

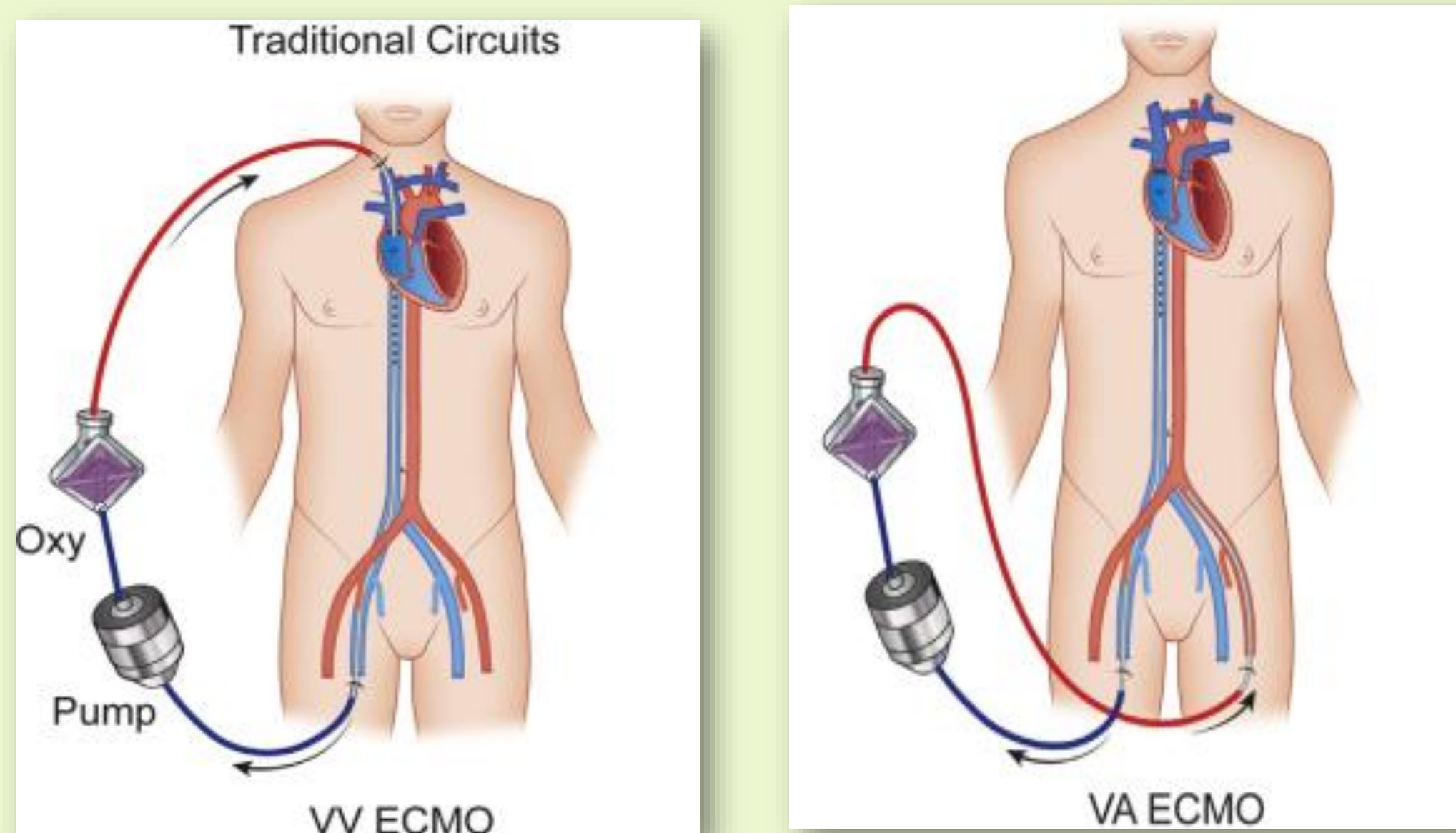
ECMO Outcomes in a Medium Sized Community Hospital without On-Site Cardiac Surgery: Using the Shock Team Approach.



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Introduction

- Extracorporeal Membrane Oxygenation (ECMO) is an advanced life-support therapy used in patients with severe cardiac or respiratory failure refractory to conventional treatment or when cardiopulmonary resuscitation (CPR) fails to achieve return of spontaneous circulation (ROSC) [1,2].
- ECMO** provides temporary cardiac and/or respiratory support by draining venous blood, oxygenating it via a membrane, removing CO₂, and returning oxygenated blood to circulation. Two main types are used:
 - VV-ECMO** – supports gas exchange in severe respiratory failure
 - VA-ECMO** – supports both circulation and oxygenation in cardiogenic or mixed shock [3,4].
- Since its first successful clinical use in 1954 for cardiac surgery and adaptation for respiratory failure in 1972, ECMO technology, patient selection, and outcomes have markedly improved. While large tertiary care centers report survival rates between 40–60% for respiratory failure and 40-50% for cardiac failure [5,6], limited data are available from medium-sized community hospitals, particularly those without on-site cardiac surgery.



Objective

Retrospective review of the outcomes in 13 ECMO patients treated at a medium-sized community hospital without on-site cardiac surgery, employing a multidisciplinary “Shock Team” approach focusing on primary diagnosis, survival rate, mortality rate and complications related to ECMO.

