

Extracorporeal Membrane Oxygenation and Lebanese Critical Care Nurses' Perceptions: A Qualitative Phenomenological Study

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Abstract

Introduction: The training of nursing staff to deliver extracorporeal membrane oxygenation in Lebanon has recently attracted attention. It is important to comprehend the background of nurses who take on this new duty.

Objectives: The main objectives of this study were to (1) explore the experiences of intensive care unit nursing staff who work with extracorporeal membrane oxygenation, (2) identify the psychological and physiological challenges experienced by intensive care unit nurses while managing patients with extracorporeal membrane oxygenation, and (3) determine the roles assumed by intensive care unit nurses while managing patients utilizing extracorporeal membrane oxygenation.

Methods: A qualitative phenomenological design utilizing semistructured interviews utilizing a purposive sampling of 15 intensive care unit nurses using extracorporeal membrane oxygenation devices. Interviews were audio recorded, verbatim transcribed, and thematically analyzed.

Results: Three themes emerged, namely (1) nurses' role in extracorporeal membrane oxygenation, (2) skills and training, and (3) challenges faced by extracorporeal membrane oxygenation nurses.

Conclusion: This study demonstrates that nurses play a crucial role in providing extracorporeal membrane oxygenation patient care, placing them under significant occupational stress due to the intensive care unit's routine workload and the demands of extracorporeal membrane oxygenation. Additionally, role confusion brought on by a lack of professional practice norms and emotional exhaustion made occupational pressure worse.

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Introduction

Recently, extracorporeal membrane oxygenation (ECMO) has advanced to become an indispensable tool in the treatment of adults and children with severe cardiac and pulmonary dysfunction that is resistant to traditional treatments (Makdisi & Wang, 2015). ECMO has historically been employed for terminal lung conditions and cardiovascular failure and is utilized as a pathway to heart and lung transplant surgery and as an emergency treatment for septicemia and postorgan implantation in right-sided myocardial failure (Ratnani et al., 2018). Over the past few years, the adoption of ECMO has grown tremendously and has just been regarded as a standard emergency therapeutic procedure in intensive care practice (Hackmann et al., 2017). Furthermore, with the latest pandemic of Coronavirus in 2019 (COVID-19), ECMO is becoming a quite effective tool in treating severe cases of COVID-19 and has been widely introduced in several hospitals (Li et al., 2020; Zhan et al., 2020).

A team of healthcare professionals, including anesthesiologists, ECMO experts, ECMO nurses, pharmacists, dietitians, social workers, perfusionists, surgeons, and respiratory therapists is needed for ECMO because it is a complex and high-risk intervention (Alshammari et al., 2022). Additionally, because ECMO is a relatively new intervention, specific staff training is needed to uphold high standards and ensure patient (Ross et al., 2023).

According to reports, nurses are essential to providing ECMO care. For instance, a study that was conducted by Lockie et al. (2017) in a global study that included 177 ECMO institutions all over the world revealed that ECMO expert nurse was proposed to be solely accountable for the bedside care of ECMO system in 59% of healthcare institutions.

Besides, nurses identified six specific challenges for critically ill patients with H1N1 influenza who were in ECMO, including treatment for extremely ill patients with serious illness, extended stay and high death risk, implications of infection management criteria, wearing personal protective equipment for more than 12 hours, being overstressed and exhausted, being alone in a room, and the uncertainty associated with the entire process (Honey & Wang, 2013). If not handled properly, these challenges can have an impact on the treatment delivered to patients during ECMO deployment. However, ECMO is not a therapy but a bridge to therapy (Schmidt et al., 2016). Originally, ECMO achieved interest in dealing with pediatrics, but it started to be employed more widely by adults after the pandemic of COVID-19 (Schmidt et al., 2016). One of the main challenges that was reported in utilizing ECMO is the transfer

of patients since it is difficult to handle (Gillon et al., 2018). Also, a study conducted by Ericsson et al. (2017) reported typical issues regarding ECMO, such as circuit issues or damage incurred during client transfer, malfunction of electrical instruments, missing devices, and physical health concerns. On the other hand, Broman et al. (2015) have shown that these problems can be handled successfully, offering sufficient support and preparation to retrieval personnel.

Review of Literature

ECMO seems to be found at specialized facilities with the training and experience to perform safely and effectively (Aldisi et al., 2017). The creation of specialized positions such as the “ECMO nurse specialist” has encouraged clinicians to acquire unique skills and qualifications to be more independent in taking care of patients (Aldisi et al., 2017). For instance, in the lack of a perfusionist, specialized ECMO nurses can perform standard patient treatment and management of the ECMO system, reducing the need for perfusion skills in emergencies (Mongero et al., 2013). Training programs have been designed to allow nurses to learn the knowledge and skills needed for this specialization (Johnston et al., 2018). Training and educational programs about ECMO take place in daily practice through planning seminars and courses, exchanging credentials at multidisciplinary conferences, and using simulation training to gain experience managing patient and device issues (Brum et al., 2015). Many ECMO nurses claimed that due to their increased level of specialty and the inherent risk in their line of work, they ought to receive compensation (Honey & Wang, 2013). Training systems have been blamed for not having adequate guidance on the moral dilemmas involved with the task (Jaouni, 2017).

