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# Learning Collaborative Clinical Reasoning in Healthcare Education: An Integrative Review

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ABSTRACT

*Background:* Collaborative clinical reasoning (CCR) occurs when two or more healthcare professionals reflect and negotiate an issue regarding patient's situation or care. This represents a crucial learning goal that needs to be achieved during healthcare education.
*Purpose:* To describe the characteristics of and the pre-conditions for learning collaborative clinical reasoning in healthcare education.
*Method:* An integrative review was conducted. A systematic search was carried out in May 2020 (updated in August 2022) in four databases (CINAHL, Pubmed/Medline, Scopus and Eric/EBSCO). Thirty-three peer-reviewed research articles met the inclusion criteria and were included into a data quality appraisal and analysis. The data was analysed with inductive content analysis.
*Results:* The characteristics of learning collaborative clinical reasoning were described using the following categories: 1) the collaborative clinical reasoning learning method 2) the collaborative clinical reasoning learning environment and 3) the collaborative clinical reasoning learners. The pre-conditions for learning collaborative clinical reasoning were described using the following categories: 1) the learning situation when learning collaborative clinical reasoning, 2) interaction when learning collaborative clinical reasoning and 3) clinical context when learning collaborative clinical reasoning. The learning situation includes the pedagogical preparation before the learning of collaborative clinical reasoning. The interaction consists of facilitation, feedback and peer communication during the learning of collaborative clinical reasoning. The clinical context utilized in the learning of collaborative clinical reasoning needs to be realistic and familiar for the students.
*Conclusions:* The results indicate that interventions enhancing collaboration and clinical reasoning apply a variety of learning methods, however there are certain characteristics of and pre-conditions for learning collaborative clinical reasoning to be considered.

## Introduction

CCR is an essential competence area that needs to be addressed in healthcare education. Inadequate collaboration and a lack in clinical reasoning (CR) skills are recognized as a threat to patient safety (Badowski, 2019; Huang et al., 2018). CCR has been defined as "a process in which two of more healthcare team members negotiate diagnostic, therapeutic or prognostic issues of an individual patient, resulting in an illness or a treatment plan" (Kiesewetter et al., 2017). In clinical situations, reasoning often occurs in a cognitive process including multiple healthcare professionals (Kiesewetter et al., 2017; Radkowitsch et al., 2020; Seif et al., 2014). Even though CCR can occur in intra- or interprofessional situations, core competencies regarding interprofessional practice for future healthcare professionals have been defined under the topics of values and ethics, roles and responsibilities, interprofessional communication and teams and teamwork (Interprofessional Education Collaborative (IPEC), 2016).

The ability to CCR demands that the students learn the skills needed and have the opportunity to foster them during their studies (Radkowitsch et al., 2020). Nevertheless, the evidence concerning the content and the learning process used to promote CCR is scarce (Kiesewetter et al., 2017; Radkowitsch et al., 2020). In this review CCR is explored as

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the learning of clinical reasoning in collaboration in the context of healthcare education. The theoretical construct guiding the research is the concept of CCR.

The objective of this integrative literature review is to describe the characteristics and the pre-conditions of learning CCR in healthcare education. The ultimate goal, as a part of a larger research project, is to generate knowledge on the phenomenon for the purpose of developing an evidence-based and effective intervention for learning CCR.

## Materials and methods

An integrative literature review was conducted following the framework by Whittemore and Knafl (2005). First, a systematic search was carried out in May 2020 and updated in August 2022 in four relevant databases, CINAHL, Pubmed/Medline, Scopus and Eric/EBSCO (Figure 1). The search terms included a combination of the following keywords and their mesh-terms: clinical reasoning, clinical decision-making, clinical judgement, clinical problem solving, diagnostic reasoning, education, learning, teaching, collaborative, co-operative, team-based, intraprofessional, interprofessional, intersectoral. The inclusion criteria consisted of peer-reviewed empirical studies written in English, exploring the learning of clinical reasoning in collaboration in the context of pre-licensure healthcare education. Exclusion criteria consisted of studies concerning post-graduate or updating education, learning of clinical reasoning as an individual and education outside of healthcare field. A total of 5047 records were identified, and based on the titles, 761 abstracts were screened for full-text evaluation. 141 full-text articles were examined by two reviewers (LH and J-MK). Ultimately, 33 articles were included into the review.

The quality appraisal of the data utilized Joanna Briggs Institute (JBI) Critical Appraisal Tools (JBI 2022) (Table 1). This was conducted by two researchers independently (LH & J-MK) and after which a consensus was reached. Twenty of the studies were assessed as good, and thirteen of the studies were assessed as average or of low quality (Table 1).

The analysis was conducted utilizing inductive content analysis (Elo & Kyngäs, 2007). The data was extracted from the articles by screening the results (Whittemore & Knafl, 2005), then by charting and coding. Sub-categories were formed based on the evaluation of similarities in the codes and the synthetization of the sub-categories resulted in the main categories. The analysis process was tentatively conducted by LH and then discussed with the research group.

