

INTERCHANGE

Society of Critical Care Anesthesiologists Newsletter Volume 37 | Issue 1 | April 2026

Mechanical Circulatory Support – Part II

pgs. 12-23

Also in this issue... 

Membership Committee Update.....3

Clinical Practice Committee Update4

Annual Meeting Information6

INTERCHANGE

Society of Critical Care Anesthesiologists Newsletter **Volume 37 | Issue 1 | April 2026**

Editor's Welcome

Welcome to the second issue of this special two-part edition of the *Interchange* in which a special focus is presented on mechanical circulatory support (MCS).

We hope you enjoy this second part, which highlights more unusual aspects of MCS care that our intensivists readers may encounter in their practice.

The Society is honored to have such an active and knowledgeable membership share their expertise. Happy reading!

President's Message

Hello, SOCCA community!

Although we live in interesting times marked by extreme dialogue and divisiveness, we come together for things that matter. I feel that SOCCA is an organization that lets that happen. It is a place where we share ideas, build relationships, and grow as a community. We belong to its parts and its whole. We share this Society and its benefits.

SOCCA is well. We are small, we always have been, but keep a steady membership. We can still grow, so invite your friends. SOCCA has never offered so much for membership,



Mark E. Nunnally,
MD, FCCM
President, SOCCA
The University
of Chicago
Chicago, IL

and at an affordable price! We embrace a wide range of intensivists with different practices and perspectives. All of our governance, from working/interest groups to the Board, is available to full members.

It is a strong period for SOCCA. Our governance has improved with revised bylaws and new policies to direct activities. We boast

an enviable level of engagement. Furthermore, our various working groups' efforts are bearing fruit: Perioperative Resuscitation and Life Support (PeRLS) is becoming part of more clinicians' repertoire, and it is now a resuscitation certificate

continued on next page

[Click here to view or print the SOCCA INTERCHANGE newsletter.](#)

CONTENTS

President's Message	1
Membership Committee Update.....	3
Research Committee Update.....	3
Clinical Practice Committee (CPC) Update.....	4
Program Directors Advisory Council (PDAC) Update.....	5
IARS/ SOCCA Annual Meeting Critical Care Track with Schedule.....	6

MECHANICAL CIRCULATORY SUPPORT – PART II

Bridging the Gap: Advancing ECMO Education Across Anesthesiology Critical Care Fellowships.....	12
Complex ECMO Configurations	14
ECPELLA: Physiology, Configurations, and Evidence.....	16
Anticoagulation and Anticoagulation Monitoring in Mechanical Circulatory Support.....	18
Two Hearts, One Lifeline: Mechanical Circulatory Support in Pregnancy	20
ECMO Billing and Financial Considerations: Key Lessons	22

CRITICAL CURRENTS

Critical Currents is on hiatus for this special two-part edition of MCS and will return in Q2 Issue of 2026.

SOCCA Board of Directors	24
SOCCA Information.....	25

option for many practices. SOCCA shares credit with the ASA Committee on Critical Care Medicine for this achievement. It is knowledge that can improve the care for patients in the perioperative setting. At this year's IARS meeting, we have arranged an ECMO workshop; providing useful training at a time when demand is high and growing. Our program for the upcoming meeting looks great! We will have a dedicated room at the conference for all of our sessions. Come and join us.

Socca puts together a yearly calendar of offerings via the internet. Look for webinars, meetups, journal clubs, chats and many more. If you haven't had a chance to look at our offerings, tune in sometime. Everything is available to all members.

I'll highlight one big change on the near horizon that reflects the health of the Society. This next election cycle, executive positions (President, President-elect, Treasurer and Secretary) will go from 2- to 1-year terms. This move is a direct reflection of the Board's enthusiasm for our engagement and available talent. Service on committees is a great path to leadership, so if you aren't already involved, get involved.

May is fast approaching, so I hope to see you all at the IARS/Socca Annual Meeting in the Fairmont Queen Elizabeth Hotel in Montreal. I've already mentioned the Socca program, but also look forward to great scientific content and excellent networking. We will also co-host the second annual Alan G. Sieroty Lecture with the Anesthesia Patient Safety Foundation.

Looking to the future, it is my hope that Socca grows under its own guiding light. We are the home for anesthesia intensivists. We will grow it. We support research and education. Let's continue to innovate our offerings, and think of the questions that will lead to new knowledge. We provide opportunities for leadership. Let's nurture the early careers of those who will lead us in the years to come. Socca has always been a supportive and welcoming home for anesthesiologist intensivists. We have kept that vision while positioning ourselves as a modern professional society, and have done so making sure that all are welcome from our specialty community. Pass along the word - Socca is a great place to belong. 🙌

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Membership Committee Update

2026 is off to a busy start for the SOCCA membership committee!

Committee members have been working hard to plan virtual get togethers to accent the standing SOCCA educational content. This year, each membership meet-up will be cohosted by two to three of our subcommittees. The first event was held on February 12, a fireside chat with Dr Brigid Flynn, sponsored by WICC and ECI. The event was well attended and the first of many to come this year! Please see the SOCCA calendar of events for more information about the remainder of the events this year.

We will be creating individual email lists as well so that we can provide members with more targeted marketing. Please review your membership profile at your earliest convenience so make sure you are being informed about events of interest to you.

We will continue to host SOCCA Socials at anesthesia conferences throughout the year, including at SCCM,

SCA, SOCCA/IARS, SNACC and ASA. Please let us know if there are any additional conferences you would like to meet up with your colleagues at in person!

The mentorship program reboot is being finalized and will hopefully be live soon. Please be on the lookout for emails recruiting mentors and mentees soon! Your participation is what will make this program a success! We are looking for members at all stages of their careers to volunteer to be mentors to their junior colleagues.

Thank you for renewing your membership and being a part of our growing SOCCA community! Please don't hesitate to reach out to info@socca.org with any additional ideas that you would like to see us pursue. 🏠



Alisha Sachdev, MD
*Chair, SOCCA
Membership
Committee*
Rush University
Chicago, IL

Research Committee Update

The SOCCA Research Committee has had a productive first quarter in 2026, with continued progress across all subcommittees and several new initiatives underway.

Following Board approval in January, Dr. Josh Douin was appointed Vice Chair of the Research Committee, strengthening leadership capacity and supporting continued growth in committee activities.

The Data Subcommittee has completed the POCUS/ VExUS in De-Resuscitation Practice survey and is beginning data review. In addition, a VV ECMO survey has been distributed and remains open through April 30, 2026. With Dr. Douin transitioning to the Research Committee Vice Chair role, Dr. Michael Kiyatkin has moved into the Data Subcommittee Chair position, with Dr. Sylvia Ranjeva serving as Vice Chair. The subcommittee continues to focus on developing meaningful datasets that highlight practice patterns and research opportunities in critical care anesthesiology.

The Scientific Writing Subcommittee continues its ongoing projects, including a manuscript highlighting the contributions of critical care anesthesiologists across subspecialties and a potential position piece addressing the value and reimbursement of anesthesiologist intensivists. These efforts aim to increase visibility of the specialty and contribute to broader discussions impacting the field.

The Research Collaboration & Dissemination Subcommittee is awarding six (6) awards at the IARS/SOCCA Annual Meeting in 2026. The Board of Directors has approved three (3) Young Investigator Awards, and new this year, three additional Best of Meeting awards. The group is also working toward refining submission criteria and developing a streamlined adjudication process to support these awards moving forward.

Additional efforts continue to focus on improving visibility of SOCCA member publications through ORCID-linked searches and enhanced display of scholarly output.

The Speakers' Bureau Taskforce continues to grow, with 38 members now included in the online directory. This resource is designed to highlight SOCCA experts and support educational programming, speaking opportunities, and collaboration across institutions.

