Original Research Article

Understanding the Challenges Faced by Nurses in Caring for Patients on Extracorporeal Membrane Oxygenation

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Abstract

Background: Nurses play a vital role in caring for patients receiving extracorporeal membrane oxygenation (ECMO) for severe respiratory or cardiac failure. However, this area of nursing practice presents unique challenges. Accordingly, understanding these challenges is essential to improve patient care and support nurses' well-being. *Aims:* This study aimed to investigate and identify challenges nurses face in providing care to patients on ECMO. *Method:* A quantitative cross-sectional study of eligible nurses was conducted at King Faisal Specialist Hospital and Research Center in Riyadh City (KFSH&RC-R). A survey instrument developed by the principal investigators was used to collect data. A panel of ECMO specialists and clinical experts validated the survey content. *Results:* A total of 66 nurses (75.8% females, 60.6% aged 25–34 years, 33.3% with 1–5 years of nursing experience, and 87.9% holding a bachelor's degree in nursing) participated in the study. The identified challenges were managing complex equipment, maintaining stability, coordinating with multidisciplinary teams, addressing ethical dilemmas, managing high acuity, coping with stress, and prioritizing self-care. *Conclusions:* These findings highlight the multifaceted challenges nurses face in caring for patients on ECMO, which influence their well-being, job satisfaction, and the quality of care provided. Thus, interventional strategies to address these issues in this specialized area are urgently required.
Keywords: Extracorporeal membrane oxygenation, nurses, challenges, patient care.

INTRODUCTION

Providing care to patients on extracorporeal membrane oxygenation (ECMO), a life-saving therapy for severe respiratory or cardiac failure,[1] requires specialized knowledge, skills, and competencies, making it a challenging and demanding area of nursing practice [2,3]. The multifaceted challenges encountered by nurses involved in ECMO patient care include managing complex equipment, maintaining stability, coordinating with multidisciplinary teams, communicating effectively, addressing ethical dilemmas, handling high acuity, coping with emotional stress, and prioritizing self-care [3,4]. In the midst of these complexities, issues such as heavy workloads, inefficient communication, and lack of organizational support further compound the challenges nurses encounter. To navigate this demanding landscape, nurses rely on coping strategies, seek satisfaction through supportive environments, and

prioritize their well-being to deliver optimal care to patients undergoing extracorporeal membrane oxygenation procedures [3]. Identifying these obstacles is crucial for the development of effective strategies aimed at mitigating their impact on nurses' well-being and patient care. By addressing these challenges and fostering a supportive ecosystem, healthcare institutions can enhance nurse satisfaction, bolster coping mechanisms, and promote overall well-being in the specialized realm of ECMO care. This holistic approach not only benefits the nurses directly involved in ECMO patient care but also contributes to improved patient outcomes and quality of care within healthcare settings [3]. Exploring coping strategies will provide insights to support involved nurses and optimize resource allocation [3]. Accordingly, this quantitative study was conducted to gain insight into the specific challenges nurses face when caring for patients on ECMO, which represent a current knowledge gap.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional study was conducted at King Faisal Specialist Hospital and Research Center in Riyadh City (KFSH&RC-R). Data were collected from 1 December 2023 to 31 December 31 2023. The study population comprised nurses who met the inclusion criteria, including (1) being employed at KFSH&RC-R, (2) currently working in the intensive care unit, and (3) being experienced in caring for patients on ECMO at KFSH&RC-R. The minimum sample size required was 62, which was calculated using the Raosoft software at the 90% confidence level, with an estimated 50% response distribution and a margin of error of 5%.

Recruitment

We identified 80 eligible nurses currently employed at KFSH&RC-R during the one-month recruitment from 1 December 2023 to 31 December 2023. Specifically, the nurses worked in the cardiac surgical intensive care unit and adult surgical intensive care unit, of whom 70 were available and willing to participate in the survey. Of the 70 participants who were given the questionnaire during their shifts, 66 responded while ensuring minimal disruption to their duties.

Data Collection

The nurses were approached individually to coordinate a suitable time to complete the questionnaire. The questionnaire, comprising 22 items divided into 6 sections, was designed to be completed within approximately 15 min.

Survey

Since no validated instrument could meet the aim of our study, we developed a survey based on the Principal Investigator's expertise in ECMO and relevant articles discussing nurses' perceptions regarding the care for patients on ECMO [3,19,21].

