

Enhancing Clinical Reasoning Skills through Structured Reflection Models

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Abstract

Background:

Clinical reasoning is an essential skill to all health care practitioners. McGlynn et al, 2015 mention that lower level of clinical reasoning skills are associated with higher rates of medical and diagnostic errors.. To enhance the clinical reasoning through reflection Hamad Medical Corporation (HMC) – Qatar established a new educational initiative under the title of reflective learning conversation and debriefing.

Method:

A prospective cross sectional exploratory of mixed methodology research conducted at Qatar- Hamad Medical Corporation (HMC) – In the critical care and trauma units. Anonymous self-reported questionnaires were collected from 236 critical care and trauma nurses who attended the reflective learning conversation and debriefing activities. Semi structured Interviews conducted for 10 nurses who facilitated the reflective learning conversation and debriefing activities. Content analysis and thematic analysis were applied.

Results:

Attending the reflective learning conversations and debriefing educational activities have a significant positive impact on the clinical reasoning skills of the critical care and trauma nurses. Moreover, attending the group level reflection, feeling threatened, are limitations and barriers for the reflective learning conversation and debriefing. Additionally, reflective practice can be encouraged and enhanced through; having reflective conversation and debriefing models and guidelines, and reflecting on both good and bad experiences.

Conclusion:

There is a positive correlation between the clinical reasoning and the structured reflections in the format of reflective learning conversation and debriefing. Reflective practice can be enhanced through attending the reflective learning conversation and debriefing activities. There are some limitations and challenges to the reflective learning conversation and debriefing method.

Background

Hamad medical corporation (HMC)-Qatar introduced a new educational method under the title of reflective learning conversation and debriefing. That method was established to enhance the clinical reasoning and reflective practices of the critical care and trauma nurses. To explore this new educational method, explorative cross sectional mixed methodology research was conducted. A thorough literature review was established to formulate the research questions which are;

- What is the effect of the structured reflection models on the clinical reasoning skills of the critical care practitioners in critical care and trauma clinical settings?
- What are the barriers and limitations of using structured reflection models to enhance clinical reasoning skills of the critical care practitioners in critical care and trauma clinical settings?
- How the reflective practice can be encouraged and facilitated at the critical care and trauma clinical settings?

Reflection and health care education

Merriam& Caffarella, 1991 discuss that reflection is a method to promote active learning, as learners become actively involved in higher order of thinking, and they need to use their skills to understand, analyse, articulate, and evaluate. This

is achievable through having healthy purposeful 'learning conversations' which gives opportunities for learners to explore their values and to gain new evidence based learning. Forneris and Peden-McAlpine, 2006 support Merriam and propose that reflection enhances workers' critical thinking, creates healthy learning environments, and promotes collaborative learning. Koole et al, 2011 echoes previous studies that reflection on experience is essential to promote lifelong learning, and this also is supported by Lobol et al, 2013 who comments that reflective practice helps health practitioners to turn each experience to another learning experience as lifelong learning.

Moon, 2007 finds that reflective practice enhances learning metacognition while Davies, 2012 comments that 'reflective conversations enhance deep approach of learning, learner- centeredness, self- directed learning'. Herrington & Reeves 2012 suggest that reflective activities that integrate reflective conversations are essential to create authentic learning environments. Wells & Brook, 2014 and Herrington et al., 2014 discuss reflective approaches as an element to enhance authentic learning which enables learners to reflect through intentional learning

Bonwell and Eison, 1991 mention that 'active learning and teaching strategies can be achieved through questions, reflective activities, and reflection on small group discussions'. Kolb (1994) support Bonwells' findings and discusses the strategies for effective teaching and learning where one of those methods is reflective group discussions and dialogues.

Schön, 1984 indicates that reflective learning discussions and debriefing are tools to bridge the gap between theory and practice. Anseel et al., 2009 describe debriefing as 'an effective learning method for learning-oriented tasks and active learning'. Dreifuerst, 2010, Burns, 2015, and Kuiper et al., 2008 concur with previous studies and suggest that structured debriefings as effective for method of learning and teaching. Prilla & Renner, 2014 indicate that debriefing on face-to face approach is effective to enhance collaborative active learning.

Ryan, 2013 suggests that reflective learning and reflective learning conversations could enhance transformative learning. Ryan describe transformative learning as 'lifelong learning and to facilitate changes for improvement in critical review'. Ryan also indicates that, "In treating 'self' as a subject of critical study in relation to others and the contextual conditions of study or work, 'lifelong learning' can be fostered". KING,2005 comments on the transformative learning as "transformative learning is the process of meaning-making that adults navigate as they critically reflect on their values, beliefs, and assumptions and consider fundamentally new". Taylor & Hamdy, 2013 concur with King that there is an interchangeable relationship between critical reflection activities and transformative learning as themes and principles of transformative learning can be 'implemented and achieved through reflective learning activities, as reflective practice, reflective learning conversations, as well as, collaborative reflections'.

Lobo1 et al., 2013 mention that reflection can be practiced in different forms both, written or verbal. Tan, Cashell & Bolderston, 2012 indicated that there are many ways to apply and practice reflective learning and this is achievable through reflective leaning dialogues, questions and debates

The literature review reveals that the reflective conversations, debriefing, and collaborative reflection have a positive impact on active learning, learner-centeredness, self-directed learning, transformative learning, lifelong learning, critical thinking, clinical reasoning , deep learning, collaborative learning, professional development, and learning and teaching effectiveness.