The Research Committee looks forward to continued engagement from members and encourages participation in surveys, manuscript development, and collaborative research initiatives throughout the year as leadership transitions to Dr. Douin. 🏠



Shahzad Shaefi, MD, MPH
*Chair, SOCCA
Research Committee*
Beth Israel Deaconess
Medical Center
Boston, MA

Clinical Practice Committee (CPC) Update

The SOCCA Clinical Practice Committee (CPC) has had a strong start to 2026, with multiple collaborative initiatives, educational programming, and cross-society partnerships advancing across its workgroups. The committee continues to focus on clinical education, competency development, and expanding resources for anesthesiology critical care practitioners.

Several CPC-led sessions and workshops were accepted for the 2026 IARS meeting, including programming on critical care billing and identity, ECMO education, neuro critical care, and obstetric critical care. These offerings highlight the breadth of CPC collaboration and the growing visibility of anesthesiology-led critical care expertise across subspecialties.

The MCS/ECMO/CT ICU workgroup has been particularly active, finalizing two ticketed ECMO simulation workshops at IARS and coordinating closely with industry partners to support hands-on educational experiences. The group continues to collaborate with PDAC leadership to define ECMO and mechanical circulatory support competencies for ACCM fellowships and is working toward development of a position paper addressing training standards, access to educational resources, and potential partnerships to expand learning opportunities. Additional efforts include identifying contributors to develop educational website content aligned with these competency goals.

The Neuro Critical Care workgroup is also advancing educational programming, including a Brain Death Determination simulation workshop and additional sessions at IARS. The group is actively planning a comprehensive SOCCA Brain Death Workshop featuring didactic content, simulation-based demonstrations, complex case discussions, and communication training.

Collaboration with colleagues in neuroanesthesia, neurology, ethics, and simulation is underway to broaden the workshop's scope and impact.

The OB Critical Care workgroup continues its collaboration with SOAP, with multiple sessions scheduled at IARS focusing on high-risk obstetric emergencies and complex perioperative management scenarios. These joint efforts strengthen interdisciplinary education and expand opportunities for member engagement.

The Quality & Safety workgroup has successfully launched the Quality Improvement Project Repository on the SOCCA website. The group is encouraging submissions and exploring ways to enhance the repository's value for members, including fellows and early-career clinicians, as a shared resource for quality initiatives.

Additional CPC workgroups remain engaged in ongoing initiatives, including global critical care collaboration and transplant critical care scholarship. Across all groups, the CPC continues to emphasize practical education, competency development, and collaboration to support the evolving clinical practice of critical care anesthesiology. 🏠



Gozde Demiralp, MD, FCCM
Chair, SOCCA Clinical Practice Committee
UW-Madison
Madison, WI



R. Alok Gupta, MD
Vice Chair, SOCCA Clinical Practice Committee
Northwestern University
Chicago, IL

MEMBERS ONLY BENEFIT!

SOCCA's Quality Improvement (QI) Project Repository

Our collaborative space for members to share, discover, and learn from quality improvement initiatives designed to enhance patient care, optimize processes, and elevate outcomes in the critical care setting.



Program Directors Advisory Council (PDAC) Update

The Program Directors Advisory Council (PDAC) remains dedicated to advancing educational programming, refining fellowship recruitment processes, and supporting the establishment of national competency standards for anesthesiology critical care training programs.

The PDAC Ultrasound Case Series remains a cornerstone initiative, with four sessions scheduled for March 19, May 14, August 20, and November 12, 2026.

Additionally, in collaboration with key stakeholders, PDAC has undertaken a comprehensive review of the fellowship match timeline to ensure alignment with both programmatic priorities and evolving applicant needs. The revised timeline includes a new SF Match CAS target date, the initiation of the match exception program on April 15, 2026, and the rank list submission deadline of May 28, 2026. These changes are intended to promote consistency across training programs and to further strengthen the recruitment process for anesthesiology critical care fellowships.

The council continues to collaborate with colleagues across SOCCA to advance the development of mechanical circulatory support (MCS) competencies. In partnership with the Clinical Practice Committee, PDAC is actively engaged in establishing a framework

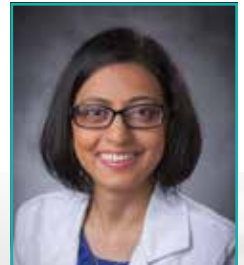
for integrating MCS education into fellowship training and in identifying strategies to standardize expectations and competencies across programs. Through these initiatives, PDAC aims to ensure that fellows benefit from high-quality educational resources and consistent competency benchmarks, thereby supporting their professional growth and preparedness for clinical practice.

Leadership transition planning is currently underway, with preparations in place for the appointment of a new Vice Chair in anticipation of the forthcoming Chair transition later this year.

PDAC remains committed to supporting program directors by fostering collaboration, providing shared resources, and maintaining ongoing dialogue to address the evolving needs of fellowship training. 🏡

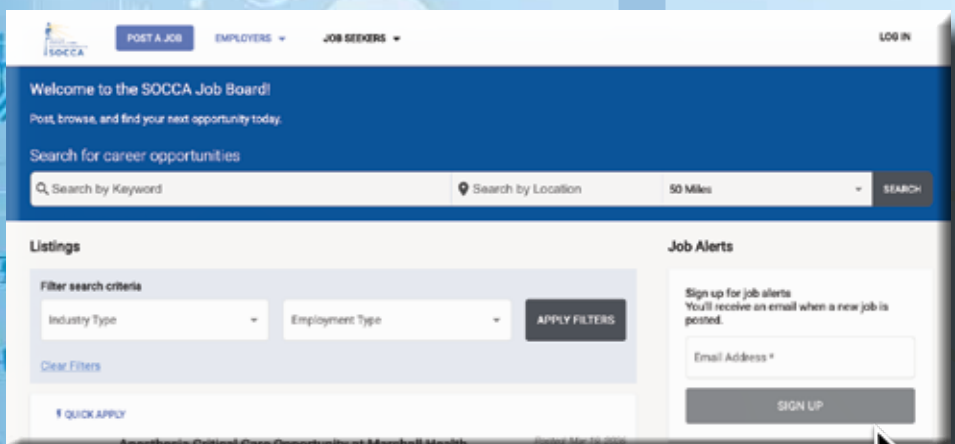


Babar Fiza, MD
Chair, SOCCA Program Directors Advisory Council (PDAC)
Emory School of Medicine
Atlanta, GA



Nazish K Hashmi, MD, MBBS
WICC Member, SOCCA Vice Chair, Program Directors Advisory Council (PDAC)
Duke University Hospital
Durham, NC

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SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS

SOCCA SPONSORED SESSIONS

on the **CRITICAL CARE TRACK**
at **2026 Annual Meeting**

Presented by **IARS & SOCCA**
Schedule subject to change. All times are HST.

Most Critical Care Content
is located in the Van Horne
Room unless otherwise stated

Friday, May 1, 2026



Take advantage of an extensive line up of sessions included in the critical care track throughout the 3-day meeting. This series of specialized sessions will cover various aspects of critical care medicine. Attendees will be able to focus on and explore various aspects of this specialized field, learn from experts, and stay current on the latest developments in anesthesia and critical care medicine.

WORK GROUP MEETINGS

The SOCCA Board of Directors, Committee and Subcommittee meetings will be held in the Diese meeting room.

All meeting times are in EDT.

Thursday, April 30, 2026

4pm | SOCCA Board of Directors

Friday, May 1, 2026

10am | Communications
12pm | Research
3pm | PDAC

Saturday, May 2, 2026

10am | Communications
11am | Education
12pm | Clinical Practice (CPC)

Locations highlighted in blue. SOCCA Member names highlighted in green.