Many studies reported the challenging role of nurses who care for ECMO patients, since they are exposed to stressful and exhausting work and are involved in many responsibilities (Alshammari et al., 2022; Koons & Siebert, 2020). For instance, in a study that was performed by Alshammari et al. (2022), they reported facing serious difficulties, such as an excessive workload, ineffective teamwork, and a lack of a system that is both orderly and supportive. On the other hand, receiving professional training and the time they had spent delivering ECMO care were the key factors that nurses believed contributed to their perception of their own competence in their roles.

Exploring the experiences and perspectives of nurses who work with ECMO is important for various reasons, and it can

greatly contribute to enhancing the quality of care delivered to ECMO patients (Koons & Siebert, 2020). ECMO is a life-saving medical procedure used to treat patients who have severe respiratory and/or heart failure (Calhoun, 2018). It is a complicated and resource-intensive process, and nurses are essential in the day-to-day administration of ECMO patients (Hijeh, 2017). So, by addressing issues, improving protocols, and supporting the healthcare team, healthcare practitioners can improve patient safety and well-being while optimizing outcomes for ECMO patients. Despite the growing trend of ECMO patient bedside management training for ICU nurses, there is a dearth of studies to illuminate their responsibilities and the difficulties they encounter. Hence, the overall aims of this study were to (1) explore the experiences of ICU nursing staff who work with ECMO, (2) identify the psychological and physiological challenges experienced by ICU nurses while managing patients on ECMO, and (3) determine the roles assumed by ICU nurses while managing patients utilizing ECMO.

Methods

Study Design and Setting

A qualitative phenomenological approach was used in this study, using a semistructured interview to allow flexibility in the data collection process. The phenomenological approach of Colaizzi focuses on the attitudes and emotions of individuals and finds common features within study subjects (Morrow et al., 2015).

This study was conducted at Rasoul Aazam Hospital in Lebanon. It is a large hospital that has sufficient ECMO services. Importantly, this facility offers ECMO retrieval services, allowing patients from other facilities to be placed on ECMO. Data were collected in October, November, and December 2021.

Participants and Sampling Procedure

The study population included specialized ECMO nurses to ensure that the respondents would have the required experiences with ECMO. A purposive sampling of informants was recruited from the ICU at the selected hospital. Nurses working in the ICU for more than 6 months and agreeing to participate in the study were included in the study. However, any nurses with less than 6 months of employment in critical care settings or who did not receive adequate training to provide ECMO were excluded from this study.

Data Collection Procedure

Before the interviews began, the researcher made an effort to establish a relationship with the participants and explained the goal of the study. A sociodemographic data questionnaire was used to collect information about the nurses' age, gender,

and years of experience. After completing the demographic datasheet, the nurses were invited to take part in semistructured interviews, which were employed to collect qualitative data regarding the experiences of these nurses with ECMO. To satisfy the comfort of the informants, the location for the interviews was deliberately chosen, so the investigator met the informants in the conference room on their respective floors. The discussions were arranged on dates and times appropriate for nurses so that they were not stressed or distracted by the load of work or the demands of their shifts. The researcher presented the work at the meeting and explained the session's objectives.

The informants were advised that this conversation was completely anonymous, and any verbatim published would not be disclosed by their names, but rather that information would be coded for privacy. The respondents were also advised that they could be withdrawn if they felt that they did not want to complete the study. The conversations were tape-recorded to mitigate any pitfalls that the live recordings could cause, and the participants were informed that no one but the interviewer might listen to the live recordings and that they would be kept secure. The interview lasted for around 30 minutes as a total time limit for each participant.

Table 1. Interview Schedule.

<i>General experience with ECMO</i>	
i	<i>How is ECMO involved in your work as an ICU nurse?</i>
ii	<i>What specific roles do you undertake at Rasool Aazam Hospital in Lebanon regarding ECMO?</i>
iii	<i>What is your perception of ECMO as a treatment mechanism?</i>
iv	<i>How has ECMO affected treatment procedures and your work in the ICU?</i>
<i>Psychological impact</i>	
i	<i>According to your experience, what are the most stressful and challenging issues while working with ECMO?</i>
ii	<i>How have these challenges impacted you?</i>
iii	<i>How does it affect other nurses in the ICU?</i>
iv	<i>How does experience working with ECMO differ from that of the normal ICU workings?</i>
<i>Where answers focus on the positive impacts of ECMO, the following structure was adopted:</i>	
i	<i>Have you ever experienced a time when working with ECMO has gone smoothly?</i>
ii	<i>Can you state any positive aspects of ECMO?</i>
iii	<i>Have your experiences with ECMO and the positive aspects of ECMO affected your work?</i>
<i>Personal, social, and organizational resources</i>	
i	<i>What strategies have you adopted to deal with the challenges of ECMO?</i>
ii	<i>How have other nurses in the ICU adapted to the challenges presented by ECMO?</i>
iii	<i>Has your facility offered any help to deal with problems arising from the use of ECMO?</i>
iv	<i>Do you have in mind any solutions that can be provided to improve and reduce problems in the ICU about ECMO?</i>

Then, aggregation of results and data analysis were carried out. The following open-ended questions were used to gather the data (Table 1).