## Results

### *Description of the studies*

The majority of the studies were conducted in the USA ($n$ = 10), Germany ($n$ = 6) and Australia ($n$ = 5). The research methods applied were quantitative ($n$ = 17), qualitative (n = 6) and mixed-methods ($n$ =

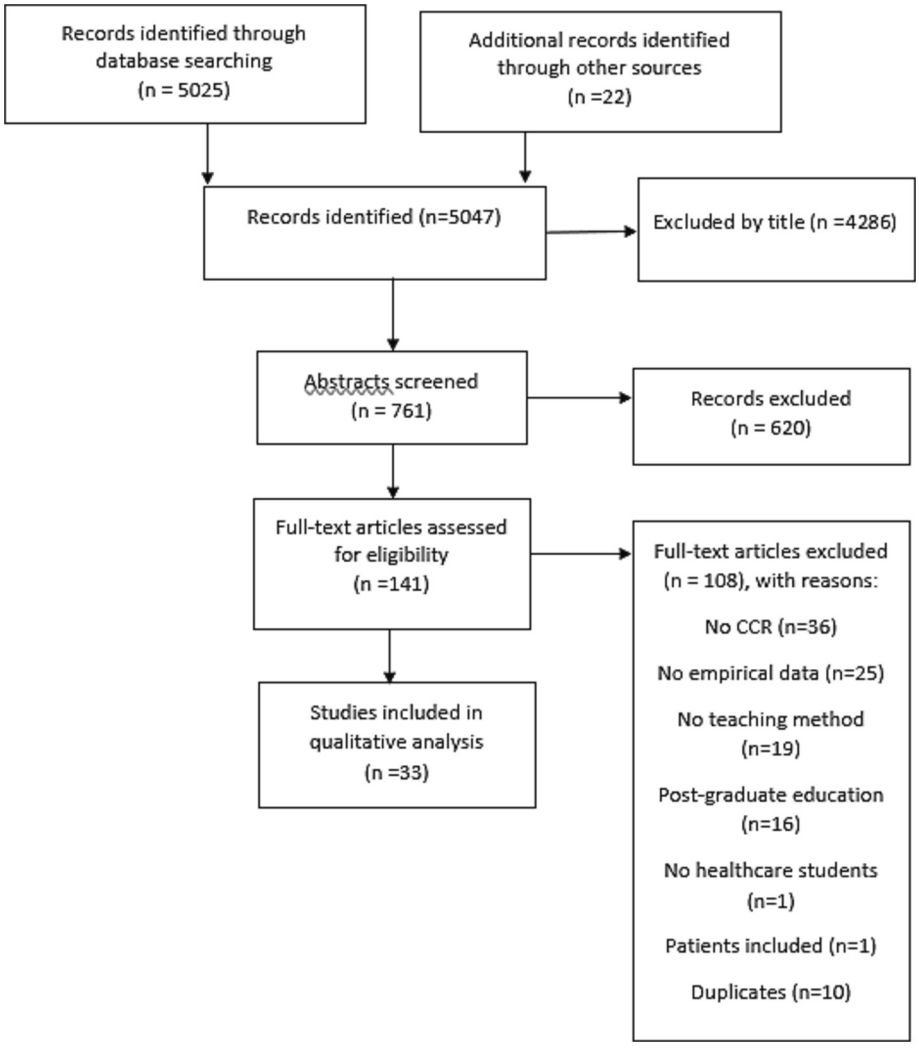


**Fig. 1.** Flowchart of the search strategy.

**Table 1**
The studies included in the review

| Study | Aim | Sample, data collection and data analysis | Learning method explored | Quality assessment |
|---|---|---|---|---|
| Berger et al. (2022) Germany | To gain detailed insights into the practice of clinical decision-making by small groups of medical and other health care students | *n* = 45 medical and bachelor programme in interprofessional health care (IPG) students<br>Observation<br>Inductive analysis | Role-play | 8/10* |
| Gong et al. (2022) China | To investigate the effects of TBL on pediatric bedside teaching in medical students | *n* = 30 medical students<br>Questionnaire, observation<br>t-test, chi-square test | TBL | 2/13** |
| Hanum and Findyartini (2022) Indonesia | To explore the CCR process within an interprofessional team | *n* = 40 medical, dental, nursing, pharmacy, public health, nutrition, occupational health, and environmental health students<br>Observation, focus group, in-depth interview, document analysis<br>SCAT- and thematic analysis | Case-based discussion | 6/10* |
| Imran et al. (2022) Saudi Arabia | To investigate the impact of interactive lecture (IL) and team-based learning (TBL)<br>on improving clinical reasoning skills (CRSs) and achieving learning outcomes (LO) | *n* = 72 medical students<br>Questionnaire<br>mean values, total marks | Team-based learning | 2/8*** |
| Kang and Kang (2022) South Korea | To explore undergraduate medical and nursing students' satisfaction with their mixed reality (MR)-based online interprofessional learning experience | n = 30 students (15 medical, 15 nursing)<br>Questionnaire<br>Descriptive statistics, independent *t*-tests | Mixed reality (MR)-based online interprofessional learning experience | 4/9*** |
| Kiesewetter et al. (2022) Germany | To describe the implementation of student collaboration in a virtual patient platform | *n* = 137 medical students<br>Questionnaire<br>ANOVAs | Virtual patient platform | 1/8*** |
| Ong et al. (2022) Singapore | To compare simplified TBL (sTBL)<br>against interactive lectures (IL) for teaching CR in neuroanatomical localisation and neurological emergencies | *n* = 179 medical students<br>Questionnaire<br>Unpaired t-test | TBL | 4/8*** |
| Burgess et al. (2021) Australia | To explore student and facilitator perceptions of the two teaching methods | *n* = 34 medical students, n = 13 facilitators<br>Questionnaire, a focus group<br>Descriptive statistics, thematic analysis | Team-based (TBL) and case-based learning | 3/5*** |