→ Friday, May 1, 2026 | 8:30 – 10:30 AM EDT

Brain Death Determination Simulation Workshop (Ticketed Event)

Rue Notre Dame & Rue St-Denis Rooms

The responsibility to diagnose brain death or death by neurologic criteria (BD/DNC) accurately is both clinically and ethically necessary as the presence of a single reflex or breath is the difference between being considered alive or dead. Deviating from established protocols or guidelines when evaluating a patient for BD/DNC can have catastrophic consequences for patients and erode trust in the medical field.

The American Academy of Neurology published guidelines on declaring Brain Death or Death by Neurologic Criteria (BD/DNC) as a legal designation for adults and children. These guidelines include 40 specific recommendations to better standardize DNC evaluations. Despite these guidelines, there is still considerable variability in local institutional practices. Even among institutions with an organized diagnostic protocol, there is substantial variation both in the criteria used and who may perform the determination.

Many critical care trainees have no formal education on BD/DNC and are exposed to fewer than five cases prior to graduation. This leads to lack of confidence, competence, and comfort in discussing BD/DNC with both families and colleagues even late in their training. These same trainees are expected to perform BD/DNC assessments independently as attending physicians.

Moderator: Miriam Quinlan, John Hopkins; **Speakers:** **Krassimir Denchev**, Wayne State University; **Jasdeep Dhaliwal**, University of Kentucky; **Jonathan Gomez**, Johns Hopkins University Medical School; **Justin Daniels**, University of Kansas Medical Center; **Kathryn Rosenblatt**, Johns Hopkins University School of Medicine; **Ines Koerner**, Oregon Health & Science University; **Emily Wasson**, University of Alabama Birmingham School of Medicine; **Daniel Gouger**, University of Alabama at Birmingham; **Adam Schiavi**, John Hopkins; **Christina Miller**, John Hopkins

→ Friday, May 1, 2026 | 9:00 – 10:00 AM EDT

Shock Management 2026: Evolving Paradigms and Innovation in Cardiovascular Support and Recovery

Van Horne Room

This session aims to explore emerging trends, evidence, and practice variations in the management of cardiovascular shock and recovery. Dr. Mathis (Research Director, MPOG, UMICH) will examine the determinants and variability in the use of cardiac inotropes during surgery, highlighting both obstacles and enablers of practice change. Dr. Khanna (VC for Research, Wake Forest) will delve into the role of RAAS dysfunction in vasoplegia, offering insights into how RAAS profiling can distinguish between septic and non-septic forms. Dr. Spelde (medical director, Penn ECMO program) will present current trends, guidelines, and best practices for mechanical circulatory support (MCS) across various shock states, including its evolving role in septic shock.

Moderator: Kamrouz Ghadimi, Cleveland Clinic; **Speakers:** Michael Mathis, University of Michigan Medical School; **Ashish Khanna**, Wake Forest University School of Medicine; **Audrey Spelde**, University of Pennsylvania Health System

→ Friday, May 1, 2026 | 11:00 AM – 12:00 PM EDT

The Physiologically Difficult Airway: Turning New Evidence Into Widespread Practice

Van Horne Room

The physiologically difficult airway (tracheal intubation in critically ill patients) remains an evolving and under-recognized concept in airway management. Drawing on a decade of high-quality research, this session will highlight the latest evidence on induction agent selection, advanced oxygenation strategies, and procedural techniques to improve outcomes in this high-risk population. We will also address current gaps in anesthesiology and critical care training, and propose future educational priorities to ensure that management of the physiologically difficult airway becomes a core competency for anesthesiologists and intensivists.

Moderator: Kunal Karamchandani, UT Southwestern Medical Center; **Speakers:** **Mary Jarzebowski**, Henry Ford Health System; **Craig Jabaley**, Emory University; **Alok Gupta**, Northwestern Memorial Hospital

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Friday, May 1, 2026

→ Friday, May 1, 2026 | 11:30 AM – 2:00 PM EDT

Session #1 - ECMO Bootcamp: From Percutaneous Cannulation to Crisis Management - A Practical ECMO Simulation Experience- Co-Sponsored by The Society of Critical Care Anesthesiologists (SOCCA)

(Ticketed Workshop)

Rue Notre Dame & Rue St-Denis Rooms

This workshop is designed to provide critical care practitioners with hands-on experience in ECMO initiation and management using high-fidelity simulation. Participants will learn percutaneous cannulation technique and engage in team-based troubleshooting of common ECMO emergencies.

Led by experienced critical care physicians, the session emphasizes practical skills, clinical decision-making, and interprofessional collaboration. The goal is to enhance confidence and competence in ECMO care across diverse critical care settings.

Speakers: *Christopher Ortiz, University of California San Francisco; Lauren Sutherland, Columbia University Irving Medical Center; Lovkesh Arora, University of Iowa Hospitals & Clinics; Thomas Comfere, Mayo Clinic; Alok Gupta, Northwestern Memorial Hospital; Anthony Panos, University of Iowa; Bhounmesh Patel, Hackensack School of Medicine*

→ Friday, May 1, 2026 | 1:30 – 3:15 PM EDT

How to Be a Great A&A Peer Reviewer (IARS with SOCCA) *(Ticketed Workshop)*

Rue Sherbrooke & Rue McGill

The validity of the published findings and consumer trust in medical journals like Anesthesia & Analgesia ultimately relies upon their peer reviewers and a robust peer review process. Each peer reviewer helps fulfill the vital mission of Anesthesia & Analgesia to provide the highest quality content that spans the breadth of anesthesiology and its many subspecialties, as well as diverse viewpoints and voices. This pragmatic workshop will focus on the fundamentals and nuances of undertaking an effective manuscript peer review. The workshop facilitators will lead interactive, roundtable sessions with a small group of workshop

participants, using actual manuscripts submitted to Anesthesia & Analgesia. This workshop is principally intended for clinician-scientists, who are at any point along their career path and are seeking to make a greater contribution to scholarly publishing.

Speakers: *David Hao, Massachusetts General Hospital; Lee Goddel, John Hopkins; Adam Milam, John Hopkins; Jaideep Pandit, University of Oxford; Daniel Saddawi-Konefka, Massachusetts General Hospital; Ashraf Habib, Duke University; Ashish Khanna, Wake Forest University; Avery Tung, University of Chicago; Jean Charchafieh, Yale School of Medicine*

→ Friday, May 1, 2026 | 2:45 – 3:45 PM EDT

Critical Care Outside the ICU: The Expanding Role of Anesthesiologists in Hospital-Wide Resuscitation

Van Horne Room

As hospital systems adapt to increasing patient acuity, staffing limitations, and demands for 24/7 critical care expertise, anesthesiologists are playing an increasingly vital role in hospital-wide resuscitation and rapid response teams. Anesthesiologist expertise in airway management, hemodynamics, and crisis leadership makes us uniquely suited for leading in-hospital emergencies beyond the operating room and ICU. This session highlights innovative institutional models and outcomes data from leading academic centers to evaluate the evolving role of anesthesiologists outside the ICU and OR. It also highlights emerging technologies, such as the integration of artificial intelligence into rapid response workflows. Faculty will explore the operational, educational, and systems-level challenges involved, with specific attention to how anesthesiology departments can contribute to patient safety, team performance, and scalable response models.