Reflection and clinical reasoning

Scheffer & Rubenfeld, 2000 suggest that critical thinking and reflective skills are integral aspects of the clinical reasoning process where the critical reflective thinkers are confident, creative, flexible, and intuitive. Furthermore, reflective thinkers have advanced skills of analysing, applying, clinical judging, and transforming knowledge. Atkinson and Nixon-Cave, 2011 discuss that more emphasis is being placed on the process of clinical decision - making and reflection to enhance

and improve the clinical reasoning skills. Mamede et al., 2014 agree with Atkinson and comments that structured reflection in the context of clinical reasoning has a focus on the problem-solving, analytical skills, and prioritising process.

Guerrasio & Aagaard, 2014, Posel et al., 2014, and Chamberland et al., 2015 discuss that clinical reasoning can be optimised through remembering and facing patient encounters, reflective practice, and reflective learning conversations. These studies are supported by the study of Olle et al., 2018 who brings that, an effective clinical reasoning process should incorporate analytical reflective mental process. Razieh et al 2018., highlight that 'reflection-structured reflection improves the clinical decision-making of the critical care nurses, and it should be integrated into all health care practices and nursing clinical teaching plans'. Schmidt and Mamede 2015 comments that 'deliberate reflection' as a tool for learning and teaching clinical reasoning skills for health care practitioners.

The current literature presents that the clinical reasoning skills have a dynamic and interactive relationship with the critical thinking and reflection process of the health care practitioners and it is recommended to incorporate the clinical reasoning into the structured reflective learning conversations

Method

This research adopted the pragmatic research paradigm for a prospective explorative cross sectional mixed methodology research which aims to answer three research questions:

- What is the effect of structured reflection models on the clinical reasoning skills of the critical care practitioners in critical care clinical settings?
- What are the barriers and limitations of using structured reflection models to enhance clinical reasoning skills of the critical care practitioners in critical care clinical settings?
- How reflective practice can be encouraged and facilitated at critical care clinical settings?

The nature of each research question was examined, and some of the questions have a qualitative nature and the others are qualitative in nature. To answer all research questions effectively, the pragmatic paradigm was adopted. Dudovskiy, 2016, & Kivunja and Kuyini, 2017 discuss that pragmatic paradigm is an integration of the quantitative and qualitative methods as "multistrand-conversion-concurrent design". Shannon-Baker, 2016 mention that "pragmatism breaks down the hierarchies between qualitative and quantitative ways of knowing in order to look at what is meaningful from both". Additionally, Morgan, 2007 discusses that pragmatism reduces the dissociation between "complete objectivity" and "complete subjectivity" which acts as complementarity joint format.

Data collection methods:

In this research two data collection strategies were applied. The first data collection strategy is a survey questionnaire, and the second is a focus group interview. The questionnaire strategy was selected as this research uses a mixed methodology, and the literature reflects that the survey questionnaire is an appropriate data collection strategy for the mixed methodology design with large research sample size. Kivunja and Kuyini, 2017, Shannon-Baker, 2016, and Dudovskiy, 2016 discuss that the questionnaire/survey is a suitable strategy to obtain data for both quantitative and qualitative researches. However, it is chiefly quantitative.

Self-reported questionnaire was designed, and then reliability and validity were tested. The questionnaires were completed by 236 critical care nurses at Hamad Medical Corporation HMC /Medical Critical Care and Trauma Critical Care Units. Information sheet, participant's rights, and ethical approval letters have been provided to all research participants. A hard copy of the questionnaire was given to the participants, who achieved the inclusive criteria, and two weeks duration was

given to complete the questionnaire. Participants were asked to put the completed questionnaires anonymously inside a monitored and secured sealed research box which is available inside each unit.

The second data collection strategy was the focus group interview. This strategy was selected because it is appropriate strategy for the mixed methodology research designs.. Moreover, this strategy is appropriate to get data from small research sample size. Abdul Rahman et al, 2018 and Flynn and Korcuska, 2018 discuss that focus group method is an appropriate strategy to be used in the mixed methodology researches and pragmatic paradigms. That was supported by Kivunja and Kuyini, 2017 , Shannon-Baker, 2016, and Dudovskiy, 2016 comment that focus group is a suitable strategy to obtain data for qualitative research and for mixed methodology, and to get data from small number of participants.

The focus group sample of this study was the reflective learning facilitators who exposed to facilitate the reflective learning conversation and debriefing sessions, and who are working in Medical ICU and Trauma ICU, and who have facilitated at least 10 reflective sessions to ensure having satisfactory exposure level. Semi structured interview was conducted for a total of 10 facilitators, and the interview process was stopped when we reached the data saturation level.

Questionnaire design

To my knowledge, this is the first study to report the validity and reliability testing of a questionnaire to assess structured reflective models effect on clinical reasoning skills in critical care clinical settings. The questionnaire was designed based on a thorough literature review. A total of (236) critical care nurse out of (300) nurses completed the questionnaires with response rate of 79%. The questionnaire validity and reliability were tested and assured. The questionnaire validity and reliability were tested through piloting the questionnaire to 20% of the sample size.

The first questionnaire considered the demographic questions about; (gender, work experience in critical care, times of attending reflective learning conversation and debriefing activities, attending reflective sessions as facilitator, and times of being reflective session facilitator), and these were added to questionnaire to understand the influence of them on the study results.

