



## The Perception of Staff Nurses and their Experience with the Critical Care Outreach Team in Oman: A Descriptive Correlational Study

By

Harith ALAbri<sup>1\*</sup>, Khaldoun M. Aldiabat<sup>2</sup>, Amjed ALNaabi<sup>3</sup>, Mohammed ALShandoudi<sup>4</sup>,  
Ahmed ALShujaibi<sup>5</sup>, Mazin ALHatmi<sup>6</sup>

<sup>1\*</sup> Corresponding author: Harith AL Abri, RN in the Royal Hospital-Oman

([al.abriharith@hotmail.com](mailto:al.abriharith@hotmail.com)). <sup>2</sup> Assistant Professor at School of Nursing- Cape Breton

University- NS-Canada. <sup>3-6</sup> RNs in the Armed Forces Hospital, Muscat-Oman

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### Abstract

Previous research indicated the benefits of the Critical Care Outreach Team (CCOT) in improving patients' health outcomes; however, in Oman, there is a dearth of evidence examining the perceptions of nurses regarding the Critical Care Outreach Team as well as its effectiveness. This study aimed to explore staff nurses' perceptions about the CCOT services in Oman and to explore the relationship between the staff's demographics (age, education, and years of work experience) and their call status to the CCOT services. A valid and reliable questionnaire that includes 19 items and a 5- point Likert scale format submitted online via Survey Monkey to the ward staff nurses who work in the area where Critical Care Outreach Team service is provided. One open-ended question was added to the questionnaire to collect qualitative data. SPSS was used to analyze the quantitative data while the qualitative data emerged to support the quantitative findings. A total of 91 participants completed the questionnaire; nurses perceived the CCOT as accessible, approachable and effective in recognizing deterioration, thereby reducing serious events; providing teaching and coaching to staff; helping in referring the patient to allied health and improving patient management on the ward. There was no significant correlation between participant demographic variables such as age ( $p = 0.616$ ), gender ( $p = 0.370$ ) or years of experience ( $p = 0.243$ ) and educational level on the call status to CCOT services. The quantitative perception was supported and explained qualitatively by participants' direct quotations when they answered the open-ended question. It is concluded that nurses in Oman perceived CCOT positively, which indicates that the existence of CCOT in hospitals of Oman is necessary, important and effective in enhancing the patients' outcomes and helping provide teaching and couch for other nurses.

**Keywords:** CCOT, Oman, Nurses, Rapid Response Team, ICU

## Introduction and Background

The National Institute of Clinical Excellence (2009) defined clinical health deterioration as a "sudden worsening of the clinical condition of the patient" (Jones et al., 2013). The risk of clinical health deterioration among intensive care unit (ICU) patients is expected after their discharge (Rosa et al., 2016). Many factors may lead to clinical health deterioration and elevate the readmission rate of ICU patients, such as lack of knowledge and skills among staff and shortages in staffing levels (Churpek et al., 2013). At the same time, the demand for ICU beds is increasing. For example, more than 100,000 patients are admitted yearly to the intensive care units in the United Kingdom (Pattison & O'Gara, 2014; Williams et al., 2010). These overloaded ICU beds may lead to the premature discharge of patients from the ICU, which subsequently increases the chances of readmission because of deteriorating their health (Kramer et al., 2012). Therefore, there is a need for a medical team with different skills managed by doctors or nurses who can react and respond to clinical health deterioration (Devita et al., 2010). This multidisciplinary team includes physicians, ICU nurses, nurse supervisors and respiratory therapists ( Scherr et al., 2012). This medical team is a core part of the intensive care transition programs that were developed to provide transition care to discharged patients from the Intensive Care Unit to normal wards. These ICU programs were first initiated in England and Wales for patients who were discharged from ICU to provide a safe transition of patients and to recognize and respond to clinical health deterioration signs (Stelfox et al., 2016). Therefore, Hosking et al. (2014) proposed the need for a team that can detect early signs of clinical health deterioration and react to it; such a team, they argued, would have a positive impact on reducing ICU readmission, mortality rate, and even lowering the medical costs of treatments.