Data Analysis

Data analysis was conducted to bring about concepts that represent the experiences perceived by ICU nurses. A concurrent evaluation was carried out to ensure that the ideas resulting from the data interpretation remained relevant and precise in the context of these observations reflecting a real interpretation of the experiences of ICU nurses. Upon conclusion of all the interviews, a transcript axial coding was employed to facilitate data analysis. The statements were then divided into categories reflecting the concepts expressed. These classes were then divided into more abstract themes and were also broken down into more specific subsections as per the specificity of the articulated context (Connelly, 2016). The interviews included an assessment of the gestures, expressions, and responses of the participants. Following the application of codes to the data, manual analysis was used to identify phrases, categories, and themes. After the full interview had been transcribed, a proficient translation into English was required to keep the meaning of the spoken words. To make statements and terminology more clear, the researchers went back and evaluated the data. The translations were verified by experts to ensure their accuracy. Additional revisions and readings helped to narrow down the issues that emerged. Other subthemes were connected, while some topics were merged into others. Writing the analysis and including supporting verbatim quotes was the final step.

Trustworthiness

According to Lincoln and Guba (1985), four main criteria were adhered to to judge the study's trustworthiness. Sharing the study's findings, interpretations, and conclusions with the nurses working with ECMO helped to establish **credibility** that was accomplished when the researcher assessed the accuracy of the data while concurrently listening to the audio recordings and reading the transcripts. Additionally, committee members reviewed sample transcripts and offered their opinions. Preliminary data analysis was also conducted to increase the validity of the research findings and inform the participants about the data analysis process. As the researchers participated in each stage of the data collection process, **dependability** was accomplished. Additionally, it was performed by consulting subject-matter experts on the research before publishing. When the researchers showed a sample of the interview transcripts, **confirmability** was attained. During the examination of the first code, the researchers were instructed that it was required to specify each topic. The principal investigator has checked the transcriptions to ensure that the translations

are accurate and that the content has not been modified. Finally, the consideration of "thick description," which combines a detailed exposition of the events with an extensive collection of participant quotations, confirmed **transferability**.

Ethical Considerations

An official approval was procured from the institutional review board (IRB#: ECO-R-305). Also, permission was taken from the selected hospital. Informed consent was obtained from the nurses who agreed to participate after explaining the aim of the study. Informed consent was included in the research study comprising background information, research aim, participant advantages, consequences of participation, opt-out and anonymity protocol, and the researcher's contact details. The researcher agreed with the respondents on the date and time of the interviews and sent a reminder beforehand. At low influx time, the respondents were contacted separately, where they had ample time to hear the directions and fill out the sociodemographic datasheet properly. Meanwhile, the proper logistics for the interviews were guaranteed, and the interviews were conducted and properly recorded. After that, the qualitative data was analyzed and aggregated into categories and then into themes and subthemes.

Findings

The study recruited 15 ICU nurses, in which there were ($n=8$) males and ($n=7$) females. The mean age of the participants was 28.9 years, and they had an average of 9.2 years of experience in the ICU. Three basic themes comprise the primary study findings, namely, Nurses' role in ECMO, Skills and training, and Challenges faced by ECMO nurses.

Nurses' Role in ECMO

Importance of ICU Nurses in Managing ECMO Patients

The participants highlighted the crucial role of the ICU nurse in managing a patient on ECMO, where the ICU nurses have expressed that they are the primary caregivers and their role is inseparable from the production of quality clinical outcomes. Furthermore, the nurses have emphasized that the healthcare team has depended on the ICU nurses in ECMO patient identification and in carrying out the majority of the associated care tasks, which proved that their role is central for ECMO patients.

One of the nurses said: "*ICU nurses usually discern the applicability and suitability of ECMO for the care of certain patients and consult the physicians... it is usually our role to take care of the processing of the procedure, the care, the monitoring, and reporting any complications and concerns to the physician*" (N3).

Another nurse also proclaimed: *“I think we are the most qualified expertise among the healthcare team to take on such tasks and responsibilities...we are the ones who stay all the time with the patient and know their case inside and out...even more than the doctor as we are always on guard we look for the details all the time and we know the patients’ responses, every breath, and every sign...our work is essential for the success of such a procedure”* (N11).