| Dong et al. (2021) China | To develop a flipped classroom underpinned by constructivism theory and to verify its effectiveness | *n* = 188 nursing students<br>Questionnaire<br>T-test, chi-square test | Flipped classroom | 7/8**** |
| Nawabi et al. (n.d.) Saudi Arabia | To identify the insights of dentistry students toward a new 3/1 problem-based learning (PBL) and team-based learning (TBL) blended package approach | *n* = 124 dentistry students<br>Questionnaire<br>Descriptive statistics, thematic analysis | PBL, TBL | 2/8*** |
| Sukumar et al. (2021) USA | To design VR to help students develop skills in inpatient prerounding, oral presentation delivery, clinical reasoning, and synthesizing feedback and clinical teaching | *n* = 14 medical students, *n* = 25 tele-instructors<br>Survey<br>Descriptive statistics, qualitative data analysis not stated | Virtual rounds (VR) | 3/5*** |
| Ulfa et al. (2021) Indonesia | To assess and compare the effects of TBL and LBL of postpartum hemorrhage topics on the clinical reasoning and classroom engagement of midwifery students | *n* = 115 midwifery students<br>Questionnaire<br>descriptive statistics, unpaired *t*-tests | TBL | 7/12** |
| Yaqoob et al. (2021) Pakistan | To assess the knowledge and practices regarding TBL among undergraduate physical therapy students | *n* = 222 physical therapy students<br>Questionnaire<br>Descriptive statistics | TBL | 1/8*** |
| Zagury-Orly et al. (2022) USA | To introduce the Student-Generated Reasoning Tool | *n* = 171 medical and dental students<br>academic quiz,<br>team discussions,<br>qualitative feedback<br>unpaired t-tests, X2-tests, post-hoc analyses, logistic regression, Fischer's exact test, mixed deductive and inductive thematic content<br>analysis | Student-Generated Reasoning Tool | 4/8*** |
| Burgess et al. (2020) Australia | To pilot an interprofessional TBL module, and to explore the experience of the TBL process | *n* = 311 students (222 medical, 89 physiotherapy)<br>Questionnaire and a pre-class quiz<br>Descriptive statistics, thematic analysis, ANOVA, Tukeys post hoc | TBL | 4/8*** |
| Gruenberg et al. (2020) USA | To determine if the use of PIVOT to prepare for and use within small group workshops results in improved student performance on examination questions designed to test therapeutic reasoning | *n* = 111 pharmacy students<br>Survey<br>Descriptive statistics, mixed-effects regression, Wilcoxon rank-sum test, thematic analysis | Case-based workshops | 5/13** |
| Floren et al. (2020) USA | To develop and evaluate a mobile learning module to support knowledge construction between medical and pharmacy students through structured dialogue prompts | *n* = 32 (16 pairs of medical and pharmacy students)<br>Text-based dialogue, care plans,<br>quantitative and qualitative feedback | Case-based learning module | 3/8*** |

(*continued on next page*)

