plan. They reported that active interaction and collaboration among all stakeholders in the study setting and their significant contribution to problem management and decision making during the study were associated with significant positive outcomes. Examples of these outcomes were improvement of their professional knowledge and motivation, better organization of the thinking process, improvement of interprofessional communications, enhancement of professional responsibility and accountability, and improvement of the quality of nursing process and nursing documentation. Conventional content analysis of the focus group discussion data resulted in the development of thirteen subcategories and four main categories respecting the outcomes of CR skills development. These four main categories were improvement of the thinking process, improvement of professional commitment, improvement of professional competence, and improvement of interprofessional communications (Table 4).

Improvement of the thinking process

Participants noted that the use of the nursing process in clinical practice together with educational strategies improved nurses' ability to organize, synthesize, and interpret data, their understanding of clinical situations, their thinking ability, and their CR. Such improvements in turn improved symptom management and

Subcategories	Main categories	
Improvement of professional knowledge	Improvement	
Effective integration of metacognitive skills	of the thinking	
Focus on patient situation	process	
Improvement of professional motivation	Improvement	
Improvement of self-worth	of professional	
Improvement of professional accountability	commitment	
Designing a standard care plan	Improvement	
Making reliable decisions	of professional	
Improvement of care quality	competence	
Improvement of the importance of nurses' profes-		
sional role		
Greater trust in nurses	Improvement of	
Greater support for nurses	interprofessional	
Development of a scientific atmosphere	communications	

patient outcomes. The subcategories of this category were improvement of professional knowledge, effective integration of metacognitive skills, and focus on patient situation.

Improvement of professional knowledge Most participants reported that educational strategies improved nurses' professional knowledge and their ability to use professional knowledge, experience, and thinking skills. Knowledge improvement was in turn associated with improvement of nurses' self-confidence in using their professional skills, particularly thinking skills, and led to the improvement of their CR skills and the outcomes of their professional practice.

With this plan and the provided educations, most nurses in this unit now have the necessary professional ability for effective care delivery. This ability moves them towards deep thinking and rational discussion in order to obtain better results (nursing manager).

Effective integration of metacognitive skills Participants highlighted that educational workshops on thinking skills improved nurses' knowledge and understanding about these skills and helped them successfully use their metacognitive skills, particularly CR skills, during the nursing process.

I was familiar with critical thinking, reasoning, and decision making skills, but had not used them in my clinical practice. In these workshops, they not only explained these skills in detail, but also provided examples with which we learned how to use these skills in real situations. Now I feel that I can use these skills in practice with more precision and higher quality (a nurse). **Focus on patient situation** According to the participants, alleviation of nursing staff shortage in the action plan and balanced number of nursing staff in different work shifts helped nurses more clearly focus on patient situation and needs. They believed that adequate nursing staffing in CCU provided nurses with more opportunities to interpret patient data, establish accurate nursing diagnoses, make sound clinical decisions, provide safe services, and improve patient outcomes.

Now, there is greater precision in staffing in our unit. In the morning shift, our head nurse checks the congruence between the number of nurses and the conditions and number of patients to ensure adequate number of experienced CCU nurses in all shifts. Such effective staffing has provided us with more opportunities to have sound CR and reach better outcomes in care (a nurse).

Improvement of professional commitment

Participants believed that the CR skills development plan significantly improved nurses' attention to professional issues and goals, their commitment to professional development, and their motivation to improve their professional knowledge and skills, and thereby, improved their CR skills. The three subcategories of this category were improvement of professional motivation, improvement of self-worth, and improvement of professional accountability.

Improvement of professional motivation According to the participants, creation of a respectful, attentive, and supportive atmosphere in CCU, consideration of nurses' expectations and needs, valuing their knowledge-based practice, and provision of positive feedback to their new ideas and professional practice improved their inner professional satisfaction, interest, and attention, and motivated them to attempt to develop their professional knowledge and skills.

An advantage of participatory care has been the joint and simultaneous evaluation of patients' problems and planning for their management. Our nurses assess patients in coordination with physicians and medical residents and plan for their care through consulting with physicians. Such care planning has had significant role in improving their CR and motivation (head nurse).