In the first phase, a panel of 3 ECMO specialists, 1 clinical instructor from the cardiac intensive care unit, and 2 staff nurses with extensive experience and clinical expertise in ECMO served as content experts to assess the validity, accuracy, and completeness of the questionnaire. The panel evaluated each item of the questionnaire. The questionnaire consisted of 22 items, encompassing both forced-choice and open-ended questions aligned with the domains outlined in the study objectives.

In the second phase, a pilot study involving 10 members of the critical care units' personnel was conducted to check for clarity. Their feedback contributed to minor rewording and shaped the final form of the questions.

The questionnaire was divided into six sections:
1. **Demographic Information:** Participants provided details such as gender, age, nursing experience, education level, specific ECMO patient care experience, and relevant training/certifications.
2. **Challenges Faced by Nurses in ECMO Patient Care:** This section presented Likert scale statements that participants rated on a scale of 1 to 5, with 1 indicating "Strongly Disagree" and 5 indicating "Strongly Agree." These statements assessed the intensity of various challenges, including physical demands, communication hurdles with colleagues and patients' families, workload pressures, emotional stressors, and ethical dilemmas commonly encountered in ECMO patient care. The internal consistency of this section, measured using Cronbach's alpha coefficient, was found to be 0.87.
3. **Specific Challenges:** Nurses were prompted to select from a list the most prevalent issues they encountered while caring for ECMO patients. This section aimed to identify key difficulties that nurses consistently face in their roles.
4. **Coping Strategies:** Nurses detailed the various mechanisms they employed to navigate and cope with the challenges inherent in ECMO patient care. These strategies could encompass individual coping methods as well as team-based approaches to managing stress and difficulties in the workplace.
5. **Nurses' Well-being and Job Satisfaction:** This section delved into aspects such as overall job satisfaction, emotional well-being, work-life balance, the effectiveness of support systems within their healthcare environment, and suggestions for enhancing these support structures.
6. **Open-ended Questions:** Participants could provide detailed narratives about specific challenges faced in ECMO patient care, how these challenges impacted their work, and their recommendations for improvements or additional support measures. This section enabled the collection of rich qualitative insights to complement the quantitative data gathered in the preceding sections.

Data Analysis

The collected data were subjected to descriptive statistical analysis using the SPSS software, with findings presented in summarized tables. Various statistical measurements, including frequencies, percentages, means, and standard deviations, were calculated for all variables. These measurements were used to analyze the distribution, central tendency, and dispersion of the collected data. The analysis of the open-ended questions from Section 5 involved coding and categorizing the responses to identify key themes and patterns emerging from the participants' experiences and perspectives.

Ethical Considerations

The procedures were performed according to the ethical standards of the responsible committee on human experimentation (institutional) and the Helsinki Declaration of 1975, as revised in 2013 (available at https://www.wma.net/policies-post/wma-declaration-of-

helsinki-ethical-principles-for-medical-research-involving-human-subjects/). The KFSH&RC-R approved this study (RAC # 2231422). Informed consent was obtained from all participants after receiving detailed information on the study's purpose and the voluntary nature of their participation, with the option to decline or withdraw from the study without negative consequences. Participant's information was kept strictly confidential and accessible only to the research team.

RESULTS
Demographic Characteristics
Of the 66 participants, 24.2% were males, and 75.8% were females. A small percentage (1.5%) were aged <25 years, with the majority (60.6%) aged 25–34 years. Participants with 1–5 years of nursing experience constituted the largest group (33.3%), followed by those with 6–10 years (21.2%) and >15 years (27.3%). The majority (87.9%) were nursing graduates, while a small portion had a diploma/associate (6.1%) or master's degree (6.1%). Furthermore, 47% of participants had 1–5 years of experience in caring for patients on ECMO, while 33.3% of participants had >5 years of experience. Most participants (60.6%) cared for <50 patients on ECMO. Approximately 39.4% of nurses were certified in ECMO, and 54.5% of participants had specialized training. Most participants (84.8%) were enrolled in formal educational programs or ECMO-related courses. Regarding confidence in their knowledge and skills associated with ECMO patient care, 24.2%, 50%, 18.2%, 4.5%, and 1.5% of participants felt very confident, confident, neutral, less confident, and not confident, respectively (Table 1).