**Table 1** (*continued*)

| Study | Aim | Sample, data collection and data analysis | Learning method explored | Quality assessment |
|---|---|---|---|---|
| | | Content analysis, descriptive statistics, open coding | | |
| McCartney and Boschmans (2020) South-Africa | To evaluate an intervention of supplementary academic support sessions | *n* = 173 pharmacy students (control cohort of 69; intervention cohort of 104)<br>Questionnaire, focus group, assessment marks<br>Thematic analysis, descriptive and inferential statistics | TBL | 8/9**** |
| Powers et al. (2020) USA | To explore students' experiences of a simulation for learning intra- and interprofessional collaboration | *n* = 27 nursing students<br>Focus group<br>Thematic analysis | Multi-patient simulation utilizing telehealth | 8/10* |
| Weidenbusch et al. (2019) Germany | To compare the effectiveness of CCD formats in fostering clinical reasoning | *n* = 106 medical students<br>Knowledge application test<br>One-way analyses of variances, post hoc Bonferroni tests | CCD (clinical case discussions) | 5/13** |
| Burgess et al. (2018) Australia | To explore students' perceptions of TBL format | n = 14 medical students<br>Focus group<br>Thematic analysis | TBL | 7/10* |
| Edelbring et al. (2018) Sweden | To investigate interactions during clinical reasoning in a two-party VP setting | n = 4 medical students (2 pairs)<br>Observation<br>Thematic analysis | Computerized virtual patient (VP) cases | 7/10* |
| Alizadeh et al. (2017) Iran | To investigate the effect of guided reflection and feedback on shared leadership behaviours | *n* = 206 medical students (39 teams)<br>Observation, questionnaire, team responses<br>Descriptive statistics, Fisher exact test, Mann–Whitney *U* test, linear regression commands, d Cohen formula | TBL | 8/9**** |
| Brich et al. (2017) Germany | To compare the effect of sTBL and small group interactive seminars on acquisition of CR skills | *n* = 122 medical students<br>Questionnaires, a written evaluation<br>Cronbach's α, *t*-Tests, Cohen's d | Simplified version of team-based learning (sTBL) and small group interactive seminars | 4/8*** |
| Jost et al. (2017) Germany | To examine the effects of a supplementary TBL-class on clinical decision-making skills | *n* = 26 medical students<br>Key-feature problem examination, multiple-choice question examination<br>Cronbach's α, Kolmogorov-Smirnov, t-tests, Mann–Whitney-*U* tests, Cohen's d | TBL | 8/9**** |
| Bucknall et al. (2016) Australia | To examine the decision-making of nursing students during team-based simulations on patient deterioration | *n* = 36 nursing students (in teams of 3)<br>Video review and recalls<br>The Framework Analysis approach | Team-based simulation | 9/10* |
| Berndt et al. (2015) USA | To explore the effectiveness of CCS based on student perceptions | *n* = 98 nursing students<br>Survey<br>Descriptive statistics | Collaborative Classroom Simulation (CCS), intraprofessional, classroom | 0/8*** |
| Mahaffey Harmon and Thompson (2015) USA | To determine if collaborative activities were effective in improving CR skills | n = 17 nursing students<br>Questionnaire<br>Kendall's coefficient of concordance, Kruskal-Wallis one-way ANOVA, t-tests | Case-studies, intraprofessional, classroom | 6/7**** |
| Konopasek et al. (2014) USA | To study feasibility of the approach using SPs with clinical reasoning exercises in a GOSCE, the effect on learners' self-efficacy and attitude toward learning communication skills, and the effect of providing multiple sources of immediate, collaborative feedback | *n* = 90 medical students<br>Questionnaire<br>Paired t-tests, descriptive statistics | Group Objective Structured Clinical Experience (GOSCE), intraprofessional, classroom | 5/9**** |
| Titzer et al. (2012) USA | To describe an interprofessional simulation exercise | *n* = 79 nursing students,15 radiologic technology students, 27 occupational therapy students, 10 associate respiratory therapy students<br>Questionnaires<br>Descriptive statistics | Simulation, interprofessional, classroom | 2/8*** |
| Radomski and Russell (2010) USA | To investigate the reflective learning interactions and practices of clinical thinking that emerged in the ICL environment | *n* = 8 medical students<br>Individual and group interviews, observation, documents/artefacts<br>content analysis, thematic narrative analysis | Integrated Case Learning (ICL), intraprofessional, classroom | 6/10* |
| Raupach et al. (2009) Germany | To assess whether WBL is superior to PBL in the setting of a 6-week cardio-respiratory course | *n* = 148 medical students<br>Questionnaires<br>Descriptive statistics, Cronbach's α, t-tests | Web-based collaborative teaching module, PBL, intraprofessional, online/classroom | 5/13** |
| Ryan et al. (2004) Australia | To investigate the effectiveness of using an online Clinical Reasoning Guide to assist integration of PBL in the clinical setting | *n* = 52 medical students, n = 6 clinical tutors<br>Observation, semi-structured interviews<br>Video and dialogue analysis | PBL supported by Clinical Reasoning Guide (CRG), intraprofessional, online/classroom | 4/10* |

* Lockwood et al. (2015).
** Tufanaru et al. (2017b).
*** Moola et al. (2017).
**** Tufanaru et al. (2017a).

9). The detailed description of the studies is presented in Table 1.

*The characteristics of learning CCR*

The characteristics of learning CCR were described using the following categories: 1) the CCR learning method 2) the CCR learning environment and 3) the CCR learners.

*The CCR learning method* refers to the content of the intervention enhancing the CCR skills of students. The majority of the interventions included solving clinical problems collaboratively. The interventions most utilized were team-based learning (TBL) (Alizadeh et al., 2017, Brich et al., 2017, Jost et al., 2017, Burgess et al., 2018, Burgess et al., 2020, Burgess et al., 2021, McCartney & Boschmans, 2020, Yaqoob et al., 2021, Ulfa et al., 2021, Nawabi et al., n.d., Imran et al., 2022, Gong et al., 2022, Ong et al., 2022) and simulation (Berndt et al., 2015; Bucknall et al., 2016; Powers et al., 2020; Titzer et al., 2012). In addition, the following methods were also explored in the studies: case-based learning discussion, modules or workshops (Floren et al., 2020; Gruenberg et al., 2020; Hanum & Findyartini, 2022), collaborative teaching module (Raupach et al., 2009) and clinical case discussions (CCD) (Weidenbusch et al., 2019), case studies (Mahaffey Harmon & Thompson, 2015), integrated case learning (Radomski & Russell, 2010), problem-based learning (PBL) (Nawabi et al., n.d.; Ryan et al., 2004), flipped classroom (Dong et al., 2021) virtual patient (VP) (Edelbring et al., 2018; Kiesewetter et al., 2022), virtual rounds (VR) (Sukumar et al., 2021), mixed reality -based online interprofessional learning experience (Kang & Kang, 2022), student-generated reasoning tool (Zagury-Orly et al., 2022), group objective structured clinical experience (GOSCE) (Konopasek et al., 2014) and role-play (Berger et al., 2022).