The healthcare settings developed worldwide different models, structures, criteria and names for the medical team, but with one aim: enhancing patients' outcomes and preventing deterioration. These models include rapid response teams, medical emergency response, and the patient at risk or critical care outreach teams (CCOT). To elaborate further, in the United States, rapid response teams (RRT) are the prevalent type of rapid response system. As the first assessors of the medical situation, nurses are the responders at the bedside. Historically, these activations rely on clinical evaluation by nursing staff to detect patient deterioration through vital sign derangements or nursing concern about the patient's condition. The RRT nurses assess the patient's situation at the bedside. Based on the patient's health status, the nurses notify a physician or respiratory therapist as required to deliver an emergency intervention such as endotracheal intubation, central line insertion, or even administering life-saving drugs. Similarly, the medical emergency team (MET) also relies on nursing staff identification, but the physician is called immediately. The MET models of rapid response systems are more seen in the European Union and Australia (UK, N. G. C. 2018).

Recently, a new model called Critical Care Out Resch Team (CCOT) as part of the RRT, which is led by a nurse and is used to identify the patients who are at risk for deterioration by using an early warning score (EWS). Danesh et al. (2013) and Stelfox et al. (2016) conducted a systematic experimental study in two different cities in the U.K. at eight hospitals to evaluate the effectiveness of establishing a CCOT to reduce ICU readmission and mortality rates. The study revealed that after the implementation of CCOT for the intervention groups, there were reductions in readmission and mortality rates; however, the reductions were not significant. Similarly, a quasi-experimental study was conducted by Bergamasco E Paula et al. (2017) in Brazilian hospitals aimed to compare the rate of readmission to the ICU pre-and-post RRT

implementation. The study showed that after the implementation of RRT, the rate of readmission to ICU was reduced. More specifically, the readmission rate in the intervention group was less than the control group (6.7% vs. 9.2%, respectively). A third study was conducted in the tertiary hospitals of Saudi Arabia with 800 beds capacity. Before implementing RRT, the number of cardiopulmonary arrests outside intensive care was 75 in 2006 (a rate of 3.53 per 1000 admissions). However, during 2007 and 2008, after introducing the RRT, the number of cardiopulmonary arrests outside the critical care reduced to 59 and 37, respectively (rate of 2.72 for 2007 and 1.68 for 2008 per 1000 admission) ( $p$ -value = 0.0068). Hence the study showed that implementing the RRT program in a tertiary care setting was associated with a reduction in the number of cardiopulmonary arrests in adult and pediatric patients (Mustafa, 2015).

In contrast to the results of the above studies, a study was conducted in Brazil (Rosa et al., 2016.) aimed to evaluate the effectiveness of CCOT after discharging the patients from ICU and showed that there were no significant changes in ICU readmission and mortality rates between the study groups (intervention and control groups). The authors of the study suggested that to reduce ICU readmission and mortality rates, more attention should be given to rehabilitation programs (physical and respiratory) and the prevention of nosocomial infection rather than the implementation of RRT.

The staff nurses' perception before and after the implementation of critical care outreach service was examined in three adult teaching hospitals in Perth, Western Australia. One hundred thirty-one nurses from the three sites joined in the focus groups, 66 nurses before and 65 after the introduction of the critical care outreach service. The finding revealed that nurses shared largely positive experiences of the critical care outreach service in three aspects: a smoother handover process, enhanced liaison between ICU and the wards, and improvement of the communication process. In conclusion, the study showed that the most beneficial aspect of a critical care outreach service is the educational support for junior nurses, who are the greatest function unit in any ward in caring for post-ICU patients (Athifa et al., 2011). Another study also conducted in Saudi Arabia in King Abdulaziz Medical City aimed to evaluate the quality of the care that was delivered by the Critical Care Response Team (CCRT) and to what extent nurses were satisfied with it. The results showed that the percentage of respondents who agreed that CCRT members arrived on time was 97%, and 98% of them agreed that the process of calling the CCRT was easy and fully understood. 99% of the respondents agreed that CCRT enhances the well-being of patients and can prevent and detect early signs of deterioration. They also agreed that continuous education should be implemented for both ward nurses and CCRT to strengthen and improve the rapid response (Al Qahtani, 2010).