Table 1 Demographic characteristics

Variables	Frequency	%
Sex		
Male	16	24.2
Female	50	75.8
Age, y		
<25	1	1.5
25–34	40	60.6
35–44	12	18.2
45–54	10	15.2
>55	3	4.5
Years of nursing experience, y		
<1	1	1.5
1–5	22	33.3
6–10	14	21.2
11–15	11	16.7
>15	18	27.3
Highest level of education		
Diploma/Associate degree in nursing	4	6.1
Bachelor's degree in nursing	58	87.9
Master's degree	4	6.1
Years of Experience Caring for ECMO Patients, y		
<1	13	19.7
1–5	31	47
>5	22	33.3
ECMO cases		
<50	40	60.6
50–100	13	19.7
>100	13	19.7
Specialized training or certification in ECMO		
Yes, obtained a certification	26	39.4
Yes, received specialized training	36	54.5
No	3	4.5
Formal educational programs or ECMO-related courses		
Yes	56	84.8
No	10	15.2
Confidence level		
Very confident	16	24.2
Confident	33	50.0
Neutral	12	18.2

Variables	Frequency	%
Less confident	3	4.5
Not confident at all	1	1.5

ECMO, extracorporeal membrane oxygenation

Challenges in ECMO Patient Care

The study identified the challenges faced by nurses while caring for patients on ECMO (Table 2). Participants rated close collaboration with other healthcare professionals as the most significant challenge, with a mean score of 4.58 (standard deviation [SD] = 0.786). The need for specialized knowledge and skills ranked second, with a mean score of 4.56 (SD = 0.897). Managing the unpredictability of patient outcomes represented another significant challenge, with a mean score of 4.14 (SD = 0.821). Additionally, high acuity in patients on ECMO (a mean score of 4.06; SD = 1.021), physical demands of caring for patients on ECMO (a mean score of 3.86; SD = 1.122), the emotional toll of caring for patients on ECMO (a mean score of 3.58; SD = 0.895), the complexity of ECMO technology (a mean score of 3.44; SD = 1.152), and communication issues within the healthcare team (a mean score of 3.65; SD = 1.157) were rated as significant challenges. Furthermore, the workload associated with ECMO patient care was perceived as overwhelming, with a mean score of 3.58 (SD = 1.11). Finally, limited resources and equipment for ECMO patient care were identified as a challenge, with a mean score of 2.89 (SD = 1.191).

Table 2: Challenges in ECMO patient care

Challenges Statements	Mean	SD
Caring for patients on ECMO is physically demanding	3.86	1.122
ECMO patient care requires specialized knowledge and skills	4.56	0.897
There are communication challenges among the healthcare team in ECMO patient care	3.65	1.157
The workload associated with caring for patients on ECMO is overwhelming	3.58	1.11
The emotional toll of caring for patients on ECMO is significant	3.58	0.895
There are limited resources and equipment available for ECMO patient care	2.89	1.191
The complexity of ECMO technology presents challenges in patient management	3.44	1.152
ECMO patient care requires close collaboration with other healthcare professionals	4.58	0.786
The high acuity of ECMO patients adds pressure to nursing practice	4.06	1.021
The unpredictability of patient outcomes in ECMO care is challenging to manage	4.14	0.821

ECMO, extracorporeal membrane oxygenation; SD, standard deviation

Specific Challenges

The most prevalent challenge was emotional stress from dealing with critically ill patients, which accounted for 57.60% of responses (Table 3). Difficulty in coordinating care with other healthcare providers ranked second (36.40%). Complex patient management due to comorbidities and challenges in discontinuing patients from ECMO support was the third most common challenge (53.00%). Inadequate staffing levels and limited availability of necessary equipment and supplies were reported as the fourth and fifth challenges (42.40% and 28.80%), respectively. The remaining challenges included the high patient-to-nurse ratio, lack of ECMO-specific training opportunities, communication gaps between the ECMO team and nursing staff, the absence of a standardized heparin protocol, issues with registered nurse–to-medical doctor (RN-MD) interaction, challenges with medical doctor–to-medical doctor (MD-MD) interaction, scarcity of doctors with ECMO expertise, and lack dedicated ECMO specialists, accounting for 18.20%–13.60% of responses.

Table 3: Specific challenges

Specific Challenges	Frequency	%
High patient-to-nurse ratio	12	18.20%
Lack of ECMO-specific training opportunities	16	24.20%
Difficulty in coordinating care with other healthcare providers	24	36.40%
Emotional stress from dealing with critically ill patients	38	57.60%
Inadequate staffing levels	28	42.40%
Limited availability of necessary equipment and supplies	19	28.80%
Communication gaps between the ECMO team and nursing staff	14	21.20%
Complex patient management due to comorbidities	35	53.00%
Challenges in weaning patients off ECMO support	35	53.00%
Other	9	13.60%

ECMO, extracorporeal membrane oxygenation

Coping Strategies

The most commonly reported coping strategy was seeking support from colleagues (69.7%; Table 4). Participants frequently engaged in self-care activities, such as exercise and hobbies, accounting for 33.3% of responses. Stress management techniques, such as deep breathing and mindfulness, ranked third (54.5%).