The second questionnaire section was designed as 22 questions which were sub-scaled into four dimensions: (impact of structured reflection models on clinical reasoning, benefits of attending structured reflection models, barriers of attending structured reflection models, and enhancement methods of reflective learning conversation and clinical reasoning skills). Each item was scored from 1-5 based on a five-point of Likert's scale (Strongly disagree=1, disagree=2, neutral=3, agree=4 and strongly agree=5). However, there were four negatively worded sentences which were scored inversely, and the presence of these negatively worded was made intentionally to strength the questionnaire and to enhance the reliability and validity levels.

Questionnaire validity

Based on the studies by Wong et al, 2012, Norland-Tilburg, 1990, and Sangoseni et al., 2013, Hosseini et al., 2015, and Ayre and Scally, 2014, face validity, theoretical construct, and content validity were assessed by eight educationalists (experts) who are working at Hamad Medical Corporation/ QATAR as educational planners and curriculum designers. The questionnaire face validity was tested by those experts by writing down their comments about items; placement, scaling, flow of information, and grammatical structure. Moreover, the content validity was assessed by those experts by reviewing the questionnaire, and to assess (relevancy, clarity, simplicity, and necessity) of each item, and content validity ratio (CVR) and index (CVI) were calculated for all questions and to exclude any unnecessary questions. Refer to appendix (12.1) and (12.12). Based on Hosseini et al, 2015 the expert review was categorised as (essential, useful but not essential, not essential), and calculated based on the following formula:

$$CVR = \frac{\text{Number of experts who choose "essential"} - \text{Total number of experts}}{2}$$

Total number of experts /2

To decide on minimum acceptable CVR value a study by Ayre and Scally, 2014 found that for a panel of eight experts CVR should be a minimum of 0.75. Refer to appendix (12.2). Furthermore, Content Validity Index (CVI) was used based on Waltz, Bausell, 1981, and Plichta and Kelvin, 2012 recommendations. In content validity index, each statement was scored based on four point ranking scale in the field of relevancy, simplicity and clarity as;(1= irrelevant, 2= relatively relevant, 3= relevant and 4= highly relevant), and CVI was calculated by the following formula, $CVI = \frac{\text{Number of experts who give 3 or 4}}{\text{Total number of experts}}$, and according to Plichta and Kelvin, 2012 CVI value of equal or more than 0.79 is acceptable. Refer to appendix (12.2).

Questionnaire reliability

Daly and Bourke.2000 defined *reliability* as “the extent to which measurements can be replicated”. In this study the questionnaire reliability process was achieved in different statistical measurements which are: internal consistency reliability which was measured by Cronbach’ alpha, test-retest reliability which was measured by Pearson’s correlation, and interrater reliability analyses which was measured by intra-class correlation coefficient (ICC).

McIntire, Miller 1999 found that reliability of Cronbach alpha is an appropriate test of internal consistency for research questionnaire with multiple dimensions, and that is applied for the questionnaire of this study. McIntire, Miller 1999 reported that Cronbach’s alpha must be 0.70-0.80 for adequate and good internal consistency.

The second reliability test was the correlation test- retest (Pearson’s test) as McIntire and Miller 1999 commented that test-retest reliability involves administering the same measure to the same group of test-takers under the same conditions on two different occasions and correlating the scores , a Pearson’s is a test-retest for correlation . Koo and Li, 2016 reported that test retest is valid test for self- report survey instruments. Hogan, 2007 found that the value for a Pearson’s coefficient(r) value can fall between 0.00 which reflects (no correlation), and 1.00 which reflects a (perfect correlation). Evans 1996 reported that the (r) value which falls between (0 .00-0.19) reveals a “very weak” correlation, and the value of (0 .20-0.39) reveals a “weak” correlation, and the value of (0 .040-.59) reveals a “moderate” correlation, and the value of (0 .60-0.79) reveals a “strong” correlation, and finally the value of (0 .80-1.0) reveals a “very strong” correlation.

The third reliability test was the intra-class correlation coefficient Classification ICC. Koo and Li, 2016 mentioned that the Intra class correlation coefficient (ICC) is “a widely used reliability index in test-retest, intrarater, and interrater reliability analyses” and it reflects “measurement agreement”. Dwyer et al, 2011 and Singh,et al 2011 found that the intra-class correlation coefficient classification (ICC) of reliability was interpreted as: ‘poor’ (≤ 0.40), ‘moderate’ (0.41-0.60), ‘good’ (0.61-0.80) or ‘excellent’ (≥ 0.81).

Reliability tests were started by piloting 20% of total research questionnaires. The piloting reliability tests were successful by passing the minimum values to confirm adequate level of reliability. Moreover, the final reliability tests for all collected questionnaires were calculated, and there was a significant improvement at reliability values, and that improvement was achieved because of higher number of questionnaire involvement, and details of reliability tests will be discussed later in this article.