Moderator: *Tao Shen, Cedars-Sinai Medical Center; Speakers: Michael Burns, University of Michigan; Matthew Wiepking, University of Southern California; Tara Ramaswamy, Stanford University*

→ Friday, May 1, 2026 | 3:15 – 4:15 PM EDT

To Wax and Wane: The Ups and Downs of Diagnosing and Managing Delirium in the Critically Ill Patient *(Ticketed PBLD)*

Parenthese Room

Delirium is a common but significant problem among ICU patients that has been shown to predict higher mortality, long-term cognitive impairment, length of hospital stay, and cost of care. Proper diagnosis and subsequent treatment can be confounded by the presence of varying sedatives, recent anesthetic administration, and pain. This PBLD will address the diagnostic and therapeutic challenges of ICU delirium while also evaluating risk factors, preventative measures, and long-term consequences. As part of this discussion, recent guidelines as well as relevant research will be highlighted.

Speaker: *Elizabeth Cox Williams, University of Maryland; Emily Bergbower, Main Medical Center*

→ Friday, May 1, 2026 | 4:00 – 5:00 PM EDT

Code Blue: Evidence-Based Practice or Medical Ritual?

Van Horne Room

Cardiac arrest management is evolving as we evaluate the efficacy of our practice. Does code-dose epinephrine really help? How should we perform chest compressions? Who should get ECPR? Algorithmic resuscitation has led us to a standardized and systematic approach to cardiac arrest patients, however, it is time to re-evaluate the evidence behind these practices and future directions.

Moderator: *Abirami Kumaresan, Cedars Sinai Medical Center; Speakers: Tao Shen, Cedars-Sinai Medical Center; Christina Jelly, Vanderbilt; Matthew Wiepking, University of Southern California*

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Friday, May 1, 2026

CONCURRENT SESSIONS

→ Friday, May 1, 2026 | 5:15 PM – 6:15 PM EDT

Demystifying APRV: Historical Roots, Modern Advancements, and Strategies for Optimal ICU Outcomes
[Van Horne Room](#)

Airway Pressure Release Ventilation (APRV) has evolved significantly since its inception, offering unique benefits for lung protection in critically ill patients, yet many clinicians remain unfamiliar with its historical foundations, refinements, and optimal modern applications. This symposium aims to educate participants on the genesis of APRV, its evolutionary advancements including standardized protocols like Time Controlled Adaptive Ventilation (TCAV), and practical strategies for implementation in contemporary critical care settings, while preparing them for forthcoming landmark data from large-scale international trials. The goal is to empower attendees to address gaps in ventilatory management, ultimately improving outcomes for patients with conditions such as acute respiratory distress syndrome (ARDS) by promoting evidence-based, personalized ventilation techniques and fostering discussion ahead of major publications.

Moderator: *Benjamin Daxon*, Mayo Clinic; **Speakers:** *Toni Manougian*, Westchester Medical Center; *Krishnan Ramanujan*, Mayo Clinic; *M Christine Stock*, Northwestern Univ Feinberg School of Medicine

→ Friday, May 1, 2026 | 5:15 – 6:15 PM EDT

Critical Care at the End of Life: When is Enough Too Much?

[Duluth Room](#)

Caregivers in the ICU devote enormous time, physical and emotional commitment to supporting critically ill patients with life-threatening illness. These invariably involve life support that may include mechanical ventilation, dialysis and/or mechanical circulatory devices. But what should we do if and when it becomes apparent that the patient will not survive this ICU admission despite major life support? This Session will address the ethical, cultural and moral issues that face caregivers in dealing with patients and their families in this situation, and provide guidance on best practices in critical care at the end of life.

Moderator: *Robert Sladen*, Columbia University Irving Medical Center; **Speakers:** *Liza Weavind*, Vanderbilt University Medical Center; *Shahla Siddiqui*, Beth Israel Deaconess Medical Center; *Teresa Mulaikal*, Columbia University

ALL SOCCA Members are invited to the:

SOCCA SOCIAL

Friday, May 1, 2026
6:30 pm – ~8:00 pm
Le Cathcart Bar
1 Place Ville Marie,
Montreal, Quebec H3B 2E7
Across the street from the Fairmont hotel.
**We hope to see everyone
for this networking event!**
Note: Cash bar will be available.

Saturday, May 2, 2026

→ Saturday, May 2, 2026 | 9:00 – 10:00 AM EDT

Emerging Inhaled Gas Therapies in Critical Illness

[Van Horne Room](#)

Inhaled gas therapies are rapidly emerging as innovative interventions in critical care, offering distinct mechanisms and promising clinical applications. Recent advances have highlighted the potential of gases such as nitric oxide, argon, and volatile anesthetics to address key challenges in the ICU, including antimicrobial resistance, systemic inflammation, ischemia-reperfusion injury, and sedation. This panel will present translational insights from bench to bedside, focusing on high-dose inhaled nitric oxide as an antimicrobial therapy, argon as a neuroprotectant in cardiac arrest, and the role of inhaled anesthetics in ICU sedation. Presenters will discuss mechanisms, safety, early clinical data, and the translational pathway to bedside implementation.

Moderator: *Carolyn La Vita*, Massachusetts General Hospital; **Speakers:** *Lorenzo Berra*, Massachusetts General Hospital; *Giuseppe Ristagno*, University of Milan; *Christopher Hughes*, Vanderbilt University Medical Center

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Saturday, May 1, 2026

CONCURRENT SESSIONS

Brain Death Determination in Complex Clinical Situations – Co-Sponsored by The Society of Critical Care Anesthesiologists (SOCCA)

Van Horne Room

The responsibility to diagnose brain death or death by neurologic criteria (BD/DNC) accurately is both clinically and ethically necessary as the presence of a single reflex or breath is the difference between being considered alive or dead. Deviating from established protocols or guidelines when evaluating a patient for BD/DNC can have catastrophic consequences for patients and erode trust in the medical field.

The American Academy of Neurology published guidelines on declaring Brain Death or Death by Neurologic Criteria (BD/DNC) as a legal designation for adults and children. These guidelines include 40 specific recommendations to better standardize DNC evaluations. Despite these guidelines, there is still considerable variability in local institutional practices. Even among institutions with an organized diagnostic protocol, there is substantial variation both in the criteria used and who may perform the determination.

Many critical care trainees have no formal education on BD/DNC and are exposed to fewer than five cases prior to graduation. This leads to lack of confidence, competence, and comfort in discussing BD/DNC with both families and colleagues even late in their training. These same trainees are expected to perform BD/DNC assessments independently as attending physicians.

Moderators: *Kate Rosenblatt, John Hopkins; Ines Koerner, Oregon Health & Science University; Speakers:* *Jonathan Gomez, John Hopkins; Daniel Gouger, University of Alabama at Birmingham; Miriam Quinlan, Johns Hopkins*

→ Saturday, May 2, 2026 | 11:00 – 12:00 PM EDT

Ethical Dilemmas of Advanced Invasive Therapies in the ICU: ECMO and Organ Support For Transplant

Viger Room

The rapid expansion of advanced invasive therapies in Intensive Care Units (ICUs), including Extracorporeal Membrane Oxygenation (ECMO) use, has been marked by ethical controversies such as equitable access, opportunity costs, and resource stewardship. The duration and the limits of invasive therapies often lack clear guidelines, placing a burden on the clinical teams and the patients' families. Practices like normothermic regional perfusion (NRP) push traditional boundaries of death definitions and the "Dead Donor Rule". This complex topic warrants an expert Panel presentation to invite audience perspectives and stimulate debate for enhanced understanding.