*The CCR learning environment* refers to the external environment utilized when learning CCR. Twenty utilized classroom teaching (Nawabi et al., n.d.; Alizadeh et al., 2017; Berger et al., 2022; Berndt et al., 2015; Brich et al., 2017; Bucknall et al., 2016; Burgess et al., 2018; Burgess et al., 2020; Burgess et al., 2021; Imran et al., 2022; Jost et al., 2017; Konopasek et al., 2014; Mahaffey Harmon & Thompson, 2015; McCartney & Boschmans, 2020; Powers et al., 2020; Radomski & Russell, 2010; Titzer et al., 2012; Ulfa et al., 2021; Yaqoob et al., 2021; Zagury-Orly et al., 2022), seven online teaching (Edelbring et al., 2018; Floren et al., 2020; Gruenberg et al., 2020; Kang & Kang, 2022; Kiesewetter et al., 2022; Sukumar et al., 2021) and seven a combination (Dong et al., 2021; Gong et al., 2022; Hanum & Findyartini, 2022; Ong et al., 2022; Raupach et al., 2009; Ryan et al., 2004; Weidenbusch et al., 2019).

*CCR learners* refer to the students learning CCR. They consisted of intraprofessional (Nawabi et al., n.d.; Alizadeh et al., 2017; Berger et al., 2022; Berndt et al., 2015; Brich et al., 2017; Bucknall et al., 2016; Burgess et al., 2018; Burgess et al., 2021; Dong et al., 2021; Edelbring et al., 2018; Gong et al., 2022; Gruenberg et al., 2020; Imran et al., 2022; Jost et al., 2017; Kiesewetter et al., 2022; Konopasek et al., 2014; Mahaffey Harmon & Thompson, 2015; McCartney & Boschmans, 2020; Ong et al., 2022; Radomski & Russell, 2010; Raupach et al., 2009; Ryan et al., 2004; Sukumar et al., 2021; Ulfa et al., 2021; Weidenbusch et al., 2019; Yaqoob et al., 2021) and interprofessional (Berger et al., 2022; Burgess et al., 2020; Floren et al., 2020; Hanum & Findyartini, 2022; Kang & Kang, 2022; Powers et al., 2020; Titzer et al., 2012; Zagury-Orly et al., 2022) student groups. The majority of the CCR learners were either medical (Alizadeh et al., 2017; Berger et al., 2022; Brich et al., 2017; Burgess et al., 2018; Burgess et al., 2020; Burgess et al., 2021; Edelbring et al., 2018; Floren et al., 2020; Gong et al., 2022; Gruenberg et al., 2020; Hanum & Findyartini, 2022; Imran et al., 2022; Jost et al., 2017; Kang & Kang, 2022; Kiesewetter et al., 2022; Konopasek et al., 2014; Ong et al., 2022; Radomski & Russell, 2010; Raupach et al., 2009; Ryan et al., 2004; Sukumar et al., 2021; Weidenbusch et al., 2019) or nursing students (Berndt et al., 2015; Bucknall et al., 2016; Hanum & Findyartini, 2022; Kang & Kang, 2022; Mahaffey Harmon & Thompson, 2015; Powers et al., 2020; Titzer et al., 2012). In addition, the CCR learners included students studying: midwifery (Ulfa et al., 2021), pharmacy (Floren et al., 2020; Hanum & Findyartini, 2022; McCartney & Boschmans, 2020), dentistry (Nawabi et al., n.d.; Hanum & Findyartini, 2022), physical therapy (Burgess et al., 2020; Yaqoob et al., 2021), bachelor programme in interprofessional health care (IPG) (Berger et al., 2022), public health (Hanum & Findyartini, 2022), nutrition (Hanum & Findyartini, 2022) and occupational therapy/health (Hanum & Findyartini, 2022; Titzer et al., 2012), environmental health (Hanum & Findyartini, 2022), radiologic technology and associate respiratory therapy (Titzer et al., 2012).

*Pre-conditions for learning CCR*

The pre-conditions for learning CCR were described using the following categories: 1) the learning situation when learning CCR, 2) interaction when learning CCR and 3) clinical context when learning CCR (Figure 2).

*The learning situation when learning CCR* was described using the following sub-categories: 1) the pedagogical framework of the learning situation, 2) the theoretical preparation of students before the learning situation, 3) student grouping in the learning situation and 4) student roles in the learning situation.

*The pedagogical framework of the learning situation* refers to the planning of the learning process enabling the learning of CCR. A structure used to guide the dialogue during the teaching session would be the support of peer interaction aimed at helping to construct new information (Dong et al., 2021; Floren et al., 2020; Kang & Kang, 2022; McCartney & Boschmans, 2020). In addition, flexible pedagogical approaches during the session encourages the students to interact (Edelbring et al., 2018). By enabling interaction between students, opportunities for learning CCR can be created (Bucknall et al., 2016; Burgess et al., 2018; Burgess et al., 2020; Edelbring et al., 2018; Mahaffey Harmon & Thompson, 2015; McCartney & Boschmans, 2020; Radomski & Russell, 2010; Raupach et al., 2009; Ryan et al., 2004; Weidenbusch et al., 2019). A standardized method of learning was favoured by the students (Burgess et al., 2018), as a set time limit resulted in a more productive behaviour during the session (Edelbring et al., 2018).