Focus group method

Based on literature search, reviewing the findings from existing literature and highlighting any gaps in the current research, a nine semi-structured interview questions were developed and focus group interviews were applied for two groups of five reflective learning and debriefing facilitators. Moreover, the focus group interview questions were reviewed and assessed by eight expert educationalists who are working at Hamad Medical Corporation/ QATAR as educational planners and curriculum designers. Refer to attached appendix (12.11)

Focus group research information sheet, participant’s rights, and ethical approval letters have been provided to all research interviewees, and expert educator was invited to moderate the interview process. The interviews were stopped when data saturation level achieved and that was with second focus group as no new information obtained and repetition of information observed. Focus group data were audio recorded and saved in principal investigator computer as password protected. Transcripts were reviewed and checked by the participants, and a quotation process for each participant was applied. Transcript of interviews initiated and thematic coding approach achieved by cutting and sorting, and words repetition techniques. Themes and subthemes were derived, and details of this will be discussed in data analysis chapter.

Results

Focus group themes and questionnaire subscales

As table (1) shows four themes were derived from the focus group data which were:

- Relationship between reflective learning conversation and clinical reasoning skills
- Benefits of attending reflective learning conversation and debriefing,
- Barriers of attending reflective learning conversation and debriefing,
- Enhancing reflective learning conversation and debriefing.

The first theme was sub-themed into two elements; reflective learning as effective learning and teaching method, how reflective learning conversations can enhance the critical care nurses clinical reasoning skills. The second theme was sub-themed to three elements; professional development, evidence based practice, and clinical skills. The third theme was sub-themed to three elements; environmental, psychological, and technical barriers. The fourth theme was sub-themed to four elements; structured versus non structured reflection, reflection on bad versus good experiences, reflective conversation timing, and enhancing the facilitator role.

Table (1) Focus group themes and sub-themes

Themes	Sub-themes
Relationship between reflective learning conversation and clinical reasoning skills	<ul style="list-style-type: none"> - Reflective learning as effective learning and teaching method - How reflective learning conversations can enhance critical care nurses clinical reasoning skills
Benefits of attending reflective learning conversation and debriefing,	<ul style="list-style-type: none"> - Professional development - Evidence based practice - Clinical skills
Barriers of attending reflective learning conversation and debriefing	<ul style="list-style-type: none"> - Environmental barriers - Psychological barriers - Technical barriers
Enhancing reflective learning conversation and debriefing	<ul style="list-style-type: none"> - Structured versus non structured reflection - Reflection on bad versus good experiences - Reflective conversation timing - Enhancing the facilitator role

Moreover, the questionnaire was sub-scaled into four domains:

- Impact of structured reflection models on clinical reasoning
- Benefits of attending structured reflection models
- Barriers of attending structured reflection models
- Enhancement methods of reflective learning conversation and clinical reasoning skills

Questionnaire demographic data analysis

The demographic data in the survey includes the (gender, work experience in critical care, times of attending reflective learning conversation and debriefing activities, attending reflective sessions as facilitator, and times of being reflective session facilitator), and this kind of data help to assess whether there is a difference in understanding between different groups of participants (based on their demographic data) and this may influence or cause variations in the results of the survey.

Demographic analysis shows that study sample has good distribution between males and females with percentage of 40% and 60% respectively. (Figure, 1)

30% of study sample were juniors critical care nurses while 65% were seniors and this could help to know the point of view for junior and senior nurses about reflective activities. See figure (2)

70 % of critical care practitioners attended 5-10 times reflective learning conversation and debriefing sessions which reflects a good exposure level to reflective leaning process, and this could enrich the study data and validity of obtained information. See figure (3)

20% of the sample had the experience of being reflective activity facilitator/Moderator which strengths the study by adding senior educational point of view. See Figure (4)

Questionnaire subscale- Domain 1; (Impact of structured reflective learning conversation and debriefing on clinical reasoning)

As discussed previously reliability was tested by Cronbach alpha, intra-class correlation ICC, and Persons correlation. Moreover, validity was tested by face and content validity which achieved by calculating CVR, CVI. The first study subscale of this study is; impact of structured reflective learning conversation and debriefing on clinical reasoning skills, and this subscale has two variables as the table below shows:

Table (2) Descriptive Statistics (Subscale- Domain1)

Variables	Mean	Std. Deviation	N	CVR	CVI	% Agree-strongly agree by (Participants)
1) Attending reflective learning conversation and debriefing activities impacted positively on my clinical reasoning skills	4.3686	.54158	236	0.1	0.1	99%
2) Frequent and continuous attendance of reflective learning conversation and debriefing activities is important to enhance my clinical reasoning skills	4.3559	.65266	236	0.1	0.1	98%
	4.356	0.596	236			

Over all values

CVR: Content Validity Ratio, CVI: Content Validity Index

Table (3) Reliability Statistics (Subscale- Domain1)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Item Means	Inter-Item Correlations Pearson test	intra-class correlation coefficient (ICC)	95% CI Lower bound	95% CI Upper bound	Sig. (2-tailed)	N of Items
.753	.761	4.356	.614	.753	.681	.809	.000	2

For all the variables of (Domain-subscale-1) the CVR=0.1, and CVI=0.1 which reflects significant content validity of subscale 1. Moreover, the five item Likert scale for (Domain-subscale-1) shows adequate internal consistency reliability with a Cronbach's coefficient alpha of $\alpha = 0.753$. Furthermore, ICC = 0.753 with 95% confident interval = 0.681-0.809 which reflects good level of reliability. The $r = .614$, $n = 236$, and $p \text{ value} = .000$ reflects significant strong positive correlation between the two variables of subscale (Domain 1) at 61.4%. Refer to table 2& 3