Moderator: *Monica Lupei, University of Minnesota; Speakers:* *Shahla Siddiqui, Beth Israel Deaconess Medical Center; Louanne Carabini, Northwestern University, Feinberg School of Medicine; Jai Madhok, Stanford University School of Medicine*

→ Saturday, May 2, 2026 | 1:30 – 5:30 PM EDT

POCUS in Trauma: EASy-FAST Framework for Ultrasound-Guided Resuscitation- Co-Sponsored by The Society of Critical Care Anesthesiologists (SOCCA) (Ticketed PBLD)

Rue Notre Dame & Rue St-Denis Room

This session will highlight the integration of EASy (Echocardiographic Assessment using Subxiphoid-only) and FAST (Focused Assessment with Sonography for Trauma) in the resuscitation of trauma patients. Through these frameworks, participants will learn to perform rapid, physiologically driven ultrasound assessments that inform hemodynamic management, procedural safety, and diagnostic accuracy.

Echocardiography and hemodynamic phenotyping: Using the subxiphoid window (4-chamber, short axis and IVC views) within the EASy framework to differentiate hypovolemic, obstructive, cardiogenic, and distributive forms of shock.

Lung/ pleural ultrasound in hypoxemic trauma patients: Differentiating pulmonary contusions, consolidation, pulmonary edema, pneumothorax, and pleural effusions/ hemothorax.

FAST examination: Early incorporation of FAST to detect intra-abdominal bleeding

Volume and perfusion assessment: Evaluating preload and venous congestion through EASy and lung ultrasound to guide balanced fluid resuscitation and prevent overload.

Speakers: *Kunal Karamchandani, UT Southwestern Medical Center; David Corpman, University of Washington; Nibras Bughara, Albany Medical College; Kapil Gupta, University of Washington; Oliver Panzer, Hospital for Special Surgery; Wey Yun (Dorothy) Wang, University of Washington; William Hsu, Albany Medical College; Aliaksei Pustavoitau, John Hopkins; Ruma Bose, Beth Israel Deaconess Medical Center; Omar Durra, Keck School of Medicine; Anwar Alinani, Harborview Medical Center; Paul Bhalla, University of Washington; Arun Prasad, University of Toronto; Rosie Gaylor, John Hopkins; Andrew Villon, Westchester Medical Center; Shuhong Guo, University of Washington*

→ Saturday, May 2, 2026 | 2:00 – 3:00 PM EDT

Airway Pressure Release Ventilation: Conventional Use of an Unconventional Ventilator Mode (Ticketed PBLD)

Parenthese Room

Despite advances in lung-protective ventilation, acute respiratory distress syndrome (ARDS) still results in significant morbidity and mortality in the critically ill population. Airway pressure release ventilation (APRV) is an infrequently used mode of mechanical ventilation that allows for gradual recruitment of alveoli to improve oxygenation, which can confer significant benefits to patients with severe hypoxemia secondary to ARDS. The purpose of this session is to introduce intensivists who are unfamiliar with APRV to the basics of this mode of ventilation, including the indications and contraindications for its use, initial settings, weaning strategies, and essentials of troubleshooting complications. The goal of this session is to impart on PBLD attendees a level of comfort with APRV such that they will be able to use it to care for patients with ARDS in the future.

Speakers: *Krishnan Ramanujan, Mayo Clinic; Benjamin Daxon, Mayo Clinic*

SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS

SOCCA SPONSORED SESSIONS

on the **CRITICAL CARE TRACK**
at **2026 Annual Meeting**

Presented by IARS & SOCCA
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Room unless otherwise stated

Saturday, May 2, 2026

→ Saturday, May 2, 2026 | 2:45 – 3:45 PM EDT

Beyond the Basics: Managing High-Risk and ICU-Level Obstetric Emergencies

[Parenthese Room](#)

This session addresses the growing need for advanced, ICU-level care in obstetrics in the context of rising maternal mortality rates, particularly among patients with complex comorbidities. Conditions such as amniotic fluid embolism, severe cardiopulmonary failure, and heart disease require rapid recognition and highly coordinated multidisciplinary responses. Attendees will gain practical, evidence-based strategies to optimize outcomes through early intervention, critical care integration, and team-based preparedness. By equipping providers with tools for high-acuity obstetric emergencies, this session supports safer, more effective care in an era of increasing maternal risk.

Moderator: *David Stahl, Stanford University*; **Speakers:** *Ioannis Angelidis, University of Pittsburgh Medical Center; Monica Lupei, University of Minnesota; Emily Naoum, Massachusetts General Hospital*

→ Saturday, May 2, 2026 | 3:15 – 4:15 PM EDT

End of Life Discussions in the Perioperative Period (Ticketed PBLD)

[Parenthese Room](#)

About 1 in 6 patients undergoing a surgical procedure have a DNR order in place. As anesthesiologists who continue to do increasingly complex anesthetics on ever more ill and aging patients, we are frequently faced with end-of-life discussions in not only the ICU but throughout the perioperative period. In fact, we are uniquely equipped to have these conversations as we play a critical role in the response to perioperative cardiac arrest, a highly morbid condition, though one with improved outcomes than other in-hospital cardiac arrests. Whereas historically, DNR orders were seen as incongruent with necessary intraoperative intervention, increasing emphasis on patient autonomy has created substantial debate regarding the automatic suspension of DNR orders. Through the problem-based learning discussion, we would cover the history of perioperative DNR, potential medicolegal implications of our decisions on this topic, as well as recommendations on how to have these sometimes challenging conversations.

Speaker: *Megan Hicks, Atrium Health Wake Forest Baptist*

→ Saturday, May 2, 2026 | 4:00 – 5:00 PM EDT

[Van Horne Room](#)

Alan G. Sieroty APSF/SOCCA
Invited Lecture in Patient Safety:

Creating Systemic Protections Against Invisible Threats to Perioperative Patient Safety

Alan G. Sieroty established a permanent legislative framework that protects the California coastal environment from encroaching development and associated erosion. This talk will outline the approach to structural implementation of evidence-based infection control measures in the perioperative environment that can stop the transmission of dangerous bacteria among anesthesia workspace reservoirs and the development of surgical site infections, the number one surgical complication. Parallel implementation strategies and next steps for the critical care arena will be briefly discussed.

Speaker: *Randy W. Loftus, MD, Professor of Anesthesiology and Perioperative Medicine, Mayo Clinic, Rochester, MN*



SOCCA's Annual Business Meeting is FREE for everyone!

→ Saturday, May 2, 2026 | 5:00 – 6:00 PM EDT

[Van Horne Room](#)

SOCCA Annual Business Meeting

The SOCCA business meeting will immediately follow the ASPF lecture. SOCCA leaders will provide updates on the recent activities of the Society.

Agenda:

- **Call to Order & Welcome** - Mark E. Nunnally, MD, FCCM, President
- **Treasurer's Report** - Brigid C. Flynn, MD, Treasurer
- **Committee/Advisory Council Chair Reports:**
 - » **Clinical Practice Committee** – Godze Demiralp, MD
 - » **Research Committee** – Shahzad Shaefi, MD
 - » **Communications Committee** – Kyle Bruns, DO
 - » **Program Directors Advisory Council (PDAC)** – Babar Fiza, MD
 - » **Education Committee** – Kunal Karamchandani, MD
 - » **Service Chiefs Advisory Council (SCAC)** – Anne Drewry, MD
 - » **Membership Committee** – Alisha Sachdev, MD
- **Introduction of New Directors** - Mark E. Nunnally, MD, FCCM
- **Annual Report of the President** - Mark E. Nunnally, MD, FCCM
- **Adjournment**



SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS

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Sunday, May 3, 2026

→ Sunday, May 3, 2026 | 9:00 – 10:00 AM EDT

At the Crossroads: Reimagining Critical Care Billing and Identity in Anesthesiology *Van Horne Room*

This panel brings together critical care anesthesiologists to examine the mounting financial, structural, and identity-related challenges facing the specialty—especially in the context of ICU billing and perioperative care. With institutional budgets tightening and procedural revenue prioritized, the panel explores divergent strategies: staying integrated within anesthesiology versus forming independent, multidisciplinary critical care departments. The goal is to critically assess these pathways, identify sustainable models for ICU staffing and reimbursement, and spark a broader conversation about the future of anesthesiology-trained intensivists.