Improvement of self-worth Participants reported that hospital dean's support for nurses significantly improved their sense of self-worth and enabled them to more confidently use their abilities and skills in care delivery. Moreover, managers' trust in nurses' abilities and improvement of their active engagement in clinical decision making not only improved their sense of self-worth, but also improved their self-confidence and motivation for developing their professional knowledge and thinking skills.

The hospital dean's support and attention have enabled our nurses to do some professional tasks which were previously performed just by medical interns or residents. Such delegation of power and authority to nurses has made them attempt to improve their professional knowledge and thinking skills in order to provide specialized care and show their professional competence (nursing manager).

Improvement of professional accountability Participants noted that nurses' improved professional commitment was associated with improvement in their professional accountability. They highlighted that improved professional accountability in turn made nurses provide their care services with greater professional commitment. Improved professional accountability highlighted the need for knowledge and skill development in order to provide quality and safe care services.

According to the decision of the management team, each nurse, instead of the in-charge nurse, should be responsible and accountable for his/her practice. Therefore, all nurses should develop their knowledge and skills to ensure the accuracy of their practice, provide safe and quality care, and choose the best and the most appropriate options for their patients (clinical supervisor).

Improvement of professional competence

Participants reported improvement of professional competence as an important outcome of the CR skills development action plan. They highlighted that the plan had significant role in improving nurses' clinical decisionmaking skills, CR skills, and their ability to provide standard patient-centered care and hence, improved the effectiveness of their professional role. This category had four subcategories, namely designing standard care plan, making reliable decisions, improvement of care quality, and improvement of the importance of nurses' professional role.

Designing a standard care plan Provision of structured nursing documentation sheets designed based on the nursing process to nurses facilitated their fast and precise care delivery, care documentation, and information exchange to nurses in other shifts. Participants noted that these sheets helped nurses better assess their situation, design standard care plans, and provide organized Page 7 of 12

and quality care and thereby, improved their professional competence.

Well I think that structured nursing documentation form helps our nurses document their activities in shorter period of time and hence, they would have more time to work with their patients. This form has given them the necessary focus on better patient assessment, data collection, data analysis, and CR and has made nursing care more scientific and specialized (educational supervisor).

Making reliable decisions Participants noted that their sound clinical decision making relied on careful assessment, in-depth data collection, accurate situational analysis, correct conclusions, accurate diagnoses, effective strategies, and selection of the best options for clinical practice. Accordingly, they highlighted that learning and using CR skills improved nurses' understanding and analysis of patient data and their confidence in selecting the best options for patient care. Reliable decisions not only improved nurses' self-confidence, but also improved trust in nurses among patients, colleagues, physicians, and managers.

There were situations in which nurses were doubtful about the best decisions and the best care options. But now, nurses have better CR skills and access clinical guidelines and hence, can make decisions with more confidence and trust the outcomes of their decisions. Currently, they do not need to ask help or earn approval for their decisions from their colleagues and other healthcare providers (head nurse).

Improvement of care quality Participants noted that using clinical guidelines and structured nursing documentation sheets during the nursing process improved clarity in care, made care delivery scientific and specialized, facilitated CR and clinical decision making, and improved care quality. They believed that using structured nursing documentation sheets improved the quality of the nursing process application, patient recovery, and nurses' thinking skills, and facilitated comprehensive evidence-based care delivery.

I think using the nursing process is a good method to improve nurses' CR. During this period, my colleague and I had to use the nursing process in our daily practice and hence, attempted to improve our CR skills in order to more accurately use the process. In my opinion, the sound application of the nursing process indicates improvement in our CR skills (a nurse). **Improvement of the importance of nurses' professional role** Participants stated that the CR skills development action plan improved nurses' knowledge, thinking skills, and professional abilities, required them to more effectively communicate with other healthcare providers, and hence, provided them with the opportunity to show their problem identification, data collection, data interpretation, and decision-making abilities. Thereby, it improved physicians' and other healthcare providers' trust in nurses and their professional abilities and roles.

I think the most important outcome of this plan was the empowerment of nurses and improvement of the value and the importance of their professional role. Improvement of their thinking skills and specialization of their practice are well manifested in the improvement of care quality and improvement of other healthcare providers' trust in their professional role (hospital dean).