As the above table of (Domain-subscale1) shows for sample size ($n = 236$) the overall item mean ($M = 4.356$) and Std. Deviation = 0.596. Additionally, the mean and standard deviation for the two subscale variables are almost similar with no significant differences as for the variable of "attending reflective learning conversation and debriefing activities impacted positively on my clinical reasoning skills", the ($M = 4.3686$; Std = 0.617), and for the variable of "Frequent and continuous attendance of reflective learning conversation and debriefing activities is important to enhance my clinical reasoning skills" where the ($M = 4.3559$; Std = .65266) and these scores reflect that both variables clustered closely around the overall mean ($M = 4.3686$) and this gives evidence that the mean is representative for both variables of (Domain-subscale1). Refer to table 2& 3

On the other hand there is a high percentage of participant's agreement that reflective learning conversation and debriefing activities have a positive impact on critical care nurse's clinical reasoning skills and the agreement percentage ranges between (98% -99%) which represents the (agree- strongly agree) questionnaire category, and this agreement reflects a real participant's experience and understanding as they are regularly attending the reflective leaning conversations and debriefing activities. Refer to table 2& 3

Moving to the focus group findings which they show a significant alignment and correlation with the questionnaire data analysis findings which revealed that all interviewees agreed on the effectiveness of reflective learning conversations and debriefing as learning and teaching method, in addition to the positive impact of reflective learning conversations on clinical reasoning skills of critical care nurses. **p3**-“yes it will enhance clinical reasoning skills as each staff will learn from colleagues, it will also create wide circle of exposure to everyone, as if I have situation it will help my colleagues”. **p5**- “yes its very effective method of learning and teaching, especially to primary staff who are involved in direct patient care”. **p10**- “Yes, It improves clinical practice, nurse’s knowledge, critical thinking and reasoning, and ultimately patient’s outcome”. Refer to appendix (12.3 and 12.4).

In summary, the questionnaire and focus groups data reveal that frequent attendance of structured reflective learning conversations and debriefing activities have a significant positive impact on clinical reasoning skills of critical care nurses.

Questionnaire subscale- Domain 2; (benefits of attending structured reflective learning conversation and debriefing activities)

(Table 4) Descriptive Statistic(Subscale- Domain2)

Variables	Mean	Std. Deviation	N	CVR	CVI	% Agree- strongly agree by (Participants)
1) Structured reflective learning conversation and debriefing activities could enhance my competence level and reflective practice	4.3644	.56365	236	0.1	0.1	98%
2) Structured reflective learning conversation and debriefing activities could enhance my professional development	4.3602	.58486	236	0.1	0.1	97%
3) Structured reflective learning conversation and debriefing activities is a form of active and lifelong learning	4.3771	.55901	236	0.1	0.1	98%
4) Structured reflective learning conversation and debriefing activities is a method to apply evidence based practice	4.4322	.53759	236	0.1	0.1	99%

Table (5) Reliability Statistics (Domain 2)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Item Means	Inter-Item Correlations	intra-class correlation coefficient (ICC)	95% CI	95% CI	Sig. (2-tailed)	N of Items
			Pearson test		Lower bound	Upper bound		
.892	.891	4.383	.672	.892	.867	.913	.000	4

For all the variables of (Domain-subscale 2) the CVR=0.1, and CVI=0.1 which reflects that subscale 2 is valid. Moreover, the five item Likert scale shows adequate internal reliability with a Cronbach's coefficient alpha of $\alpha = 0.891$. Furthermore, ICC = 0.892 with 95% confident interval = 0.867-0.913 also reflects good level of reliability. The $r = .0672$, $n = 236$, and p value = .000 shows that there is significant positive strong correlation between the four subscale variables and the correlation ratio is 67.2%. Refer to table 4&5

The above table of (Domain-subscale 2) shows for $n = 236$ the overall item mean is (4.383) and Std. Deviation is (0.560) and the mean and standard deviation for all variables are almost similar with no significant differences which reflects mean is representative for all variables of (Domain-subscale 2). Refer to table 4&5

There is a high percentage of participant's agreement that attending structured reflective learning conversation and debriefing is beneficial to; improve critical care nurse's competence level (98) %, encourage professional development (97%), enhance critical care health care practitioner's lifelong learning (98%), and improve evidence based practices in critical care clinical settings of tertiary hospitals (99%). The agreement percentage ranges between (97% -99%) for all (Domain-subscale 2) variables which represents (Agree- strongly agree) category. Refer to table 4&5

Moving to focus group interviews which significantly support the quantitative data findings as the interviewees agreed that attending reflective learning conversation and debriefing activities enhances competence level (clinical skills), professional development, and evidence based practice) . p 2; "it will encourage nurses to improve clinical practices as we make them more empowered". P 1; "I found it very efficient to improve or change skill, practice or even attitude" .p 3; "it's done in clinical setting which is good to learn because evidence based support that any teaching bedside is highly effective". P6; "Yes, It helps in professional development and improves reasoning skills". Refer to appendix (12.3 and 12.4).

In summary, there is a general agreement between the questionnaire and focus group findings that attending structured reflective learning conversation and debriefing is beneficial to; improve critical care nurse's competence level and professional development, in addition that attending structured reflective learning conversation and debriefing benefits critical care health care practitioner's lifelong learning, and evidence based practices.