Similarly, another ICU nurse shared: *“...being an ICU nurse is essential in caring for a patient on ECMO as we know how to deal with critical situations and emergencies on the spot and usually can act rapidly and intuitively due to the expertise we have assimilated in the ICU...other nurses would not be able to take on the tasks and responsibilities associated with ECMO...having a critical nurse on guard of the patient is crucial especially that ECMO is a highly risky procedure and needs a lot of attention and care”* (N15).

Interprofessional Collaboration

Another concept that was prevalent throughout the interviews with the ICU nurses revolved around the importance of interdisciplinary cooperation and collaboration between nurses as critical care staff and physicians as well as the other members of the designated healthcare team. This finding was stressed because ECMO patients need holistic care utilizing a patient-centered care approach from all team members to incentivize the highest quality of care with the best outcomes.

One of the nurses proclaimed: *“...the teamwork between us and the physicians I guess is one of the most important aspects of care for an ECMO patient... it is the constructive collaboration between us that makes the care of such a patient easier and smoother”* (N6).

Another nurse also shared a similar experience: *“...when we and the other team members are on the same page, we know what we need to do, when to do it, and how to coordinate between us, taking care of an ECMO patient and the complex circuitry becomes easier and less of a burden...even the patient feels better and progress is much more tangible”* (N13).

A similar anecdote was also shared: *“...the patients on ECMO need us and the doctors to work cohesively so that we can tend to their varying and complex needs, so if we want the patient to be stable and reach the planned goals we and the doctors need to be effectively working on managing all the care aspects of the patient”* (N8).

In addition, another nurse also said: *“...the collaboration between all the members of the ICU team has always made me feel comfortable through an ECMO care task and patients have been immensely taken care of whenever the team was consistent in their roles and responsibilities, their communication and their coordination... an inter-professional take on ECMO care is very important for achieving the care goals of such patient rather than single-handedly taking on all the care”* (N12).

Skills and Training

The second theme that the nurses highlighted through the interviews was the need for recurrent training to refine skills and update practices to maintain their competence in dealing with ECMO. The nurses also stressed the need to train more nurses on ECMO to sustain higher coverage.

One of the nurses proclaimed: *“...we have attained quite a level of skill in managing ECMO circuitry and machinery in addition to all the other lines that would be attached to such a patient; however, I feel that I need recurrent updates on the latest practices so that I can enhance my performance and bring out the best for the patient especially that these patients have complex needs”* (N9).

In addition, another nurse also said, *“...I feel that we need more nurses specialized in ECMO as the number of nurses who know how to deal with it is limited and it puts higher pressure on us...I was so curious to get to learn from a colleague but we need more recurrent formal training even us who already know how to manage it so that we can standardize practice and serve a higher quality”* (N1).

Challenges Faced by ECMO Nurses

High Workload and Burnout

The ICU nurses who participated in this study have expressed that ICU nurses are subject to intense pressure during their work. In addition, ECMO adds to that pressure as there is no structure in the system of work that needs to be more meticulously thought of.

One of the nurses shared: *“...we provide comprehensive care to our patients we are responsible for bathing, feeding, medication, the lines, the documents, and on top of ECMO it is too much ... all too much... I feel exhausted at the end of the shift”* (N2).

Another nurse also had a similar experience: *“... I barely have time to drink a cup of water and continue working...with this high-pressure work I end the shift by the last breath...I go home barely able to cook for my family... I just want to sleep...it’s an endless cycle and you feel like you’re doing it all with no energy dreading the shifts on ECMO”* (N10).

Another nurse also said: *“...nurses on ECMO should have their work regulated in a way that relieves them from the rest of the pressure... we can’t handle ECMO and the paperwork and the hygiene...it’s too much for me to handle all of this the time does not help and my legs can’t help as well ...”* (N7).

Role Confusion and Miscommunication

The second subtheme conveyed that the ICU nurses were related to the notion that at many times and due to the extensive responsibilities held by the ICU nurses handling ECMO and the general pressure of the ICU, confusion ensues between the healthcare team members and mainly between

them and the physicians. Therefore, certain roles get lost among healthcare team members and precipitate miscommunication.

One of the nurses said: "... many times toned discussions have taken place about why I did this or that without the physician's order knowing that it is exclusively part of my practice in ECMO and does not need the doctor's approval...sometimes the doctors treat us like we don't know what we're doing and dispute starts between us which compromises our health and the patient's outcomes and quality of care..." (N4).

Another nurse also shared a similar experience: "...due to a lack of standardized policy regarding ECMO sometimes we clash with the physician and it escalated one time that one of our colleagues got so mad that he refused to listen to the nurse regarding a certain patient condition only because he thinks that it's not a nurses authority to take certain decisions in the management of ECMO... sometimes it's even the other way around ... certain acts we don't do without the physician's consent and they say that they are not entitled...there's a wide margin of miscommunication and confusion" (N13).