In conclusion, most of the literature shows that the introduction of a rapid response team is associated with a reduction in ICU readmission rates, reducing hospital mortality, reducing the cost of treatment, and is positively perceived by nurses.

In Oman, there is a shortage of well-trained staff nurses who can meet the health demands of the increasing population (Ministry of Health, 2014). In this context, critically ill ICU patients are discharged to the general ward with a high risk of being readmitted (Quirke et al., 2011). Therefore, CCOT has been implemented in some hospitals in Oman to enhance patient outcomes and to support nurses who work in general wards. The Royal Hospital critical care outreach team was established in 2010, covers adult patients and currently consists of more than 20 members; all of them are from the critical care area and are led by the unit nurse of critical care (Ministry of Health Oman, 2018). The team covers the following acute areas: male and female medical, male and female surgical, cohort ward, VIPs (very important persons) and

multispecialty ward. During each shift, one nurse from the team is assigned to be on call and oversee the patients. The ward staff could activate the team in response to an abnormality in the vital signs with modified early warning signs (MEWS) > 3 or if the ward staff nurse is concerned about the patient's clinical status. If the patient is still having MEWS of more than 3, the team will keep tracking those patients to prevent further deterioration. However, the program's effectiveness and nurses' perceptions about the CCOT in the Royal hospital have not yet been studied. This study aimed to explore staff nurses' perceptions about the CCOT services in Oman and the relationship between the staff's demographics (age, education, and years of work experience) and their call status to the CCOT services.

### **Method**

In this study, a quantitative, cross-sectional, descriptive correlational design was used to explore staff nurses' perceptions of the services provided by the critical care outreach team. The questionnaire used in this study consisted of two parts: part one asks about the demographic data, and part two explores nurses' perceptions of the CCOT. The instrument was developed, tested and used previously by McIntyre et al. (2012) to evaluate ward nurses' attitudes about ICU Nurse Consultant Services. The instrument was valid and Reliable (Cronbach's alpha values ranged between 0.89-0.90). Permission was obtained from the author to use the tool in this study and to modify it by rewording the term ICU nurse consultant service to the critical care outreach team. The instrument consisted of 19 questions with a five-point Likert scale (strongly agree, agree, uncertain, disagree and strongly disagree) to measure the nurses' perception of CCOT in four aspects: 1) accessibility and approachability; 2) skills in recognizing patient deterioration and reducing serious event; 3) skills in teaching/coaching staff to manage sick patients, and 4) activating allied health referrals and improving patient transfer from the ICU and high dependency care unit (HDU) to the ward. Moreover, one open-ended question was added at the end of the questionnaire to allow the staff nurses to share their lived experiences in dealing with CCOT.

### **Ethical considerations**

The study was granted ethical approvals from the College of Nursing Research and Ethics review committee at the College of Nursing – Sultan Qaboos University (# CON/GP/2020/05) and the Research Ethics Board at the Royal Hospital (#SRC#25/2020). Participants were informed that their participation was entirely voluntary and that they could refuse to participate at any time before submitting the completed instrument. The consent was implied through their agreements to fill and return the questionnaires. Anonymity and confidentiality of the participants were ensured.

### **Setting**

The study was conducted at the Royal Hospital -Muscat-Oman. This hospital was established in 1958 and is considered one of the leading institutes in developing health services in Oman. It provides tertiary care services with specialist and super-specialist care of the highest standard. It was accredited in 2016 by Canada international accreditation.

## Population and Sample

All staff nurses working and dealing with CCOT in the Royal Hospital except junior staff with less than one year were included in this study. The participants were from different acute wards, which CCOT covered. This study's sample size was calculated using Slovin's formula; the margin error was 0.05.

The formula is  $n = \frac{N}{1 + N \cdot e^2}$

n= sample size.

N=Population size.

E= Desire margin of error.

One hundred fifty-four questionnaires were distributed to the eligible participants using online Survey Monkey. The total population of our study was estimated at 250 staff nurses. According to the formula, our target population was around 154 staff nurses.