Questionnaire subscale- Domain 3

(Enhancement of structured reflective learning conversation and debriefing method)

Table (6) Descriptive Statistics (Subscale- Domain 3)

Variables	Mean	Std. Deviation	N			% Agree- strongly agree by Participants
				CVR	CVI	
1) Having clinical guidelines and protocol about reflective learning conversation and debriefing is beneficial	4.3390	.64208	236	0.75	0.88	98%
2) To enhance my clinical reasoning skills reflective learning conversation should be on Good / successful experiences	3.8347	.99905	236	0.1	0.1	81%
3) To enhance my clinical reasoning skills reflective learning conversation should be on bad / failure experiences only	2.8729	1.33079	236	0.1	0.1	42%
4) To enhance my clinical reasoning skills reflective learning conversation should be on both good and bad experiences	4.1822	.79671	236	0.1	0.1	90%
5) Reflective learning conversation and debriefing activities duration should be less than one hour	4.0636	.89928	236	0.1	0.1	84%
6) Reflective learning conversation and debriefing activities should be more than one hour	2.8390	1.33987	236	0.1	0.1	44%
7) The role of reflective learning conversation and debriefing facilitator/Moderator is important	4.2924	.62849	236	0.1	0.1	97%
8) To lead reflective learning conversation and debriefing activity the facilitators/moderators should have high level of clinical competence, experience, and skills.	4.1907	.82622	236	0.1	0.1	90%
9) Facilitator inputs and feedback during reflective learning conversation and debriefing activities is crucial	4.1780	.78422	236	0.1	0.1	91%
10) Facilitators of reflective learning conversation and debriefing activities should have effective leadership skills	4.2966	.65635	236	0.1	0.1	94%
11) Depth of reflection is important as deep reflection is preferable over surface reflection to enhance my clinical reasoning skills	4.1864	.58998	236	0.1	0.1	94%
12) Attending structured reflective learning conversation and debriefing is beneficial in compare to non-structured reflective activities	4.3178	.60903	236	0.1	0.1	96%

CVR: Content Validity Ratio, CVI: Content Validity Index

Table (7) Reliability Statistics (Subscale- Domain 3)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Item Means	Inter-Item Correlations	intra-class correlation coefficient (ICC)	95% CI Lower bound	95% CI upper bound	Sig. (2-tailed)	N of Items
			Pearson test					
.736	.783	3.966	.231	.736	.683	.783	0.000-0.5	12

For the variables of (Domain-Subscale 3) the CVR=0.1 and CVI=0.1 except variables number 1 as the CVR=.75 and CVI =.88. However, these values were at acceptable validity level as it has been discussed in validity section of this chapter, and the overall outcome for all variables reveals adequate validity level. Refer to table 6

Moreover, the five item scale shows adequate internal reliability with a Cronbach's coefficient alpha of $\alpha = 0.783$. Furthermore, ICC = 0.736 with 95% confident interval = 0.683-0.783 also reflects good level of reliability. The $r=0.231$, $n = 236$, and p value in range of 0.000-0.5 shows that there is weak correlation between the twelve subscale variables and the correlation ratio is 23.1%. However, as explained previously the justification for this poor correlation is having opposite meaning questions which are not negatively worded and those variables are; number 3 and 6 which are correlated negatively with opposite variables number 2 and 5 and if we consider variable 3 and 6 the correlation jumps significantly and this does not reflect any negative effect on the research results, credibility, validity, and reliability. Refer to table 6 & 7

Furthermore, for $n=236$ the overall item mean is (3.966) and Std. Deviation is (0.860). However, the mean and standard deviation for variables 3 and 6 are significantly different from other variables and this reflects that mean is representative for all variables except variables 3 and 6. Refer to table 7

Moreover, there is a high percentage of participant's agreement that reflective learning conversation and debriefing can be enhanced by; having protocols and guidelines as structured reflection process (98%), reflecting on both good and bad experiences (90%), having reflective sessions for less than one hour (84%), having deep reflections (94%), and finally having reflective session moderator with high level of knowledge and skills in addition to leadership skills (94%). The agreement percentage ranges between (81% -98%) for all subscale variables which represents (Agree- strongly agree) category except for variables number 3 and 6 as these questionnaire variables were designed intentionally by having opposite meaning questions but not negatively worded sentences, and this questionnaire design aims tracking participant's bias factors such as; blind filling up the questionnaires. Refer to table 7

Moving to focus group findings which reveal that most of interviewees agreed that reflective learning conversation and debriefing can be enhanced by having protocols and guidelines and structured reflection process. **p8**-“There is need to have standardized ideas, protocol or model”. **p2**- “yes we need structured model”. **p6**- “There should be structured process, for effective learning there should be reflective model”. **P9**-“structured model is important as it will help to organize and coordinate the class and for better understanding of attendees.”. Refer to appendix (12.3 and 12.4).

Moreover, there was general focus group agreement that reflecting is preferable on both good and bad experiences, **p2**-“yes, I do agree it could be for successful and failed experience, if successful it will bring something new to gain change in clinical practices and by failure experience we will know where is a deficit”. **p3**-“It is not matter of experience whether it is successful or failure, we need to focus on failure cases, find out the reasons behind it and make it successful”. **p4**- “Yes, successful events are motivation and good learning experience for staffs. And bad experiences can help in understanding the mistakes and to do necessary corrections. Refer to appendix (12.3 and 12.4).