Seeking educational resources related to ECMO care was the fourth most used coping strategy (65.2%). Participation in debriefing or counseling sessions and engagement in reflective practice or journaling were reported less frequently (18.2% and 22.7%, respectively).

Table 4: Coping strategies

Coping Strategies	Frequency	%
Seeking support from colleagues	46	69.7%
Engaging in self-care activities (e.g., exercise and hobbies)	22	33.3%
Participating in debriefing or counselling sessions	12	18.2%
Utilizing stress management techniques (e.g., deep breathing and mindfulness)	36	54.5%
Seeking educational resources related to ECMO care	43	65.2%
Engaging in reflective practice or journaling	15	22.7%

ECMO, extracorporeal membrane oxygenation

Nurses' Well-Being and Satisfaction

The nurses ' well-being and satisfaction indicated relatively high job satisfaction among nurses caring for patients on ECMO, with a mean score of 2.09 (SD = 0.65; Table 5). On average, nurses reported their overall well-being in caring for patients on ECMO as 'good,' with a mean score of 1.95 (SD = 0.732). Burnout among nurses caring for patients on ECMO showed an average score of 2.7 (SD = 1.037), suggesting 'occasional' burnout. A mean score of 2.38 (SD = 1.160) for the perception of organizational support among nurses caring for patients on ECMO suggested that nurses perceived the received organizational support as 'moderately supported.' The likelihood of recommending a nursing career to others in caring for patients on ECMO obtained a mean score of 1.83 (SD = 1.001), indicating that nurses were more inclined to recommend this career to others. Regarding factors contributing to job satisfaction, the highest prevalence was observed for positive patient outcomes (74.20%), followed by effective teamwork and collaboration (66.70%), opportunities for professional growth and development (62.10%), supportive work environment (63.60%), appreciation and recognition from colleagues and supervisors (42.40%), and adequate resources and equipment (42.90%). Work-life balance (28.80%) and other factors (1.50%) were reported with a lower prevalence. Conversely, the study also identified factors affecting job satisfaction among nurses caring for patients on ECMO. Emotional and psychological stress had the highest prevalence (56.10%), followed by high workload and long working hours (50.00%), inadequate staffing (51.50%), insufficient compensation and benefits (50.00%), lack of support from colleagues and supervisors (37.90%), lack of training and educational opportunities (30.30%), and limited career advancement opportunities (25.80%).

Table 5: Nurses' well-being and satisfaction

Nurses' Well-being and Satisfaction	Mean	SD
Overall job satisfaction for a nurse caring for patients on ECMO	2.09	0.65
Overall well-being in the role of a nurse caring for patients on ECMO	1.95	0.732
Burnout experience in the role of a nurse caring for patients on ECMO	2.7	1.037
Organization support for nurses caring for patients on ECMO	2.38	1.16
Recommend a nursing career in caring for patients on ECMO	1.83	1.001
Main factors contributing to job satisfaction as a nurse caring for patients on ECMO	**Frequency**	**%**
Supportive work environment	42	63.60%
Appreciation and recognition from colleagues and supervisors	28	42.40%
Opportunities for professional growth and development	41	62.10%
Effective teamwork and collaboration	44	66.70%
Positive patient outcomes	49	74.20%
Adequate resources and equipment	29	42.90%
Work-life balance	19	28.80%
Main factors negatively impacting the job satisfaction of a nurse caring for patients on ECMO	**Frequency**	**%**
High workload and long working hours	33	50.00%
Lack of support from colleagues and supervisors	25	37.90%
Inadequate staffing levels	34	51.50%

Nurses' Well-being and Satisfaction	Mean	SD
Emotional and psychological stress	37	56.10%
Insufficient compensation and benefits	33	50.00%
Limited career advancement opportunities	17	25.80%
Lack of training and educational opportunities	20	30.30%

ECMO, extracorporeal membrane oxygenation; SD, standard deviation

DISCUSSION

Our findings provide valuable insights into the specific challenges encountered by nurses caring for patients on ECMO, shedding light on various aspects related to the provision of care, the impact on nurses' well-being, and potential strategies for improvement. The challenges include managing complex equipment, maintaining stability, coordinating with multidisciplinary teams, addressing ethical dilemmas, managing high acuity, coping with stress, and prioritizing self-care.