*The theoretical preparation of students before the learning situation* seems to enhance the process of learning, collaboration and applying theoretical information into CCR (Berndt et al., 2015; Burgess et al., 2018; Burgess et al., 2020; Dong et al., 2021; Gruenberg et al., 2020; Powers et al., 2020; Titzer et al., 2012; Ulfa et al., 2021). During the theoretical preparation, several methods have been utilized: for example individual and team tests (Burgess et al., 2018; Burgess et al., 2020), board games (Powers et al., 2020) and case presentations (Weidenbusch et al., 2019).

*Student grouping in the learning situation* refers to forming groups that function well together. It might be helpful to combine students who know each other's capabilities beforehand (Bucknall et al., 2016). Moreover, a smaller group might be a good choice since it was seen to be more conducive and appeared to motivate students to prepare better in advance (Burgess et al., 2018; Burgess et al., 2021; Sukumar et al., 2021).

*Student roles in the learning situation* refers to the pre-assigning of roles. A higher level of learning regards CCR seemed to result from planning an active role for the students (Berndt et al., 2015; Burgess et al., 2018; Dong et al., 2021; McCartney & Boschmans, 2020; Powers et al., 2020; Radomski & Russell, 2010; Ulfa et al., 2021; Weidenbusch et al., 2019) which led the students to contribute in the collaborative learning (Nawabi et al., n.d.; Ulfa et al., 2021). Being able to act independently and take the role of a professional was observed to enhance the preparation level, learning and CCR (Burgess et al., 2018; Powers et al., 2020). It also helped to adopt a new role as a healthcare professional (Hanum & Findyartini, 2022; Konopasek et al., 2014; Radomski &

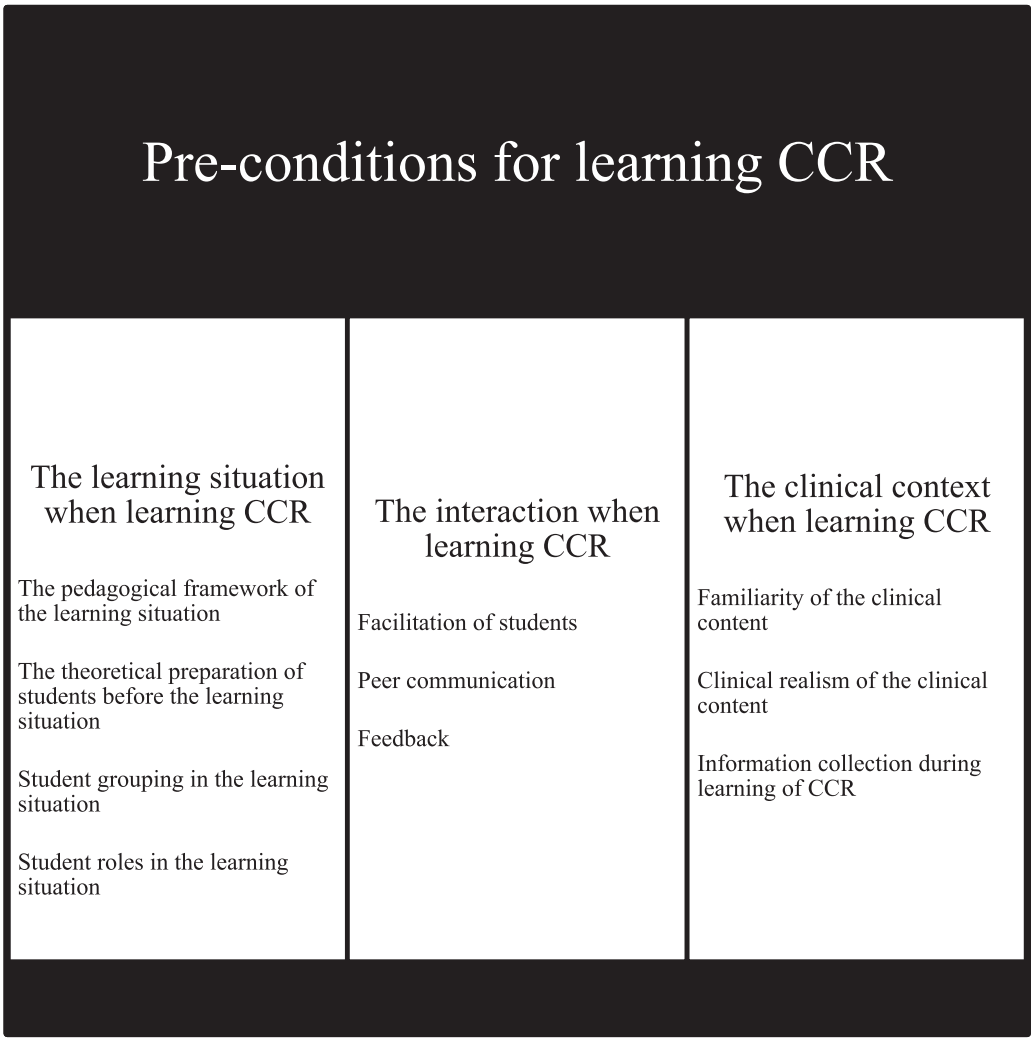


**Fig. 2.** Pre-conditions for learning CCR.

Russell, 2010) and to clarify the roles of other professionals in interprofessional context (Hanum & Findyartini, 2022). Furthermore, the observer role was also found an active means of learning (Berndt et al., 2015; Powers et al., 2020; Radomski & Russell, 2010).