## Analysis

The data was extracted from Survey Monkey and downloaded into the Statistical Package (SPSS), version 23. The data were analyzed using frequency and percentages; however, an ANOVA test was used for the correlation test between variables ( $p \leq 0.05$ ). The qualitative data were jointly analyzed to support the quantitative data by including direct quotations from the participants.

## Results

Ninety-one participants completed and returned the questionnaire with a response rate of 59%. The majority of them were female (92.31%), and the average age for the majority was between 25-35 (53.84%). Most of them had work experience between 11-20 years (47.25%) with a Diploma degree certificate (64.84%). There was no significant correlation between participant demographic variables and staff perception on the CCOT such as age ( $p = 0.616$ ), years of experience ( $p = 0.243$ ) and educational level ( $p = 0.37$ ) [Table 1].

**Table 1 :Demographic characteristics of the participants (n= 91)**

Variable	Number and Percentage	Significant at $p < 0.050$
Gender		Not significant
Male	7 (7.69%)	F = 0.810 $p = 0.370$
Female	84 (92.31%)	
Age (years)		Not significant
25 – 35	49 (53.84%)	F = 0.601 $p = 0.616$
36 – 40	42 (46.16 %)	
Years of experience as a Nurse:		Not significant
<3 years	8 (8.79%)	F = 1.419
3-10 years	31 (34.07%)	$p = 0.243$
11-20 years	43 (47.25%)	
>20 years	9 (9.89%)	
Educational level		Not significant

Diploma degree	59 (64.84%)	F= 1.006 p = 0.37
Bachelor degree	31 (34.04%)	
Master degree	1 (1.10%)	

Questions 1, 2, 4, 6, and 8 examined nurses' perceptions of the accessibility and approachability of the CCOT, as shown in Table 2. Most of the participants agreed that CCOT was approachable and accessible.

**Table 2: Nurses agreed and strongly agreed to perceptions of CCOT Service**

	STRONGLY DISAGREE (1)	DISAGREE (2)	UNCERTAIN (3)	AGREE (4)	STRONGLY AGREE (5)	TOTAL
1- The CCOT is easy to access 24 hours a day.	2.20% 2	7.69% 7	10.99% 10	67.03% 61	12.09% 11	91
2-The CCOT is punctual when responding to patient referrals.	2.20% 2	5.49% 5	14.29% 13	68.13% 62	9.89% 9	91
3-The CCOT reduces the ward's nurse skills in managing sick patients in the ward.	8.79% 8	40.66% 37	20.88% 19	25.27% 23	4.40% 4	91
4-Communication among Co-workers is good while providing intervention to the deteriorating patient.	1.10% 1	2.20% 2	7.69% 7	73.63% 67	15.38% 14	91
5-The CCOT teaches ward nurses to identify sick patients on the ward.	5.49% 5	19.78% 18	14.29% 13	49.45% 45	10.99% 10	91
6-The CCOT service is needed 24 hours per day.	4.40% 4	4.40% 4	7.69% 7	51.65% 47	31.87% 29	91
7-CCOT intervention reduces serious adverse events in patients.	2.20% 2	7.69% 7	14.29% 13	56.04% 51	19.78% 18	91
8-The CCOT staff are approachable people.	4.40% 4	2.20% 2	16.48% 15	63.74% 58	13.19% 12	91
9-The CCOT assists the referral of the patient to allied health.	2.20% 2	12.09% 11	17.58% 16	62.64% 57	5.49% 5	91
10-When my patient is sick, I call the CCOT after evaluating and intervening according to the patient's MEWSs	2.20% 2	4.40% 4	2.20% 2	65.93% 60	25.27% 23	91
11-The CCOT improves the process of patient transfer from the ICU.	1.10% 1	14.29% 13	23.08% 21	50.55% 46	10.99% 10	91
12-The CCOT teaches me how to manage sick patients.	8.79% 8	19.78% 18	14.29% 13	46.15% 42	10.99% 10	91