Improvement of interprofessional communications

Participants reported that teamwork and participatory care in collaboration with other healthcare providers, particularly physicians, had significant role in improving nurses' CR and decision-making skills. Participating nurses noted that they engaged in group activities and exchange of knowledge and experience in their discussions with physicians about treatment goals. Moreover, they highlighted that their professional competence in accurate patient management, their sound CR, and their sound clinical decisions improved other healthcare providers' trust in nursing, increased their support for nurses, and improved their interest in involving nurses in clinical decision making. The three subcategories of this category were greater trust in nurses, greater support for nurses, and development of a scientific atmosphere.

Greater trust in nurses Participating nurses believed that clinical rounds with physicians and nursing faculties in CCU provided them with the opportunity to have scientific discussions, promoted their learning about the results of clinical studies, improved their critical thinking, CR, and clinical decision-making skills, and improved physicians' and nursing faculties' engagement in providing education to nurses and answering their questions. Moreover, their experiences showed that nurses' interactions with their colleagues, physicians, and other healthcare providers improved physicians' interest in seeking their comments and engaging in rational discussions with them, improved physicians' trust in nurses, promoted healthcare providers' respect for each other, and strengthened interprofessional communications in clinical settings.

In my opinion, our nurses' attendance at clinical rounds and their engagement in sharing their opinions based on reliable evidence can improve physicians' interest in scientific discussion with them and thereby, encourage physicians to provide them with more information and guidance about care. Such interactions improve CR and lead to better clinical decisions (hospital dean).

Greater support for nurses Participants' experiences indicated that manager's support for nurses, their positive feedback to nurses' creative ideas, their encouragement of nurses' commitment and efforts, and their facilitation of nurses' involvement in the process of decision making had significant role in improving nurses' sense of worthiness, self-confidence, and professional competence.

I see that most of nurses in this unit are doing their best to follow care plans and principles. Our matron also sees this and actively supports nurses' engagement in the process of care. This supportive atmosphere has led to nurses' self-confidence for improving their skills and competencies (clinical supervisor).

Development of a scientific atmosphere Participants considered participatory care as a key factor in developing their professional skills and promoting their informal and rational discussions with their nursing and non-nursing colleagues. They also highlighted that the atmosphere of participatory care provided them with the opportunity to analyze perceptions, provide their ideas and opinions, and share their knowledge and experiences and hence, improved their thinking skills.

This participatory process not only has provided an opportunity for intra-professional scientific discussions and up-to-date knowledge acquisition, but also has improved our participation in scientific discussions with physicians during the process of treatment. In my opinion, such discussions and knowledge and experience exchange have improved our thinking skills and our ability to accurately manage complex situations (a nurse).

The findings of the fifth stage

This stage focused on reflecting on and determining the weaknesses and problems of the action plan. Participants believed although the action plan was effective in improving nurses' CR skills, the results of qualitative evaluation showed that there were problems that could be solved. The problems of the plan were categorized into four main categories, namely limited efficiency of educational courses on the nursing process, incoherence in nursing documentation, mentors' inadequate supervision and instructions, and mentors' role pressure.

Limited efficiency of educational courses on the nursing process According to the participants, one of the problems of the plan was the paucity of educational courses on the nursing process and nurses' limited skills for the practical use of the process. They highlighted that the appropriate use of the nursing process relied on adequate and appropriate education as well as development of the necessary skills. Moreover, they emphasized that merely learning of the nursing process without developing the necessary skills for its use interfered with the practical use of the process in daily practice.

In connection with the point mentioned, Observation made from the field attendance indicated that there were few in-service trainings on the nursing process and majority of the nurses have few other training sessions on nursing process aside their formal education in the nursing school and some of the nurses had not had any form of training on nursing process after academic education. Inadequate periodic workshops on the nursing process a posed a challenge to its implementation and Nurses have not adequate knowledge and skill in the design and implementation of the nursing process.

Incoherence in nursing documentation Another problem of the plan was weaknesses in the process of nursing documentation. Participants believed that the structured nursing documentation sheets were applicable only for documenting the nursing care plan and had no items on some essential patient outcomes. Moreover, they noted that some patient data could be documented solely in the hospital information system. They highlighted that these problems could make it difficult to retrieve, organize, and analyze the data for sound clinical decision making.