Methodology

- We conducted a retrospective observational study of 13 ECMO patients treated from 2021 to 2023 at North Knoxville Medical Center, a 219-bed community hospital with 28 intensive care unit (ICU) beds.
- Data was extracted through chart review using an electronic medical record system and analyzed in Excel. The analysis focused on patient demographics, indications for ECMO initiation, mode of support (Veno-venous or Veno-arterial), duration of ECMO, clinical outcomes, survival and mortality rates, and ECMO-related complications.
- The hospital followed a **Shock Team approach**, wherein the ECMO coordinator initiated rapid consultation among critical care, cardiology, and an affiliated cardio-thoracic surgery team at a partnering facility. ECMO was pursued only when there is unambiguous consensus among all three services regarding patient candidacy.
- Seven additional patients were excluded from cannulation due to unfavorable body habitus (n=2), poor post-cardiac arrest prognosis (n=1), lack of transfer destination for post-ECMO care (n=1), and clinical improvement after optimized ventilation or proning (n=3).

Results

A total of thirteen patients (6 females, 7 males) were included in the study, with a median age of 56 years (range: 40–65 years). Primary diagnosis and outcomes of ECMO briefly delineated below.

Primary Diagnosis	N= 13	Survived/ Died	Parameter	Survivors (n=4)	Non-Survivors (n=9)
• Acute respiratory distress syndrome (ARDS)-due to COVID-19.	4	1/3	• Median Age (years)	49.5	59.0
• Septic shock & acute hypoxic respiratory failure due to Pneumonia*	4	1/3	• Gender (Male / Female)	3 / 1	4 / 5
• Drug overdose	2	1/1	• ECMO Mode	VV:2 VA: 2	VV: 4 VA: 4 VV→VA: 1
• Pulmonary embolism	1	0/1	• Mean Days on ECMO	16.8	10.0
• Cardiogenic shock	2	1/1			

Discussion

- According to the Extracorporeal Life Support Organization (ELSO), more than 260,638 patients had received ECMO by 2025, including 164,013 adults, with reported survival rates of 59% for respiratory indications and 48% for cardiac indications [5].
- The CESAR trial further demonstrated improved survival without severe disability in patients with severe ARDS treated with ECMO compared to conventional ventilation (63% vs. 47%) [6].

Outcome	Our Study (n=13)	Published Data
• Overall survival rate	30.8% (4/13)	40–60% (respiratory); 48% (cardiac) [5]
• Median age (years)	56 (range 40–65)	Varies; younger age often favorable [5,6]
• Mean ECMO duration (days)	12.1 (16.8 survivors vs. 10.0 non-survivors)	Median 10–21, depending on indication [5,6]
• Intracranial hemorrhage	7.7% (1/13)	10–20% [7,8]
• Cannulation-related bleeding	15.4% (2/13)	Up to 30–40% (major bleeding) [7,8]
• Oxygenator failure	7.7% (1/13)	10–15% [3]
• Limb ischemia / amputation	7.7% (1/13)	10–15% (mainly VA ECMO) [7,8]

Discussion

- Despite these advances, ECMO carries substantial risks, particularly bleeding, neurologic injury, and thromboembolic events [3].
- Documented complications in our study included intracranial hemorrhage (n=1), cannulation-related bleeding (n=2), oxygenator failure requiring replacement (n=1), and limb ischemia leading to above-knee amputation (n=1).
- These complications mirror those reported in the literature, where bleeding occurs in up to 30–40% and neurologic events in 10–20% of ECMO patients [3,4].
- Our findings highlight that, even without on-site cardiac surgery, ECMO can be implemented in community hospitals.
- Continued refinement of protocols, multidisciplinary training, and partnerships with referral centers remain critical to improving safety and survival.

Conclusion

- Early ECMO initiation and appropriate patient selection are key to improving survival.
- Despite limited resources and no on-site surgeon, a 30.8% survival rate was achieved in a medium sized community hospital
- Enhancing training, protocols, and teamwork can expand safe ECMO use in hospitals.

References

- Bartlett RH, Gattinoni L. Extracorporeal life support (ECLS) in critical care. *N Engl J Med*. 2010;363(20):1905–1914.
- Abrams D, Combes A, Brodie D. Extracorporeal membrane oxygenation in cardiopulmonary disease in adults. *J Am Coll Cardiol*. 2014;63(25 Pt A):2769–2778.
- Vyas A, Bishop MA. Extracorporeal Membrane Oxygenation in Adults. *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2023.
- Burki NK, Mani RK. Mechanisms and modes of extracorporeal life support. *Respir Care*. 2018;63(9):1180–1192.
- Extracorporeal Life Support Organization (ELSO) Registry Report, 2025.
- Peek GJ, et al. Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): a multicentre randomised controlled trial. *Lancet*. 2009;374(9698):1351–1363.
- Aubron C, et al. Factors associated with bleeding and transfusion during ECMO: a prospective observational study. *Crit Care*. 2013;17(1):R29.
- Lorusso R, et al. Neurologic injury in adults supported with venoarterial ECMO: findings from the Extracorporeal Life Support Organization Registry. *Crit Care Med*. 2017;45(8):1389–1397.