Furthermore, deciding on reflective session timing should be based on situation and discussion case with a range of flexibility”. **p4**-I think sometimes from 15-30 minutes and sometimes the situation will take more than one hour especially

if we have a lot of participants". **P3-** " it should be variable". "**p2-I** would like to be with no limit, to be open discussion and participants will give their review, so it might take more time". **P8-**"it should be for maximum 45 minutes to seek the attention of participants". **p9-**"One hour to 90 minutes, first one hour to discuss about the incidence, and remaining 30 minutes for discussion". **P10-**"Reflective learning and debriefing session should be for less than one hour, including debriefing time of five to ten minutes". Refer to appendix (12.3 and 12.4).

Finally, there is a general focus group agreement on importance of having reflective session moderator with high level of knowledge and skills and leadership ability. p4- "yes, facilitator should lead discussion and share any information with participants". p5-"Yes, we need facilitator, so if facilitator is highly knowledgeable we will be able to get the most out of staff". p3- "Yes, facilitator has crucial role in controlling according to guidelines to learn staff". p9- "Yes, Facilitator helps in coordinating the session and in debriefing". p4- "facilitator Feedback is important if we use in the closure and summary". Refer to appendix (12.3 and 12.4).

In summary, there is a general agreement between the questionnaire and focus group findings that reflective learning conversation and debriefing can be enhanced by; having protocols and guidelines as structured reflection process, reflecting on both good and bad experiences, having reflective sessions for less than one hour, having deep reflections, and finally having reflective session moderator with high level of knowledge and skills in addition to leadership skills

Questionnaire Subscale- Domain 4; (Barriers of structured reflective learning conversation and debriefing activities)

Table (8) Descriptive Statistics (Subscale- Domain 4)

Variables	Mean	Std. Deviation	N	CVR	CVI	% Agree- strongly agree by (Participants)
1) Attending reflective learning conversation and debriefing activities is time consuming for no reason	2.7542	1.22343	236	0.1	0.1	41%
2) Individual reflection is preferable over collaborative and group level reflection	3.1314	1.31591	236	0.1	0.1	55%
3) I feel shame when I share and reflect on my experience in presence of my colleagues	3.4449	1.19979	236	0.1	0.1	28%
4) I feel threatened when I share and reflect on my experience in presence of my colleagues	3.3957	1.22683	235	0.1	0.1	30%

Table(9) Reliability Statistics(Subscale- Domain 4)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Item Means	Inter-Item Correlations	intra-class correlation coefficient (ICC)	95% CI Lower bound	95% CI upper bound	Sig. (2-tailed)	N of Items
			Pearson test					
.747	.750	3.179	.429	.747	.690	.796	.000	4

All the variables of (Domain-subscale 4) are negatively worded for purpose of increasing the questionnaire strength, reliability, and validity levels. The CVR=0.1 and CVI=0.1 reflects a high validity level for subscale 4. Refer to table 8.

Moreover, the inversed five item Likert scale shows adequate internal consistency reliability with a Cronbach's coefficient alpha of $\alpha = 0.750$. Furthermore, ICC = 0.747 with 95% confident interval = 0.690-0.796 also reflects a good level of reliability. The $r = .429$, $n = 236$, and $p \text{ value} = .000$ shows that there is a moderate positive correlation between the four variables of (Domain-subscale 4), and the correlation ratio is 42.9%. Refer to table 8 & 9.

For $n = 236$ the overall item mean is (3.179) and Std. Deviation is (1.240), and the mean and standard deviation for all variables are almost similar and this brings reasonable evidence that mean is representative for all variables of (Domain-subscale 4). Refer to table 9.

The descriptive analysis shows that 55% of the participants disagree that group reflective activities are preferred over individual reflective activities and that was very surprising and unexpected. However, the agreement percentage was 55%, and the remaining opposite percentage was 45% which is significant to think about the reason by conducting other studies. Furthermore, 60 % disagrees –strongly disagrees that reflective learning conversation and debriefing activities are time consuming, and 70 % disagrees –strongly disagrees that they feel threatened and shamed while attending reflective learning conversation and debriefing sessions, and this also was surprising and unexpected findings. Refer to table 9.

80% of Focus group participants argue the questionnaire findings and reveal that feeling shy, threatened, attending group reflections, and time restriction are barriers for effective reflective learning conversation and debriefing. P2-“If you would like to reflect on failure, nurse will feel shy or afraid to come up with failure experience, and we need to encourage them to share experience”. p4- “feeling shame, culture, judgement is a barrier”. p3- “People are shy to express their negative experiences”. However, we should consider that 100% of the focus group interviewees had the experience of being reflective conversation moderators in compare to the questionnaire participants, as 20% of them had the chance to be a reflective facilitator, and this raises a concern on how seniority level and being reflective facilitator could affect the view and perception on barriers of reflective learning and debriefing, and this brings a need for separate study on seniority level and perception of barriers of reflective learning and debriefing. Refer to appendix (12.3 and 12.4).

In summary, the questionnaire findings reveal that attending group level reflection is a barrier against effective reflective learning and debriefing with a border line agreement with a percentage of 55%. Moreover, the questionnaire partially supports that feeling shy is a barrier for effective reflective learning conversation and debriefing in critical care clinical settings with an agreement percentage of 28%. Moreover, feeling threatened as barrier had an agreement percentage of 30%. And finally, time restriction issues as barrier had an agreement percentage of 41%. In contrary, the focus group findings reveal that feeling shame, threatened, attending group level reflections, and time restrictions are barriers for effective reflective learning conversation and debriefing in critical care clinical settings, and this disagreement between the focus group and the questionnaire findings brings a need to recommend further studies on barriers of reflective learning conversation and debriefing in critical care clinical settings.