Mentors' inadequate supervision and instructions Another problem of the plan was related to mentors' participation in providing education to nurses. Participants highlighted that mentors' active involvement in the process of care delivery to patients with complex conditions reduced their ability to provide education to nurses and closely supervise their practice.

Mentors' role pressure Some participants also referred to mentors' role multiplicity and role pressure as other problems of the plan. They highlighted that limited peer and organizational support for mentors caused them to allocate inadequate time to provide education to nurses.

The findings of the sixth stage

In the sixth stage, based on the discussion and exchange of views, new decisions and solutions were adopted to

Table 5	Strategies to improve	the efficiency	of the	CR skills
develop	ment action plan			

Components	Strategies
Efficiency of nursing education	Improving the effectiveness of in-service educational programs on the nursing process; Ensuring the continuity of education about the nursing process; Increasing the opportunities to learn the nursing process to get mastery over its use; Obliging the documentation of the nursing process in the nursing report
Effective nursing management	Unifying patient data in the documentation process in order to improve data accessibility; Documenting all patient-related data in the hospital information system in order to improve the efficiency of the documentation process; Improving the hospital information system and promoting electronic documentation; In- tegrating the nursing process into the hospital information system; Providing formal education to nurses about electronic documentation; Pro- viding the necessary equipment for electronic documentation; Programming an appropriate software to facilitate data documentation
Personal professional development	Clarifying the role expectations and the respon- sibilities of mentors; Adequate nursing staffing during mentoring; Reducing mentors' workload and care-related responsibilities; Strengthening peer support for mentors during mentoring; Ensuring the continuity of education; Close col- laboration of novice and expert nurses; Provid- ing adequate perceived organizational support to mentors in order to improve their motivation and commitment; Supervising mentors' educa- tional practice; Improving mentors' educa- tional practice; Improving mentors' educational practice and providing feedback

solve the problems raised in the fifth stage. Participants provided different recommendations and strategies to manage the problems of the plan and improve its effectiveness which were categorized into three main categories, namely quality and effective nursing education, effective nursing management, and development of professional nursing (Table 5).

Discussion

The aim of this study was to develop CCU nurses' CR skills through an action plan. Findings showed that the CR skills development action plan had positive effects on CCU nurses' CR skills and was associated with participants' satisfaction with the plan.

Improvement of professional knowledge was one of the main outcomes of the CR skills development action plan. A previous study also showed that developing nurses' thinking skills necessitated nurses' adequate attention to the development of their professional knowledge and skills. Improvement of professional knowledge enables nurses to purposively use CR in complex clinical situations based on up-to-date knowledge and firm scientific

evidence [5]. Moreover, study findings revealed that close attention to thinking skills in the action plan and careful supervision of their use in nursing were associated with the effective integration of metacognitive skills. Appropriate educational programs in nursing have significant role in organizing and interrelating thinking skills, analyzing situations, establishing accurate nursing diagnoses, implementing appropriate nursing interventions, making sound clinical judgments and decisions, and improving clinical outcomes [18]. We also found greater focus on patient situation as an outcome of the CR skills development action plan. Ruppel et al reported that focusing on patient situation helps nurses collect new data about patient situation, detect critical situations, rationally analyze the data, establish accurate nursing diagnoses, make sound clinical decisions, provide safe services, and improve patient outcomes [19]. Improvement of nurses' thinking process relies on developing their thinking skills and helps them focus and reflect on patient situation, clinical approaches, and care measures and enables them to use the nursing process based on their metacognitive skills.

Study findings also indicated that the implementation of the CR skills development action plan was associated with improvement of nurses' professional motivation, sense of self-worth, and professional accountability and thereby, improved their professional commitment. Similarly, two studies showed that improvement of CR and thinking skills improved professional motivation, attitude towards nursing, and professional accountability, particularly with respect to care delivery to critically-ill patients [20, 21]. Moreover, creation of a respectful and supportive atmosphere at nurses' workplace, appreciation of their sound practice, and provision of positive feedback to their creative care-related ideas can improve their professional motivation and develop their knowledge and thinking skills [1]. Our findings also revealed that nurses' professional accountability was associated with their committed attempt to improve their thinking skills. This is in line with the findings of several studies which reported that adequate CR skills were associated with professional competence, responsibility, and accountability [1, 21]. Nurses' great professional motivation and managers' recognition of their professional roles make nurses pay closer attention to their professional tasks and skills, improve their desire to accept different responsibilities, and improve their professional commitment.