*The interaction when learning CCR* was described using the following sub-categories: 1) facilitation of students, 2) peer communication and 3) feedback.

*Facilitation of students* refers to a sufficient guidance from the facilitator (Floren et al., 2020; Weidenbusch et al., 2019); the role of the facilitator is to guide and evaluate the communication of the students, resolve conflicts if needed and summarize the key points of the theoretical content (Burgess et al., 2018; Burgess et al., 2021; Dong et al., 2021; Kang & Kang, 2022; Radomski & Russell, 2010; Ryan et al., 2004; Sukumar et al., 2021; Weidenbusch et al., 2019; Zagury-Orly et al., 2022), yet encourage the students to take the initiative in learning (Dong et al., 2021). In addition, the clinical expertise of the facilitator is vital in correcting the possible misconceptions the students might encounter (Burgess et al., 2018; Kang & Kang, 2022; Ryan et al., 2004; Weidenbusch et al., 2019; Zagury-Orly et al., 2022). The use of interprofessional facilitators promotes learning from different perspectives (Burgess et al., 2020; Powers et al., 2020).

The facilitator can provide a constructive learning environment that will encourage student's independence, confidence and CCR (Bucknall et al., 2016; Burgess et al., 2018; Powers et al., 2020; Radomski & Russell, 2010; Ryan et al., 2004). This could also be supported by allowing the students to explore different options (Powers et al., 2020; Titzer et al., 2012) and to justify their reasoning (Zagury-Orly et al., 2022). Finally, the learning intervention should be closed with a debriefing, concluding the CCR and the clinical content of the interaction (Alizadeh et al., 2017; Berndt et al., 2015; Kang & Kang, 2022; Konopasek et al., 2014; Weidenbusch et al., 2019).

*Peer communication* between the students is essential when learning CCR (Berger et al., 2022, Bucknall et al., 2016, Burgess et al., 2018, Burgess et al., 2020, Edelbring et al., 2018, Mahaffey Harmon & Thompson, 2015, McCartney & Boschmans, 2020, Radomski & Russell, 2010, Raupach et al., 2009, Ryan et al., 2004, Ulfa et al., 2021, Weidenbusch et al., 2019). The students described the peer interaction as consisting of the following elements: preparing together, listening to different approaches and solutions, asking for help and completing each other's knowledge gaps, correcting their own mistakes, sharing the responsibility of solving complex problems, supporting each other and even competing in a collegial manner (Nawabi et al., n.d.; Bucknall et al., 2016; Burgess et al., 2018; Edelbring et al., 2018; Gruenberg et al., 2020; McCartney & Boschmans, 2020; Powers et al., 2020; Radomski & Russell, 2010; Raupach et al., 2009; Zagury-Orly et al., 2022). Peer interaction was noted as a highly important and motivating part of the learning process (Berndt et al., 2015; Burgess et al., 2018; Burgess et al., 2020; Gong et al., 2022; Imran et al., 2022; McCartney & Boschmans, 2020; Powers et al., 2020; Radomski & Russell, 2010; Titzer et al., 2012; Ulfa et al., 2021; Weidenbusch et al., 2019; Yaqoob et al., 2021) and it

also resulted in more productive working and the generation of broader and more complex knowledge (Berger et al., 2022; Bucknall et al., 2016; Burgess et al., 2018; Dong et al., 2021; Gong et al., 2022; Ong et al., 2022; Radomski & Russell, 2010; Ryan et al., 2004; Ulfa et al., 2021; Zagury-Orly et al., 2022). Interprofessional student groups can create an opportunity to learn from diverse perspectives, teamwork skills and thus enabling interprofessional CCR both in clinical and ethical dilemmas (Berger et al., 2022; Burgess et al., 2018; Kang & Kang, 2022; Powers et al., 2020; Titzer et al., 2012).

*Feedback* refers to receiving and giving feedback during the intervention. Timely feedback from the facilitator on the clinical content as well as the reasoning process is pivotal to improving communication and CCR (Nawabi et al., n.d.; Alizadeh et al., 2017; Burgess et al., 2018; Burgess et al., 2020; Burgess et al., 2021; Konopasek et al., 2014; Powers et al., 2020; Sukumar et al., 2021). In addition, feedback from peers (Dong et al., 2021; Konopasek et al., 2014; Powers et al., 2020; Yaqoob et al., 2021) and the patient (Konopasek et al., 2014), if possible, were found beneficial, as well as guided self-evaluation and reflection of the learning process (Dong et al., 2021; McCartney & Boschmans, 2020). The feedback needs to be accurate and constructive (Burgess et al., 2018).

*The clinical context when learning CCR* was described using the following sub-categories: 1) familiarity of the clinical content, 2) clinical realism of the clinical content and 3) information collection during the CCR learning process.

*Familiarity with the clinical content* is vital when learning CCR (Burgess et al., 2018; Edelbring et al., 2018; Hanum & Findyartini, 2022; McCartney & Boschmans, 2020; Raupach et al., 2009; Ulfa et al., 2021). Lack of theoretical knowledge of the clinical situation results in detrimental decisions and lower performance and vice versa (Bucknall et al., 2016; Raupach et al., 2009). In interprofessional learning interventions, the content should be familiar and relevant to all students (Burgess et al., 2020; Hanum & Findyartini, 2022) and the roles of different professionals should be clearly stated (Hanum & Findyartini, 2022).