Discussion And Conclusion

The results show that the questionnaire and focus groups of enhancing clinical reasoning skills through structured reflection models have significant level of validity and reliability. This study was able to answer the first research question; “What is the effect of structured reflection models on the clinical reasoning skills of the critical care practitioners in critical care clinical settings?” and both focus group and questionnaire findings revealed that attending the structured reflective learning conversations and debriefing and frequent attendance have a significant positive impact on enhancing clinical reasoning skills of the critical care nurses, and this finding supports what have been highlighted in the literature review chapter about the positive relationship between reflection and clinical reasoning skills.

Moreover, the second research question “What are the barriers and limitations of using structured reflection models to enhance clinical reasoning skills of the critical care practitioners in critical care clinical settings?” was answered as

attending group level reflection is a barrier, and there was partial agreement on feeling shy and threatened, and time restriction as limitations and barriers. However, further studies are needed considering the seniority level of critical care nurses. Furthermore, the literature review chapter reflected that there are no studies on barriers and limitations of reflective learning conversation and debriefing in critical care settings. Hence, this study can be considered as a beginning and a foundation for further needed studies.

The third research question "How reflective practice can be encouraged and facilitated at critical care clinical settings?" was answered as reflective practice can be encouraged and enhanced by; having structured model and guidelines, reflecting on both good and bad experiences instead of only good or bad experiences, having deep reflections instead of superficial, having reflective moderator with high level of knowledge and clinical skills in addition to leadership skills, and finally deciding on ideal timing of reflective learning and debriefing activity should be situational with flexibility, and more studies are required to decide on this. Moreover, going back to the literature review chapter we observe a strong correlation between the literature review and these study findings, and these findings can be utilised to enhance the implementation of reflective practice in critical care clinical settings.

Recommendation And Disseminations

- There is a recommendation to run regular reflective learning conversation and debriefing sessions as clinical education activities in critical care settings of tertiary hospitals
- There is a recommendation to design a structured model which integrates and consolidates both reflective learning conversations and clinical reasoning skills in one model instead of separate models
- More studies are recommended on ideal timing of reflective learning conversation and debriefing sessions
- More studies are recommended on barriers of feeling shy and threatened while attending reflective learning conversation and debriefing sessions considering seniority level
- More studies are recommended to explore individual level reflection versus group level reflection

Abbreviations

P: Participant, n: sample size, ICC: Intra-Class Correlation Coefficient, CI: Confidence Interval, CVR: Content Validity Ratio. CVI: Content Validity Index. IRB: institutional Research Board.

Declarations

Ethics approval and consent to participate

"The institutional Research Board IRB and all other required ethical approvals have been obtained. The ethical and IRB committee is from Hamad Medical Corporation HMC- Medical Research Centre MRC- QATAR, the approval reference is: MRC-01-18-069. A verbal consent to participate was obtained and approved by the IRB committee ".

Consent for publication

(N/A).

Availability of data and materials

"The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request".

Competing interests

"The authors declare that they have no competing interests".

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"KA facilitated the questionnaire survey, and the focus group interviews to get the research data. EA analyzed and interpreted the survey and focus group data, and had a main role in writing the manuscript. All authors read and approved the final manuscript".

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Figures

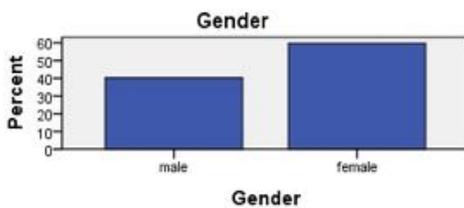


Figure 1

Gender. 30% of study sample were juniors critical care nurses while 65% were seniors and this could help to know the point of view for junior and senior nurses about reflective activities. See figure (2)



Figure 2

Years of experience. 70 % of critical care practitioners attended 5-10 times reflective learning conversation and debriefing sessions which reflects a good exposure level to reflective learning process, and this could enrich the study data and validity of obtained information. See figure (3)

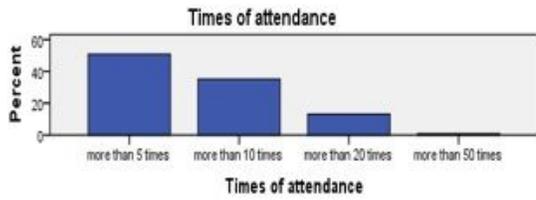


Figure 3

Times of attendance. 20% of the sample had the experience of being reflective activity facilitator/Moderator which strengths the study by adding senior educational point of view. See Figure (4)

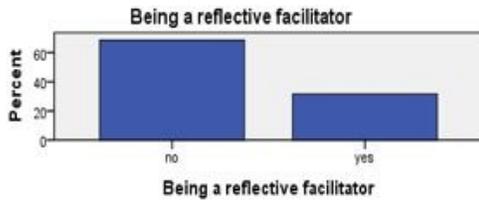


Figure 4

Being a reflective facilitator. Questionnaire subscale- Domain 1; (Impact of structured reflective learning conversation and debriefing on clinical reasoning)