Speakers: *Gozde Demiralp*, *Michael Nurok*, Department of Anesthesiology, Cedars-Sinai Medical Center; *Robert Groff*, Emory University

→ Sunday, May 3, 2026 | 11:00 AM - 12:00 PM EDT

Regional Analgesia in the Intensive Care Unit: Undervalued Asset or Overrated? *Van Horn Room*

Regional analgesic techniques may hold many advantages for critically ill and injured patients. However, there are challenges to widespread acceptance and implementation. This session will explore novel applications of regional analgesic techniques in selected ICU populations, explore challenges to implementation, and propose areas of additional research in the field to address unanswered questions

Moderator: *Ronald Pauldine*, University of Washington Medical Center; **Speakers:** *Anwar Alinani*, Harborview Medical Center; *Paul Bhalla*, University Of Washington; *Vijay Krishnamoorthy*, Duke University

→ Sunday, May 3, 2026 | 12:45 – 1:45 PM EDT

Bloody Complicated: Navigating ECMO in Adults with Congenital Heart Disease *(Ticketed PBLD)* *Parenthese Room*

This problem based learning discussion will focus on the case of an adult patient with Fontan physiology who underwent a mechanical aortic valve replacement complicated by massive hemorrhage and veno-arterial extracorporeal membrane oxygenation (ECMO) cannulation. The novel Fontan physiology makes the management of ECMO extremely complicated in this patient population. We will discuss management of adult patients with multiple forms of congenital heart disease, including those with Fontan physiology. We will discuss down-stream organ system implications in detail, management strategies for massive hemorrhage in the setting of Fontan physiology, and approaches to ECMO management in various configurations. Lastly, we will discuss communication strategies in the setting of language and cultural barriers.

Speakers: *Christina Hayhurst*, Vanderbilt University Medical Center; *Christina Jelly*, Vanderbilt

Bridging the Gap: Advancing ECMO Education Across Anesthesiology Critical Care Fellowships

Over the past decade, extracorporeal membrane oxygenation (ECMO) and other forms of mechanical circulatory support (MCS) have transitioned from rare salvage therapies to essential components of advanced critical care. Since 2010, the use of adult ECMO in North America has grown more than threefold, with over 9,000 reported cases.¹ This rapid expansion has reshaped expectations for critical care physicians, who increasingly manage patients supported by both temporary and durable MCS devices. Furthermore, over the past decade, Anesthesiology Critical Care Medicine (ACCM) physicians have expanded their expertise to include not only daily ECMO management but also patient selection, cannulation, weaning, and decannulation decisions — roles once primarily performed by cardiothoracic surgeons.

Managing critically ill patients with MCS demands a nuanced understanding of complex physiology and pharmacology, along with proficiency in handling hemodynamics, anticoagulation, mechanical ventilation, and device integration. Clinicians trained through the ACCM pathway bring a unique background in perioperative physiology, hemodynamic management, and interdisciplinary coordination, making them especially well-equipped for this role.

Current Gaps

As the clinical demand for ECMO expertise continues to expand, fellowship training has not uniformly kept pace with this growth. A 2018 survey by Cook et al.² found that while most critical care fellowship program directors recognized ECMO management as an increasingly essential skill, only one-third believed their graduating fellows were competent in its management, and even fewer felt their trainees could perform cannulation. Training opportunities often depend on local case volume, institutional resources, and faculty expertise rather than shared curricular expectations. While some fellows gain hands-on experience through structured ECMO rotations, others may have primarily didactic or observational exposure. In contrast, cardiothoracic surgery and cardiology trainees follow well-defined ACGME milestones and procedural benchmarks for mechanical circulatory support.^{3,4} The absence of comparable national standards in ACCM contributes to variability in training experiences and creates challenges for local credentialing and privileging, potentially ceding leadership in this growing clinical domain to other subspecialties. As MCS becomes a cornerstone of cardiopulmonary critical care, the anesthesiology intensive care community must clearly define its professional scope within this space. This paradigm shift highlights the need for a structured, competency-based ECMO curriculum that aligns training with modern clinical practices.

Defining Competency: A Framework for Progress

An initial step forward is the development of shared competencies in MCS that complement existing milestones in ACCM. These competencies should be incorporated into fellowship training to ensure alignment with current clinical practices while allowing flexibility for programs with differing case volumes and institutional models. Three broad, interconnected domains that can serve as the foundation for MCS training may include:

- **Medical Knowledge:**

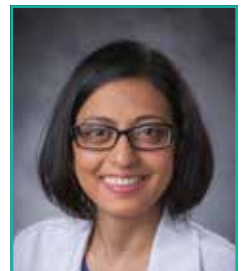
A comprehensive understanding of device physiology and function; patient selection and timing for MCS initiation; hemodynamic monitoring and interpretation; anticoagulation and hemostasis management; troubleshooting device-specific complications; strategies for weaning and decannulation; and integration with other organ support systems such as renal replacement therapy and mechanical ventilation.



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Bridging the Gap continued from previous page

• **Procedural and Technical Skills:**

Proficiency in circuit and oxygenator management; emergency troubleshooting (e.g., air entrainment, flow loss, or hemolysis); and the use of simulation-based and supervised bedside experiences to cultivate both technical proficiency and cognitive readiness for high-stakes scenarios. Depending on local expertise and resource availability, training could also foster familiarity and, where feasible, proficiency in cannulation and decannulation across different MCS configurations, including venoarterial, venovenous, and hybrid.


• **Systems-Based and Professional Practice:**

Leadership in multidisciplinary team coordination; participation in quality improvement and patient safety initiatives; familiarity with institutional protocols and national standards; ethical and communication skills related to goals of care and resource stewardship; and ensuring safe transitions of care across perioperative and ICU settings.

Mapping these competencies to measurable milestones and entrustable professional activities would enable programs to assess trainee readiness systematically, promote transparency in credentialing and privileging, and align fellowship training with emerging national standards in mechanical circulatory support.

Working Towards Consensus and Standardization

To translate these ideas into working realities, a coordinated and collaborative effort is essential. A SOCCA-led Mechanical Circulatory Support working group, composed of experts from the Clinical Practice Committee, in partnership with the Program Directors Advisory Council, could develop consensus-based ECMO and MCS competency guidelines for ACCM fellowship programs.

This initiative parallels earlier efforts, such as the 2015 development of *Ultrasound Learning Goals for American Anesthesiology Critical Care Trainees*, which laid the foundation for structured ultrasound competency within ACCM.⁵ A similar framework for MCS would advance the specialty's commitment to standardized, high-quality training and equitable credentialing across institutions. 

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MORE INFORMATION

Complex ECMO Configurations



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Extracorporeal membrane oxygenations (ECMO) is a form of mechanical support used for life-threatening refractory cardiorespiratory failure. ECMO may serve as a bridge to recovery, decision on long-term mechanical support, or transplantation. In patients with isolated respiratory failure a veno-venous ECMO, or VV ECMO, is the preferred modality. In patients with isolated cardiac or combined cardiorespiratory failure, veno-arterial, or VA ECMO, is typically employed. The ECMO circuit consists of a drainage cannula, a pump, an oxygenator, and a return cannula. At many centers, peripheral VA ECMO cannulation is preferred to central VA cannulation because of ease and rapidity of deployment.