The predominance of female nurses in our study aligns with the overall trend observed in the nursing profession, highlighting the significant role of female nurses in this field and consistency with the broader demographic composition of the KFSH&RC-R nursing workforce. In 2021, approximately 77% of 201,489 nurses were females, adding up to 155,146 female nurses [5]. Moreover, approximately 81% of among 1,830 graduate nurses were females, totaling 1,490 female nurses in 2021 [5]. A national program aimed at increasing employment contributed significantly to increasing the number of male nurses [6,7]. However, insufficient training programs, religious and cultural limitations, gender-related concerns, [8] and the desire for educational and professional development coupled with the relatively low social status of the nursing profession are factors influencing the nursing workforce [6].

The age distribution of the participants revealed that a considerable proportion were aged 25–34 years, indicating the early career stages of many nurses caring for patients on ECMO. The challenges faced by this group might stem from their lack of experience and exposure to complex cases, requiring greater support, mentorship, and educational resources to enhance their competence and confidence in managing patients on ECMO. However, the presence of more experienced nurses in the study sample suggests the availability of a valuable pool of knowledge and expertise, which can aid the professional growth and development of less experienced colleagues.

The findings of this study emphasize the critical importance of maintaining stability in the care of patients on ECMO. Nurses play a crucial role in this process by continually monitoring the patient's condition, adjusting therapeutic parameters, and responding promptly to any changes in the patient's status. Successfully maintaining stability involves both technical aspects, such as managing ECMO equipment, and the ability to make critical decisions under pressure.

Ongoing education and training programs are necessary to enhance nurses' critical thinking, problem-solving, and decision-making skills for ensuring optimal patient outcomes. These programs should focus on developing and refining the skills required to manage patients on ECMO as proposed by Fouilloux *et al.,* [10] and Priest *et al.,* [11] Furthermore, Botsch *et al.,* emphasized the crucial and multifaceted role of nurses in managing patients on ECMO, which requires proficiency in time management, assessment skills, and specialized care [12].

Another significant challenge highlighted in this study, as well as by Brown *et al.,* is the collaboration and effective communication required among various healthcare professionals, including physicians, respiratory therapists, perfusionists, and other specialized team members when caring for patients on ECMO [13]. A cohesive team approach is essential for ensuring seamless and coordinated care. Strategies such as team training and regular interdisciplinary meetings can be implemented to optimize interprofessional collaboration, enhancing communication and teamwork and ultimately improving patient outcomes [14]. Abrams *et al.,* emphasized the need for a multidisciplinary team of experts to guide the use of ECMO in cardiac failure [15]. This highlights the importance of involving various healthcare professionals in patient selection and complication management.

Ethical dilemmas pose a significant challenge for nurses caring for patients on ECMO. Decision-making surrounding the initiation, continuation, or withdrawal of ECMO is intricate and emotionally challenging. Nurses are often involved in discussions about end-of-life care, resource allocation, and support of patients and families through difficult decisions, as highlighted by Kirsch and Munson [16]. Thus, providing nurses with the necessary ethical frameworks, education, and emotional support is vital to navigating these challenging situations effectively while upholding patient autonomy and ensuring compassionate care. Nurses play a crucial role in this process as they closely interact with patients and families, offering valuable support and advocacy [17]. However, as the extent of their involvement may vary depending on the specific decision made, more consistent inclusion of nurses in these discussions is urged [18].

Managing high stress levels and understanding the emotional toll of caring for critically ill patients on ECMO are significant challenges faced by nurses. These patients require specialized care. Thus, nurses must possess clinical expertise and be able to manage emergencies while remaining composed in high-pressure situations. However, the demanding nature of their job causes an emotional burden and increases stress, compassion fatigue, and moral distress while reducing job satisfaction [19,20]. Establishing comprehensive support systems for nurses, including debriefing sessions, counseling services, and self-care initiatives, is essential to address the aforementioned challenges [21, 22]. Isa *et al.,* highlighted that nurses in high-stress environments, such as those caring for ECMO patients, often employ problem-solving and positive reappraisal as coping strategies [21]. However, they may also resort to escape-avoidance strategies, underscoring the need for effective support mechanisms that mitigate the negative effects of stress. By implementing these interventions, healthcare organizations can improve the overall quality of care provided by nurses in high-stress environments, such as ECMO patient care.