13-The CCOT can be used to prevent a minor problem from becoming a major problem.	4.40%	5.49%	12.09%	59.34%	18.68%	
	4	5	11	54	17	91
14-Early intervention and collaboration by YOU prevent calling the CCOT.	2.20%	8.79%	15.38%	54.95%	18.68%	
	2	8	14	50	17	91
15-The CCOT is skilled at detecting a deteriorating patient.	4.40%	8.79%	18.68%	53.85%	14.29%	
	4	8	17	49	13	91
16-The CCOT helps to prioritize the clinical issue.	2.20%	13.19%	18.68%	56.04%	9.89%	
	2	12	17	51	9	91
17-The CCOT intervention helps prevent ICU/HDU admission.	4.40%	20.88%	25.27%	42.86%	6.59%	
	4	19	23	39	6	91
18-The CCOT accelerates the process of medical review for sick patients.	2.20%	10.99%	24.18%	52.75%	9.89%	
	2	10	22	48	9	91
19-CCOT is a useful source of knowledge on equipment needed for patient care.	4.40%	10.99%	23.08%	54.95%	6.59%	
	4	10	21	50	6	91

51.6% and 31.87 agreed and strongly agreed that the CCOT service was needed for 24 hours. The accessibility was supported by responses to the open question with the following comments: *"Approachable people and easily available all time" (Nurse 71).*

*"They are approachable and help us to take care of patients in a critical situation" (Nurse 76).*

*"They are approachable and helpful most of the time" (Nurse 2).*

Although 68.13% agreed that CCOT is punctual in responding to the call, some participants commented that CCOT arrives late:

*"They are coming late; already, the management is done by our doctor" (Nurse 1). "They are coming late, and already the management is done by our doctor; perhaps they are busy" (Nurse 3). "They arrive late. No intervention was done. I managed the patient alone (Nurse 40). "They are viewing patients too late, where already doctor was called" (nurse 91). "They are easy to contact but take some time to respond at times" (Nurse 26). "They are coming late after stabilizing the patient only, and sometimes they do not come" (Nurse 81).*

Questions 7, 10, 13, 14, 15, 17, and 18 measured nurses' perceptions about the effectiveness of CCOT in recognizing patient deterioration and reducing serious events. Most participants agreed that the CCOT is effective in these roles, as examples from the open question responses illustrate:

*"They are always helping us to deal with the critical patient, and the patient is shifted to High medical dependency. for better management" (Nurse 68). "Introduction of the CCOT helped in reducing the cardiac arrest, and it reduced the patients' transfer from general wards to the ICU*

and H.D." (Nurse 67). "CCOT is a great team in terms of optimizing deteriorated patients and guiding staff to adapt with sick patients and provide a high quality of medical care" (Nurse 13).

42.86% of participants agreed that CCOT intervention helps in the prevention of ICU/HDU readmission. Responses that addressed this issue include:  
 "CCOT, they will come and see the patient, but they can't make any orders without our doctor's involvement. No need to involve them" (Nurse 6). "My suggestion is to call the doctor instead of calling them as once they reached; they are asking to follow doctor plan" (Nurse 15)." "If the patient is missing, CCOT will tell to continue to monitor then at their side nothing done just informing them; then they inform the team doctor in turn" (Nurse 37).

Questions 3, 5, 12, 16 and 19 assessed perceptions of the CCOT's effectiveness in teaching them to identify and manage deteriorating ward patients. Most nurses agreed that the CCOT provided teaching in this area and did not reduce their skills in managing these patients (see Table 2). Participants indicated that:

"CCOT guided nurses to prevent the patient from deteriorating and readmissions to ICU" (Nurse 85). "CCOT was supportive and guided us very well" (Nurse 21). "CCOT members are also giving basic instructions on how to monitor the sick patient" (Nurse 30) closely.

Questions 9 and 11 examined how staff perceived the CCOT in referring to allied health and improved the processes of transferring patients from the ICU and high medical dependency to the ward. As shown in Table 2, 62.6% of staff agreed CCOT assists in referring the patient to allied health as in the examples below: 50.55% agreed that CCOT had a role in facilitating patient transfer from ICU and MHD to the ward.