Although in the majority of patients, conventional VV and VA femoral ECMO provides adequate support, there are certain instances where this configuration may not be feasible or may not provide the desired support. These instances may be due to patient factors such as limited vascular access and limb ischemia or to machine-related factors such as cannula size, recirculation of blood in VV ECMO, and inadequate body perfusion and the North-South (Harlequin) syndrome in VA ECMO. Under circumstances of inadequate conventional ECMO support, it is important to maximize medical management for peripheral VV and VA ECMO before changing the ECMO configuration¹.

In this review, we will discuss the most commonly used hybrid and parallel ECMO configurations and more advanced complex configurations.

Hybrid Configurations of ECMO

Strategy #1: Increasing venous drainage

The goal of this strategy is to increase ECMO flows by adding a venous drainage cannula. Thus, there are two draining lines and one return line in each of the subtypes of this strategy.

1. Veno-veno-venous (VVV) ECMO

This modality is primarily used in VV ECMO. At baseline, there is a femoral venous drainage cannula and an internal jugular return cannula. Adding another drainage cannula from the contralateral femoral vein will increase ECMO flow to allow more oxygenation during VV ECMO support. Another reason to resort to the VVV configuration is to reduce the recirculation that results from close proximity of the drainage and return VV ECMO cannulas,

after attempting to reduce the flows and reposition the cannulas. Adding a drainage cannula will decrease the drainage through the existing drainage cannula that is at close proximity to the return cannula - decreasing the likelihood of recirculation.

2. Veno-veno-arterial (VVA) ECMO

This configuration applies to VA ECMO. Adding a drainage cannula - typically from the right internal jugular vein in patients with peripheral femoral-femoral VA ECMO, will offload the heart, treat differential upper body hypoxia resulting from the heart pumping deoxygenated blood to the upper body through a failing lung (Harlequin syndrome).

Strategy #2: Increasing oxygenated blood return from the circuit

In this strategy, an additional return cannula is added to either VV or VA ECMO.

1. Converting VV to VAV configuration

This configuration is implemented in patients who develop heart failure while on VV ECMO. A return arterial cannula is added to the femoral artery to add oxygenated blood to the circulation in addition to the oxygenated blood returning through the venous cannula in the internal jugular vein. By so doing, more offloading of the failing heart occurs by pumping oxygenated blood to the peripheral circulation through the added return cannula. Overall, in this configuration we add an arterial cannula carrying oxygenated blood to provide cardiac support on top of respiratory support provided by VV ECMO.

2. Converting VA ECMO to VAV ECMO

This configuration is implemented in patients on VA ECMO who develop Harlequin syndrome. In such a case, the heart function is recovering in the presence of respiratory failure. As a result, the heart pumps deoxygenated blood to the upper body - including the brain, the arms, and the coronaries. Adding a return cannula carrying oxygenated blood to the internal jugular vein will improve the oxygenation of the upper body by delivering well-oxygenated blood to the right heart. Therefore, in this situation a venous return cannula carrying oxygenated

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Complex ECMO Configurations *continued from previous page*

Configuration	Description	Indication	Consideration
Veno-veno pulmonary Single dual lumen cannula	<ul style="list-style-type: none"> • Drainage ports in the RA, IVC • Return ports in SVC or PA 	<ul style="list-style-type: none"> • VV ECMO with refractory RV failure or high CO 	<ul style="list-style-type: none"> • Ensure cannula position • Clot burden in RV
Left atrial veno-arterial	<ul style="list-style-type: none"> • Drainage cannula in the common femoral V terminating in the RA, additional cannula in the LA via atrial septostomy from the contralateral femoral V • Return cannula to the femoral artery • A single biatrial cannula via septostomy can be used 	<ul style="list-style-type: none"> • VA ECMO with refractory LV distention • Vascular access precluding venting using IABP or Impella • May be used in cases of LV thrombus 	<ul style="list-style-type: none"> • Septostomy requires patient stability to transport to cath lab • common displacement of LA cannula • thrombus formation can still occur in the LV and aorta
Dual lumen single cannula through LV apex	<ul style="list-style-type: none"> • Dual lumen single cannula is inserted through LV apex and aorta via mini-thoracotomy • The drainage lumen is in LV apex • The infusion lumen is at the aorta 	<ul style="list-style-type: none"> • LV distention on patients on peripheral VA ECMO and difficult arterial access precluding other forms LV venting • Extracorporeal position allows the use of oxygenator if needed 	<ul style="list-style-type: none"> • Invasive • LV thrombus is a contraindication

RA; right atrium; LV; left ventricle, V; vein; IVC: inferior vena cava; SVC: superior vena cava; VV: veno venous; VA: veno arterial; ECMO: extracorporeal membrane oxygenator; CO: cardiac output

blood is added to provide respiratory support on top of cardiac support already provided by VA ECMO.

Important considerations for hybrid configuration

When blood flow is split between 2 cannulas by a Y-connector, either on the returning or the drainage limb of the ECMO circuit, attention has to be paid to the flow across each cannula. In VVA ECMO, the flow distribution between venous drainage cannulas may be equivalent assuming similar size of the cannulae as the resistance to flow is almost the same. The condition is different in VAV ECMO where blood flow through the arterial cannula may encounter higher resistance compared to the flow through the venous cannula. This differential resistance with resulting differential flow may lead to hemolysis and thrombosis. Flow probes and throttle valves at the tubing between the Y-connector and the venous return cannula have been used successfully to monitor and control flow distribution, respectively¹.

Parallel ECMO Configuration


Parallel ECMO configuration entails the institution of two separate VV or VA ECMO circuits. The need for this configuration arises in conditions of high cardiac output (CO) in patients on VV ECMO due to sepsis, for example, after the employment of other rescue measures. The inability of a single ECMO circuit to capture adequate CO in patients with VV ECMO may lead to refractory hypoxia. In patients on VA ECMO, a parallel VA ECMO circuit is indicated when there is evidence of inadequate perfusion due to cardiorespiratory failure on a single VA ECMO circuit after employment of rescue measures and changes in VA ECMO configuration. A central VA

ECMO cannulation may be a better option in these circumstances. The latter is composed of a drainage cannula that is placed in the right atrium or in a central vein and a return cannula that is placed in the ascending aorta.

Considerations during parallel ECMO circuit configuration

Parallel ECMO circuits are associated with the morbidity of utilizing 2 separate circuits and 4 cannulas. In parallel VA ECMO there is a risk of recirculation within each circuit as well as cross circulation between both circuits. There should be an adequate distance between the drainage and return cannulae of both circuits. In the setting of 2 peripheral VA ECMO circuits, there is always the risk of cardiac thrombus formation resulting from extended low flow state in the heart due to both circuits offloading blood return to the heart².

More Advanced ECMO Configurations

The advent of the dual-lumen single cannula has opened new avenues for treating right and left ventricular failure in patients on VV and VA ECMO², respectively (Table 1). 

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ECPELLA: Physiology, Configurations, and Evidence

Introduction

Venoarterial extracorporeal membrane oxygenation (VA-ECMO) restores systemic perfusion by providing cardiorespiratory support to patients in cardiogenic shock. However, retrograde aortic flow increases left ventricular (LV) afterload, both with central and peripheral VA-ECMO, predisposing the injured ventricle to distention and impaired myocardial recovery and often leading to pulmonary edema and increased risk of LV or aortic thrombus formation. LV unloading reduces LV pressure and volume, improving coronary perfusion and decreasing myocardial oxygen demand. This can be done through use of the Impella® (Abiomed) percutaneous left ventricular heart pump, an intraaortic balloon pump (IABP), a direct left ventricular vent, or other methods. Use of Impella® with VA-ECMO forms the “ECPELLA” configuration. This article reviews the underlying pathophysiology of LV distention on VA-ECMO, common ECPELLA configurations, and the current evidence supporting this combined strategy.