*The clinical realism of the clinical content* seems to improve both the learning and the dialogue (Bucknall et al., 2016; Burgess et al., 2021; Edelbring et al., 2018; Powers et al., 2020). Realism can be achieved by for example creating scenarios that illustrate real-life situations that the students encounter in clinical practice, for example utilizing actual people as patients and the use of authentic healthcare collaborators unknown to the students (Bucknall et al., 2016; Powers et al., 2020; Ryan et al., 2004; Sukumar et al., 2021).

*Information collection during the learning of CCR* refers to enabling the search for cues from various sources during the intervention. Being able to access a wide-range of information seemed to assist the students in their endeavours to CCR and it helped to identify knowledge gaps (Bucknall et al., 2016; Edelbring et al., 2018; Radomski & Russell, 2010). The students utilized various sources to obtaining information: patient observation and interviews, from patient charts, by physical examinations, from peers and the facilitator and finally from web-based, video- and textbook format sources (Bucknall et al., 2016; Dong et al., 2021; Edelbring et al., 2018; Radomski & Russell, 2010; Sukumar et al., 2021; Weidenbusch et al., 2019; Zagury-Orly et al., 2022).

## Discussion

The results indicate that CCR can be learned utilizing various pedagogical methods that include collaborative problem solving. The learning can occur in a traditional classroom environment and the majority of studies applied this approach. However, the growing need for remote and online learning (Suliman et al., 2021) as well as extended reality pedagogical solutions (Koivisto et al., 2018) indicate that there is a need for further research exploring the feasibility and effectiveness of these methods. Another factor to be considered is the combination of the learners. A possibility to practice interprofessional CCR should reflect clinical realism (Arulappan et al., 2021; Seif et al., 2014) and offer an opportunity to take a role of a healthcare professional in a safe environment.

The preconditions when learning CCR reveal that there are several issues that need consideration before, during and after the learning situation in order to enrich both the CCR learning experience and the involvement of the students. The pedagogical competence of the facilitator responsible for planning and executing the intervention is crucial. A structured learning situation with a familiar clinical content seems to reinforce peer interaction (Floren et al., 2020; McCartney & Boschmans, 2020), vital for learning CCR. Nonetheless, even if the facilitator has a high level of pedagogical competence, it is not sufficient if not accompanied with appropriate clinical competence (Burgess et al., 2018; Ryan et al., 2004; Weidenbusch et al., 2019).

When learning CCR, the learning situation needs to be accompanied by a clinical content that reflects a realistic context (Bucknall et al., 2016; Edelbring et al., 2018; Powers et al., 2020). However, there are some limitations that are solely dependent on CCR learners. The content needs to be relevant for all the learners to enable the learning of CCR (Burgess et al., 2018; Burgess et al., 2020; Edelbring et al., 2018; McCartney & Boschmans, 2020; Raupach et al., 2009). It seems that in the previous theoretical studies, understanding the responsibilities of other disciplines (Bucknall et al., 2016) and the experience of the participants as regards clinical practice to guide their decision-making and the ability to learn CCR. This might prove to be a challenge especially in interprofessional CCR learning situations. Many clinical situations occur within an interprofessional team of healthcare professionals, and the IPEC core competencies for interprofessional collaborative practice (Interprofessional Education Collaborative (IPEC), 2016) are seen as a part of the pre-conditions for learning CCR. For example, these include being able practice how to take the responsibility of a healthcare professional, communicating and working in this role as a part of a team.

Future healthcare professionals will encounter complex clinical situations and will need to be able to make decisions in difficult situations employing good collaboration, whilst being pressured on time (Huang et al., 2018; Kiesewetter et al., 2017; Radkowitsch et al., 2020; Taylor et al., 2021). However, difficulty of educating healthcare students in larger groups, online and with diminishing resources is a challenge faced in many countries (Suliman et al., 2021).

### *Limitations*

There are a few limitations to considering this review. First, the data searches only resulted studies written in English which might indicate that the search might have omitted some relevant studies. Second, the appraisal of the studies resulted a conclusion that a significant part of the studies had moderate or low methodological quality. Third, the qualitative contents analysis method is vulnerable to the influence of the researcher. This was considered within the research group.

### *Implications for nursing education*

This article introduces the characteristics of and preconditions for learning CCR in healthcare education based on existing evidence, which provides the opportunity to create learning interventions that enhance learning of CCR. The planning begins with defining the theoretical framework and the clinical content of the learning situation followed by organising appropriate theoretical preparation for the students. Also, student groups and roles represent an important decision that affects the learning outcomes. During the learning situation it is crucial to enable peer-communication and feedback, as well as act as a guiding facilitator of the situation.

## Conclusions

The results of this review show that the ability to CCR has been addressed in healthcare education using variety of learning methods

with different combinations of healthcare students. There are pre-conditions precise for learning CCR, which need to be considered before, during and after the learning situation. These findings indicate that there is a reasonable demand for future research aiming to explore how they are considered when developing evidence-based, effective yet innovative interventions for learning CCR.

## Declaration of competing interest

None.

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