"CCOT is helping us to empower the patient to high dependency and speed up the process" (nurse 2). "If I need to transfer patients to the intensive care unit or high medical dependency, CCOT staff will help to arrange bed very fast and also if any mistake or any lacking in the treatment take place, they report to the doctor or us" (Nurse 60), "CCOT is approachable and helping to arrange for a bed in critical care" (Nurse 4).

### **Discussion**

The findings of this study revealed that most nurses agreed and perceived that CCOT members are accessible, approachable and effective in recognizing patients' deterioration status; thereby reducing serious events, providing teaching and coaching to the ward staff; helping in referring the patient to allied health and improving patient management on the ward. The findings of this study were similar to those found by Wood et al. (2017); however, in this study, only 42.86% of nurses agreed that CCOT interventions help in preventing patients from being readmitted to the high dependency or intensive care units compared to 74% in the Wood et al. (2017) study. This is likely due to the differences in the CCOT structure, wherein CCOT members in the Royal Hospital consist only of nurses who worked in the intensive care unit, while in the Wood et al. (2017) study, the team consists of both doctors and nurses and had more power in decision making. This study showed no significant relationship between staff perception to call CCOT services and their educational level, age, and years of work experience. In contrast to this result, Wynn et al. (2009) found that nurses with a bachelor's degree and less

nursing experience called the rapid response team more frequently compared to the associated degree nurses with more than three years of nursing experience perspectively.

Few participants viewed that CCOT would reduce their skills in managing sick patients (25.4%), while most agreed that the CCOT members teach them to manage sick patients. These findings are similar to other studies that evaluated nurses' perceptions of CCOT (McIntyre et al., 2012; Wood et al., 2017). Providing support and teaching staff how to manage unwell patients rather than taking over their role will encourage nurses to continue utilizing the service rather than being reluctant to call upon them (Athifa et al., 2011; Jones et al., 2006; Salt, 2013).

In Wood et al.'s (2017) study, 93.5% agreed that the CCOT is punctual in responding to calls compared to 68.1% in our study. Some participants commented that CCOT arrives late to evaluate the patients; this delay in responding to calls could be likely because, in the Royal Hospital, CCOT members are bedside nurses who have their own patients, and before responding to any call, they need to secure their patients first before leaving to other wards. In addition, the long distance between the wards and the ICU and the crowdedness of the hospital are also significant factors that affect the promptness of OCCT in responding to calls. In contrast to the nature of CCOT in the Royal hospital which consist of ICU nurse without a team physician, the CCOT in Wood et al.'s (2017) study consists of two nurses available 24 hours / 7 days a week and further nurses are often available to support the team during the time from 10: 30 am to 10: 30 pm throughout weekdays. In addition to nurses, there is a CCOT doctor to accommodate the peak times.

#### **Limitation**

Data collection was proposed to be collected via self-administered questionnaires; however, because of COVID-19 restrictions and lockdown in Oman, the data collection plan was modified to an online survey, negatively influencing the response rate. The time frame for collecting the data was planned to be four months; however, data were collected within a shorter time because of COVID-19 restrictions and the inability to reach all nurses because they were busy dealing with the pandemic. In addition, the generalizability of the findings of this study is limited because of the relatively small sample size and the fact that the data was collected from only one hospital.

#### **Recommendation**

It is recommended to conduct further studies to test the relationship between more variables from participants who work in different health settings to ensure more diversity in the characteristics of the study population. It is also recommended that more qualitative studies be conducted to understand the perceptions of the staff and their lived experiences in dealing with the CCOT.

#### **Conclusion**

Despite the limitations of this study, and although there was a delay in responding to calls, it is concluded that nurses in Oman perceived CCOT positively such as CCOT was accessible and approachable, able to recognize deteriorated patients and reduce serious events, having a role in teaching and coaching ward staff and facilitating transferring patients to medical high dependency and ICU. This positive perception indicates that the existence of CCOT in hospitals of Oman is necessary, important and effective in enhancing the patients' outcomes and helping provide teaching and couch for other nurses. The results of this study are significant to decision-makers in health institutions to develop policies and programs to support the team's role in identifying deteriorating patients and therefore reducing severe events, and in teaching and

coaching ward staff and facilitating the transfer of patients to high dependency and intensive care units.

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