Consistent with Varma *et al.*'s proposal,[23] this study's findings emphasize the importance of prioritizing self-care among ECMO nurses due to the demanding nature of their jobs, long working hours, and high-acuity care. Neglecting personal well-being can cause burnout, decreased job satisfaction, and compromised patient care. Therefore, healthcare institutions should establish policies and initiatives promoting a culture of self-care, including provisions for regular breaks, adequate rest, and access to resources for stress management and maintenance of a healthy work-life balance. This study acknowledges that organizational factors, such as work schedules, can act as barriers to self-care. However, Vidal-Blanco suggested that the rewarding nature of working with patients can serve as a protective factor [24]. Notably, nurses in non-direct patient care roles may not always engage in health-promoting behaviors [25]. Therefore, comprehensive policies and initiatives are necessary to encourage and support self-care among nurses.

The challenges faced by nurses in ECMO patient care are multifaceted and require a comprehensive approach. Our findings provide valuable insights for healthcare institutions, nursing leaders, and policymakers for the development of strategies and interventions to address these challenges. Educational and training programs should be tailored to enhance nurses' knowledge, skills, and resilience in managing patients on ECMO. Support systems and resources should be implemented to provide emotional and psychological support to nurses, foster a positive work environment, and ensure nurses' well-being. Additionally, interdisciplinary collaboration, ethical guidance, and self-care initiatives should be integrated into the healthcare system to improve the quality of care

provided to patients on ECMO, as well as to enhance nurses' overall work experiences.

This study has some limitations. This study was conducted in a specific healthcare setting, possibly limiting the generalizability of findings to other contexts. Furthermore, this study utilized a cross-sectional design to provide an overview of the challenges at a specific time point. Accordingly, future research employing longitudinal designs can provide a more comprehensive understanding of the dynamic nature and evolution of the challenges faced by nurses in ECMO patient care. Additionally, qualitative research methods, such as interviews or focus groups, can be employed to better understand nurses' experiences and perspectives regarding the identified challenges.

In conclusion, caring for patients on ECMO poses significant challenges to nurses both professionally and personally. These challenges include managing complex equipment, maintaining stability, coordinating multidisciplinary teams, effective communication, addressing ethical dilemmas, handling high acuity, coping with stress, and prioritizing self-care. Thus, identifying and understanding these challenges are crucial for developing effective strategies to mitigate their impact on nurses' well-being and patient care. Healthcare organizations can enhance the quality of care provided to patients on ECMO and improve their overall work experience by addressing these challenges. Targeted interventions, support systems, and educational resources should be developed to assist nurses in effectively managing these challenges, ultimately improving patient outcomes.

Abbreviations: ECMO, extracorporeal membrane oxygenation; MD, medical doctor; PI, principal investigator; RN, registered nurse; SD, standard deviation.

Key Points:
1. **Nursing Practice Enhancement:** The study sheds light on the multifaceted challenges faced by nurses caring for patients on ECMO, emphasizing the critical need for tailored interventions to support nurses in managing complex equipment, coping with stress, and maintaining patient care quality.
2. **Healthcare Policy Implications:** The findings underscore the urgency of developing institutional strategies to address challenges identified in ECMO patient care, such as coordinating with multidisciplinary teams and prioritizing self-care, to enhance nurse satisfaction, job retention, and ultimately, patient outcomes.
3. **Future Research Directions:** This research highlights the necessity for further studies exploring effective coping strategies, supportive environments, and intervention programs tailored to the unique demands of ECMO nursing care, contributing to a more comprehensive

understanding of how to optimize nurse well-being and patient care quality.

4. **Educational Initiatives:** Insights from this study can inform the development of educational programs focusing on ECMO nursing, equipping nurses with the necessary skills and knowledge to navigate the complexities of ECMO care effectively, thereby improving overall care delivery and patient outcomes.

5. **Quality Improvement:** By addressing the challenges identified in this study through targeted quality improvement initiatives, healthcare institutions can foster a culture of support, resilience, and well-being among nurses, ultimately enhancing the quality of care provided to patients undergoing ECMO procedures.

Key Messages: This study identified the following challenges faced by nurses caring for patients on ECMO: managing complex equipment, maintaining stability, coordinating with multidisciplinary teams, addressing ethical dilemmas, managing high acuity, coping with stress, and prioritizing self-care. Consequently, interventional strategies to address these challenges are required.

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