The third main category of the study was improvement of nurses' professional competence. Findings showed that the CR skills development action plan improved nurses' competence in designing a standard care plan through strategies such as using structured nursing documentation sheets. In agreement with this finding, two previous studies noted that using structured nursing documentation provided nurses with a systematic framework for CR and clinical judgment and thereby, helped them design sound care plans and make sound clinical decisions based on thinking skills [1, 22]. Structured nursing documentation also makes documentation coherent, organizes the process of thinking, and facilitates the analysis of patient data, establishment of accurate diagnoses, and selection of appropriate care measures.

We also found that improvement of nurses' professional competence following the CR skills development plan was associated with improvement of the importance of their professional roles and improved other healthcare providers' trust in their competence. Similarly, a study reported that improvement of nurses' thinking skills such as CR, clinical judgment, and clinical decision making not only improved patient outcomes, but also improved the status of their professional role in quality care delivery [23, 24]. It seems that CR skills can facilitate nurses' acquisition of professional skills, support them in designing standard care plans, and improve their competence in managing different situations.

Findings also showed that the CR skills development action plan was associated with the improvement of interprofessional communications through improving other healthcare workers' trust in nurses, strengthening their support for nurses, and developing a scientific atmosphere at nurses' workplace. Two previous studies reported the significant role of the trust and the support of support parties such as physicians in developing nurses' thinking skills [20, 25]. Another study highlighted the importance of professional support for CR and metacognitive skills development, behavior modification, performance improvement, and professional development among nurses [5].

We also found that the implementation of the CR skills development action plan provided nurses with the opportunity to have scientific discussions with other healthcare workers and receive their opinions, help, and instruction. Healthcare workers' trust in nurses and their support for them can strengthen interprofessional communications, promote the exchange of information and experiences in clinical settings, facilitate group thinking, and support nurses in using different thinking skill [5, 20]. Professional support for nurses through trusting their activities, providing them with positive feedback, and welcoming their ideas and opinions can improve their self-confidence, improve their understanding and perceptions, increase their engagement in rational discussion, and thereby, improve their thinking skills.

This study was an innovation in the clinical context, but it should be noted that action research requires much time and energy due to its participatory nature. Coordinating group meetings was sometimes difficult because the participants had different roles and responsibilities at the heart center, and it was difficult to hold meetings at a time when everyone could attend. One of the limitations of our study was the time limit for implementing research and the lack of financial resources in the implementation of the program.

Conclusions

In this study, poor CR skills of the CCU nurses was a problem, and the solution was found in improving CR skills development plan through action research. This study shows that the CR skills development action plan improves CCU nurses' CR skills through improving their thinking process, professional commitment, professional competence, and interprofessional communications and hence, improves care quality, safety, and effectiveness. It can be concluded that collaboration of stakeholders in designing and implementing healthcare programs can facilitate higher-order thinking skill changes and improve nursing care outcomes. The results of this study can be used as a model to help CCU nurses develop their CR skills.

Abbreviations

CR	Clinical reasoning
CCU	Coronary Care Unit
NCRS	Nursing Clinical Reasoning Scale

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Author contributions

All authors have drafted the work and substantively revised it. T.H was responsible for data collection, enhanced by K.N For data analysis and drafting the manuscript. T.H critically revised the paper. T.H wrote the main manuscript text and prepared tables. All authors have read and approved the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Ethics approval and consent to participate in this study was performed in accordance with the checklist for qualitative research COREQ and followed the Helsinki Declaration. The Ethics Committee of the University of Social Welfare and Rehabilitation, Tehran, Iran (code: IR.USWR.REC.1399.073), approved this study. Necessary permissions for the study were obtained from this university and provided to the authorities of the study setting. All participants were informed of about the study aim, were ensured of data confidentiality and

their right to voluntarily withdraw from the study, and were asked to provide written informed consent for participation.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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