Another nurse also proclaimed: "...with all the workload on us, a simple mistake sometimes can fire up the doctor and he starts shouting and yelling at us as if this is only our responsibility... there is a big misunderstanding among certain doctors and they feel like they are only responsible for the orders and not for the outcomes as well..." (N9).

Emotional Drain and Psychological Exhaustion

The final theme that emerged from the interviews with the ICU nurses emphasized the heavy psychological impact of managing an ECMO patient. The nurses have expressed their experience of intense stress and anxiety due to structural and procedural constraints with ECMO and their compassion for the patient and the family.

One of the nurses said: "...it is so emotionally tiring to deliver bad news to the family of the patient at end of life or whenever we face any difficulties to acquire certain resources or whenever poor prognosis was determined... you need to be strong for them but you are not as you have been trying your best to keep up the outcomes of the patient ...you see the patient suffer and you can do nothing about it... It is exhausting..." (N5).

A similar experience was also shared: "...sometimes I get emotionally overwhelmed and I start crying ... on one hand I have a lot of work to do and on the other hand you just stop everything and look at all the tubing and look at the patient at the mercy of this machine...you get so overwhelmed... It's heavy..." (N2).

Discussion

Nurse's Role in ECMO

The findings of this study demonstrated that ICU nurses who have been caring for patients on ECMO considered nursing

to be one of the most crucial aspects of ECMO management. Additionally, the qualitative study demonstrated that ICU nurses are part of ECMO treatment team and give particular attention to the various care needs of ECMO patients. ICU nurses, for instance, perform a variety of dynamic tasks, including patient management of the patient's clinical needs and ensuring the integrity of ECMO circuit by constant monitoring, review, and configuration, as well as the detection and control of the circuit incidents. This was consistent with Alshammari et al. (2020) and Wellman (2017), who showed that nurses regarded their function as key and crucial in the success of ECMO procedure as well as for the clinical outcomes of the patient (Alshammari et al., 2020; Wellman, 2017).

In addition, the results of this study have indicated that the ICU nurses managing ECMO patients faced various challenges and were put under high workloads and occupational pressures additional to those inherently exerted in critical care settings. The participants reported a lack of structure in the work systems, which has smothered them with higher pressure, thus affecting their daily living, quality of life, and quality of care. This study's findings are consistent with Alshammari et al. (2020), who have indicated that nurses dealing with ECMO patients were subject to extremely high workloads, which rendered them inept or unable to deliver high-quality services and affected them physically and psychologically. This study finding is also in line with Paolone (2017) which has revealed that ECMO work experience shows many obstacles facing healthcare practitioners, and these have been primarily related to the challenging nature of the procedure (Paolone, 2017). In addition, the insufficient workforce was recorded in the mentioned survey, turning into job overload and ultimately exhaustion. In comparison to the prescribed level of 1:1 nurse-to-patient ratio, nurses reported operating on an average of 1:3 nurse-to-patient ratio. Further, this study's results were also consistent with Li et al. (2020) who have indicated that the nature of ECMO is that it entails patient retrieval and mobility treatment which poses high psychological and physiological pressure on the nurses due to the time restrictions of transferring patients, as well as the physical burden of fulfilling such a task and then coming back to the unit to continue their regular tasks. Also, further pressures of contracting infectious diseases due to the administration of ECMO were reported by ICU nurses (Ng et al., 2020). Moreover, this study's results are in line with Argent et al. (2015) and Dall'Ora et al. (2015), which have documented immensely the heavy workload of ECMO nurses and the structural constraints that have placed these nurses under long working hours, heavy tasks, and personal stress (Argent et al., 2015; Dall'Ora et al., 2015).

Skills and Training

The findings of this study have shown that managing ECMO patients needed an interdisciplinary approach to care to meet

the care requirements of such complex patient cases enhance the quality of care and enhance patient outcomes. The ICU nurses have conveyed that interprofessional collaboration also helped them alleviate the workload and role confusion in managing ECMO patients. These findings are consistent with Ratnani et al. (2018), which have indicated that ECMO is a complex procedure that needs multiple healthcare team members to be managed and handled. As a result, nurses find themselves stuck and unable to deliver the requisite treatment without collaboration with the healthcare team. Therefore, hospital administrators must maintain that teamwork is ensured on ECMO across the spectrum of patient care. The findings of this study were also consistent with Honey and Wang (2013), which have found that interprofessional collaboration in ECMO not only contributes to desirable outcomes for the patients but by reduces some of the nurses' care duties, as it is also necessary to offer comfort and support to the nurses. Also, this study's findings were corroborated by various authors who found that team spirit and interprofessional collaboration among the ICU team is crucial for the clarity of roles and responsibilities and the success of treatment modalities and namely complex procedures (Al-Ajarmeh et al., 2021; Bruce et al., 2015). For instance, Li et al. (2020) have shown that an average of two caregivers must tend to one patient on ECMO to attain optimum care.

Furthermore, the results of this study have shown that the competence of nurses is crucial in managing ECMO patients and that training more nurses and updating the nurses' skills and competency makes ECMO nurses feel more secure and confident in providing such care as well as alleviates the heavy workload. This finding is consistent with Kneebone (2016) and Wellman (2017), which have indicated that nurses expressed the desire for recurrent training and education sessions on ECMO management to master specific technical skills and update their competency in performing ECMO-related procedures (Kneebone, 2016; Wellman, 2017). The study results are also in line with Hackmann et al. (2017), which have indicated that a crucial aspect of effective ECMO management is staff skill. To achieve the requisite expertise, nurses appreciated the intensive training obtained in the present report, which is primarily specialist training in ECMO management. It has been noted that undergoing advanced training in ECMO management strengthens the skill and trust of nurses in the handling of ECMO patients by resolving life-threatening concerns and minimizing possible complications during the ECMO process. The study findings are also in line with Zhan et al. (2020), which have reported that it is important that nurses are specially equipped with skills in ECMO care and circuit maintenance in clinical environments where ICU nurses predominantly handle ECMO patients.

Challenges Faced by ECMO Nurses

This study showed that the ICU nurses taking care of ECMO patients had experienced intense emotional responses and

psychological burdens due to the delivery of bad news to families. This could be due to the high psychological burden on the family members of patients in the ICU (Eshah & Rayan, 2015). This finding is also comparable to the findings of Corley et al. (2010), which show that caring for ECMO patients with similar characteristics to workers may have exceptionally high emotional depth (Corley et al., 2010). In addition, the results of this study were also in line with Wellman (2017) and Eshah and Rayan (2015) who indicated that one of the most psychologically demanding conditions for ICU nurses was helping families of terminally ill patients. In this sense, nurses shared contrasting opinions on the acceptability of voicing feelings in front of families. Efstathiou and Walker (2014) state that it is a considerable challenge for nurses to find intimate, ethical, and emotional borders with patients and families in certain situations (Efstathiou & Walker, 2014). Some nurses may have preferred to minimize emotional communication in front of patients since doing so often may contribute to exhaustion or burnout (Van Mol et al., 2015).

Strengths and Limitations

The researchers agree that to expand comprehension of the perceptions of ECMO treatment and accept the assumptions made, it is necessary to include nurses' viewpoints from diverse backgrounds and environments. This limitation accounts for the need to carry out comparable studies around Lebanon and other countries in other ECMO centers to produce more reflective results that could guide changes in ECMO administration. However, this study conducted a qualitative approach amongst nurses delivering ECMO in critical care settings to gain a deep understanding of clinical relevance and practical application and hence improve the quality of patient care.

Implications for Practice

Further qualitative studies in this field will contribute to taking into account ICU personnel's perceptions of clinical and ethical problems that apply to particular areas of ECMO treatment. In some cases, the decision-making process between clinicians, patients, and families is one illustration. This is particularly important as the "awake ECMO" practice is being used more often in which patients are treated while they are alert. Using quantitative measures such as surveys may help decide if the opinions shared in this analysis by ICU nurses shape more common trends within a domestic or global context among ECMO-practicing critical care nurses. In addition, survey research would help to explore expectations of professional competence for ECMO in various fields of clinical practice of doctors or nurses, such as the view of doctors on their decision-making abilities or expertise in dealing with families, or the views of nurses on their capacity to administer ECMO independently.

Conclusion

ICU nurses who work with ECMO face high-stress conditions since it necessitates the collaboration of numerous healthcare specialists, including physicians, perfusionists, respiratory therapists, and pharmacists. To achieve optimal patient care, ICU nurses must effectively communicate and coordinate with these team members. Caring for severely ill patients can also be emotionally exhausting for ICU nurses. They frequently create close bonds with patients and their families, which can cause emotional strain, especially if a patient's condition does not improve or if they have negative results. To sum up, working as an ICU nurse in an ECMO unit is demanding work. The high-stress workplace, emotional toll, and physical demands are offset by the satisfaction of contributing to better patient outcomes and playing an important role in the patients' ECMO journey. To help ICU nurses cope with the specific challenges of managing ECMO patients, healthcare organizations must provide proper training, resources, and emotional support.

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References

- Al-Ajarmeh, D. O., Rayan, A. H., Eshah, N. F., & Al-Hamdan, Z. M. (2021). Nurse–nurse collaboration and performance among nurses in intensive care units. *Nursing in Critical Care*, 27(6), 747–755. <https://doi.org/10.1111/nicc.12745>
- Aldisi, M., Alsalemi, A., Alhomsy, Y., Ahmed, I., Bensaali, F., Alinier, G., & Amira, A. (2017). Design and implementation of a modular ECMO simulator. *Qatar Medical Journal*, 2017(1-Extracorporeal Life Support Organisation of the South and West Asia Chapter 2017 Conference Proceedings), (1), 62. <https://doi.org/10.5339/qmj.2017.swacelso.62>
- Alshammari, M. A., Vellokalam, C., & Alfeeli, S. (2020). Nurses' perception of their role in extracorporeal membrane oxygenation care: A qualitative assessment. *Nursing in Critical Care* (2), 251–257. <https://doi.org/10.1111/nicc.12538>
- Alshammari, M. A., Vellokalam, C., & Alfeeli, S. (2022). Nurses' perception of their role in extracorporeal membrane oxygenation care: A qualitative assessment. *Nursing in Critical Care*, 27(2), 251–257. <https://doi.org/10.1111/nicc.12538>
- Argent, A. C., Benbenishty, J., & Flaatten, H. (2015). *Chronotypes, night shifts and intensive care*. In (pp. 698–700): Springer.
- Broman, L. M., Holzgraefe, B., Palmér, K., & Frenckner, B. (2015). The Stockholm experience: Interhospital transports on extracorporeal membrane oxygenation. *Critical Care*, 19(1), 1–6. <https://doi.org/10.1186/s13054-015-0994-6>
- Bruce, C. R., Miller, S. M., & Zimmerman, J. L. (2015). A qualitative study exploring moral distress in the ICU team: The importance of unit functionality and intrateam dynamics. *Critical Care Medicine*, 43(4), 823–831. <https://doi.org/10.1097/CCM.0000000000000822>
- Brum, R., Rajani, R., Gelandt, E., Morgan, L., Raguseelan, N., Butt, S., & Broughton, S. (2015). Simulation training for extracorporeal membrane oxygenation. *Annals of Cardiac Anaesthesia*, 18(2), 185. <https://doi.org/10.4103/0971-9784.154472>
- Calhoun, A. (2018). ECMO: Nursing care of adult patients on ECMO. *Critical Care Nursing Quarterly*, 41(4), 394–398. <https://doi.org/10.1097/CNQ.0000000000000226>
- Connelly, L. M. (2016). Trustworthiness in qualitative research. *MedSurg Nursing*, 25(6), 435.
- Corley, A., Hammond, N. E., & Fraser, J. F. (2010). The experiences of health care workers employed in an Australian intensive care unit during the H1N1 Influenza pandemic of 2009: A phenomenological study. *International Journal of Nursing Studies*, 47(5), 577–585. <https://doi.org/10.1016/j.ijnurstu.2009.11.015>
- Dall'Ora, C., Griffiths, P., Ball, J., Simon, M., & Aiken, L. H. (2015). Association of 12 h shifts and nurses' job satisfaction, burnout and intention to leave: Findings from a cross-sectional study of 12 European countries. *BMJ Open*, 5(9), e008331. <https://doi.org/10.1136/bmjopen-2015-008331>
- Efstathiou, N., & Walker, W. (2014). Intensive care nurses' experiences of providing end-of-life care after treatment withdrawal: A qualitative study. *Journal of Clinical Nursing*, 23(21-22), 3188–3196. <https://doi.org/10.1111/jocn.12565>
- Ericsson, A., Frenckner, B., & Broman, L. M. (2017). Adverse events during inter-hospital transports on extracorporeal membrane oxygenation. *Prehospital Emergency Care*, 21(4), 448–455. <https://doi.org/10.1080/10903127.2017.1282561>
- Eshah, N., & Rayan, A. H. (2015). The psychological burden of a relative's CICU admission. *British Journal of Cardiac Nursing*, 10(4), 194–200. <https://doi.org/10.12968/bjca.2015.10.4.194>
- Gillon, S., Rowland, K., Shankar-Hari, M., Camporota, L., Glover, G., Wyncoll, D., & Langrish, J. (2018). Acceptance and transfer to a regional severe respiratory failure and veno-venous extracorporeal membrane oxygenation (ECMO) service: Predictors and outcomes. *Anaesthesia*, 73(2), 177–186. <https://doi.org/10.1111/anae.14083>
- Hackmann, A. E., Wiggins, L. M., Grimes, G. P., Fogel, R. M., Schenkel, F. A., Barr, M. L., & Starnes, V. A. (2017). The utility of nurse-managed extracorporeal life support in an adult cardiac intensive care unit. *The Annals of Thoracic Surgery*, 104(2), 510–514. <https://doi.org/10.1016/j.athoracsur.2016.11.005>
- Hijeh, M. (2017). ECMO nurse specialist: Qatar experience. *Qatar Medical Journal*, 2017(1), 55. <https://doi.org/10.5339/qmj.2017.swacelso.55>

- Honey, M., & Wang, W. Y. (2013). New Zealand nurses perceptions of caring for patients with influenza A (H1N1). *Nursing in Critical Care, 18*(2), 63–69. <https://doi.org/10.1111/j.1478-5153.2012.00520.x>
- Jaouni, H. (2017). Application of ethical principles to VV-ECMO patients in Qatar. *Qatar Medical Journal, 2017*(1-Extracorporeal Life Support Organisation of the South and West Asia Chapter 2017 Conference Proceedings), (1), 48. <https://doi.org/10.5339/qmj.2017.swacelso.48>
- Johnston, L., Williams, S. B., & Ades, A. (2018). *Education for ECMO providers: Using education science to bridge the gap between clinical and educational expertise*. Paper presented at the Seminars in perinatology.
- Kneebone, R. L. (2016). Performing surgery: Commonalities with performers outside medicine. *Frontiers in Psychology, 7*(7), 1233. <https://doi.org/10.3389/fpsyg.2016.01233>
- Koons, B., & Siebert, J. (2020). Extracorporeal membrane oxygenation (ECMO) as a bridge to lung transplantation: Considerations for critical care nursing practice. *Critical Care Nurse, 40*(3), 49–57. <https://doi.org/10.4037/ccn2020918>
- Li, X., Guo, Z., Li, B., Zhang, X., Tian, R., Wu, W., & Clifford, S. P. (2020). Extracorporeal membrane oxygenation for coronavirus disease 2019 in Shanghai, China. *Asaio Journal, 66*(5), 475–481. <https://doi.org/10.1097/MAT.0000000000001172>
- Lockie, C. J., Gillon, S. A., Barrett, N. A., Taylor, D., Mazumder, A., Paramesh, K., & Meadows, C. I. (2017). Severe respiratory failure, extracorporeal membrane oxygenation, and intracranial hemorrhage. *Critical Care Medicine, 45*(10), 1642–1649. <https://doi.org/10.1097/CCM.0000000000002579>
- Makdisi, G., & Wang, I.-w. (2015). Extra corporeal membrane oxygenation (ECMO) review of a lifesaving technology. *Journal of Thoracic Disease, 7*(7), E166. <https://doi.org/10.3978/j.issn.2072-1439.2015.07.17>
- Mongero, L., Beck, J., & Charette, K. (2013). Managing the extracorporeal membrane oxygenation (ECMO) circuit integrity and safety utilizing the perfusionist as the “ECMO specialist”. *Perfusion, 28*(6), 552–554. <https://doi.org/10.1177/0267659113497230>
- Morrow, R., Rodriguez, A., & King, N. (2015). Colaizzi’s descriptive phenomenological method. *The Psychologist, 28*(8), 643–644.
- Ng, K., Poon, B. H., Kiat Puar, T. H., Shan Quah, J. L., Loh, W. J., Wong, Y. J., & Raghuram, J. (2020). COVID-19 and the risk to health care workers: A case report. *Annals of Internal Medicine, 172*(11), 766–767. <https://doi.org/10.7326/L20-0175>
- Paolone, S. (2017). Extracorporeal membrane oxygenation (ECMO) for lung injury in severe acute respiratory distress syndrome (ARDS): Review of the literature. *Clinical Nursing Research, 26*(6), 747–762. <https://doi.org/10.1177/1054773816677808>
- Ratnani, I., Tuazon, D., Zainab, A., & Uddin, F. (2018). The role and impact of extracorporeal membrane oxygenation in critical care. *Methodist DeBakey Cardiovascular Journal, 14*(2), 110. <https://doi.org/10.14797/mdcj-14-2-110>
- Ross, P., Watterson, J., Fulcher, B. J., Linke, N. J., Nicholson, A. J., Ilic, D., & Hodgson, C. L. (2023). Nursing workforce, education, and training challenges to implementing extracorporeal membrane oxygenation services in Australian intensive care units: A qualitative substudy. *Australian Critical Care, 36*(1), 114–118. <https://doi.org/10.1016/j.aucc.2021.12.003>
- Schmidt, M., Bréchet, N., & Combes, A. (2016). Ten situations in which ECMO is unlikely to be successful. *Intensive Care Medicine, 42*(5), 750–752. <https://doi.org/10.1007/s00134-015-4013-9>
- Van Mol, M. M., Kompanje, E. J., Benoit, D. D., Bakker, J., & Nijkamp, M. D. (2015). The prevalence of compassion fatigue and burnout among healthcare professionals in intensive care units: A systematic review. *PloS One, 10*(8), e0136955. <https://doi.org/10.1371/journal.pone.0136955>
- Wellman, J. (2017). *An exploration of staff experiences of extracorporeal membrane oxygenation (ECMO)*. University of East London.
- Zhan, W., Li, M., Xu, M., & Lu, Y. (2020). Successful treatment of COVID-19 using extracorporeal membrane oxygenation. *European Review for Medical and Pharmacological Sciences, 24*(6), 3385–3389.