Physiology

Ventricular Pressure–Volume Loop

The ventricular pressure–volume loop (PVL) illustrates the mechanical profile of the myocardium by integrating intrinsic myocardial properties—such as contractility and diastolic stiffness—with extrinsic vascular determinants including preload and afterload. Myocardial oxygen consumption correlates closely with the pressure–volume area (PVA), the sum of stroke work and potential energy¹.

Pressure–Volume Loop on Peripheral VA-ECMO

During cardiogenic shock, VA-ECMO supports systemic perfusion but increases LV afterload through retrograde aortic flow. The compromised ventricle may be unable to overcome this load, resulting in elevated LV end-diastolic pressure (LVEDP), reduced or absent aortic valve opening, and increased left atrial and pulmonary capillary wedge pressures. These changes promote pulmonary edema and worsen gas exchange; in severe cases, intracavitary stasis may lead to thrombus formation^{1,2}.

On the PVL, VA-ECMO shifts the loop upward and rightward along the end-diastolic pressure–volume relationship, creating a taller, narrower loop—indicating reduced stroke volume and increased PVA, thus increasing myocardial oxygen consumption despite improved systemic perfusion^{1,2}.

Effects of LV Unloading

Active LV unloading reverses these undesired hemodynamic changes. The Impella® provides antegrade flow from the LV to the aorta, reducing LV end-diastolic volume (LVEDV), LVEDP, and wall stress while improving coronary perfusion. Unloading eliminates isovolumic phases and produces a triangular, left-shifted PV loop with a markedly reduced PVA². Unloading differs from simple “venting” by reducing LV work and myocardial oxygen demand as opposed to primarily decreasing filling pressures.

When to Consider Unloading

Mechanical unloading should be strongly considered when there is evidence of LV distention, including LV or left atrial dilation, diminished arterial pulsatility (*i.e.*, <15–20 mm Hg), absent aortic valve opening, or intracavitary stasis².

Configurations and Considerations

ECPELLA can be configured in several ways depending on patient anatomy, urgency of support, and institutional resources. Femoral Impella CP® utilized with peripheral VA-ECMO is the most common configuration as it can be placed rapidly utilizing percutaneous deployment, but it carries a higher risk of hemolysis, limb ischemia and vascular injury³. ECPELLA with Impella 5.5® placed into the axillary artery enables higher flow rates for more significant unloading, potentially allowing transition to Impella®-only support while awaiting myocardial recovery or bridge to durable LVAD or transplant³. Impella 5.5® can also be placed into the ascending aorta and used for unloading with central VA-ECMO in patients with post-cardiotomy shock, allowing significant hemodynamic support with LV unloading, but at the expense of increasing bleeding and infection risk⁴.



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ECPELLA continued from previous page

Newer approaches such as ipsilateral upper-extremity VA-ECMO with contralateral axillary Impella® and the axillary “Y-chimney” ECMO and Impella® single arterial access configurations provide enhanced mobility and smoother weaning pathways^{5,6}. Hybrid and staged approaches—initiating ECMO first and adding Impella® when LV distention develops—allow clinicians to tailor support as physiology evolves⁷.

Contraindications to use of Impella® include LV thrombus, severe aortic regurgitation, mechanical aortic valves, significant peripheral arterial disease, and aortic pathology. ECPELLA carries risks such as bleeding, hemolysis, renal injury, differential hypoxemia, device malposition, and right-sided heart failure⁷.

Evidence Summary

Evidence regarding mortality benefit with ECPELLA over VA-ECMO alone remains mixed. Several large retrospective studies and meta-analyses demonstrate improved survival with ECPELLA compared to VA-ECMO alone^{8-10,15}, while others show no significant difference¹¹⁻¹³. ECPELLA also carries higher complication rates over VA ECMO alone or with IABP unloading, including bleeding^{8-11,13-14}, hemolysis⁹⁻¹¹, limb ischemia^{8-9,11}, and acute kidney injury^{8-11,13-14}.

Certain subgroups may benefit more from ECPELLA over VA ECMO alone. In acute coronary syndrome there is evidence of benefit with ECPELLA unloading¹⁴, but there is conflicting evidence for patients cannulated to ECMO during cardiac arrest (i.e., E-CPR)^{12,15}. Early compared to late ECPELLA unloading has been associated with improved survival^{8,16}. Randomized controlled trials are needed to further elucidate the populations that most benefit from ECPELLA, considering its high risk of complications. 

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Early-Onset Intraoperative Anaphylaxis Requiring VA-ECMO

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Abstract

Background: Perioperative anaphylaxis (POA) occurs in up to 1 in 6,531 anesthetics and carries a higher risk of cardiovascular collapse and mortality than anaphylaxis in nonoperative settings [1]. Diagnosis is challenging due to simultaneous administration of multiple agents and limited visibility of cutaneous signs. Early recognition and prompt initiation of epinephrine and advanced circulatory support, including veno-arterial extracorporeal membrane oxygenation (VA-ECMO), may be lifesaving [2].

Case Presentation: We report a case of severe intraoperative anaphylaxis in a 54-year-old woman undergoing elective microvascular decompression,

resulting in refractory hypotension, cardiac arrest, and cardiogenic shock requiring VA-ECMO. Elevated serum tryptase confirmed anaphylaxis, and subsequent allergy testing identified chlorhexidine as the offending agent.

Conclusion: This case underscores the atypical presentation of POA and highlights the importance of maintaining a high index of suspicion for anaphylaxis in rapidly deteriorating intraoperative patients. Early initiation of epinephrine and VA-ECMO may significantly improve outcomes in refractory cases.

Keywords: Perioperative anaphylaxis, chlorhexidine, cardiogenic shock, VA-ECMO

Introduction

Anaphylaxis is defined as an acute, potentially fatal systemic hypersensitivity reaction characterized by airway compromise, hypotension, or end-organ dysfunction. Anaphylaxis frequently presents atypically in the operating room and may rapidly progress to cardiovascular collapse. Perioperative anaphylaxis (POA) has a higher associated mortality rate than traditional anaphylaxis, emphasizing the need for early recognition and decisive management [3].

Approximately 95% of POA cases occur within 30 minutes of anesthetic induction, and neuromuscular blocking agents (NMBAs) are the most implicated agents in the United States [4,5]. Both IgE-mediated and non-IgE-mediated mechanisms contribute to POA, with the latter often occurring in patients without prior exposure or known risk factors [6]. Given these diagnostic challenges, anesthesiologists must rely on clinical suspicion and rapid physiologic deterioration rather than classic diagnostic criteria alone.

Case Presentation

A 54-year-old woman (ASA II) with trigeminal neuralgia presented for elective microvascular decompression after failure of conservative therapy. Her medical history was notable only for vitamin D deficiency and a nonspecific aspirin allergy. She had previously tolerated general anesthesia without complication. Preoperative examination and laboratory studies were unremarkable.

Following standard monitoring and intravenous access, anesthesia was induced with lidocaine (80mg), fentanyl (100mcg), propofol (160mg), and rocuronium (50mg), followed by uncomplicated endotracheal intubation. Anesthesia was maintained with sevoflurane, dexmedetomidine, and remifentanyl infusions. Cefazolin (2 g) was administered for surgical prophylaxis. Approximately 10 minutes later, the patient was positioned laterally, and chlorhexidine was applied to the lumbar region in preparation for lumbar drain placement.

Shortly thereafter, the patient developed abrupt hypotension and bradycardia refractory to fluid resuscitation, phenylephrine, glycopyrrolate, vasopressin, ephedrine, and escalating doses of epinephrine. Airway pressures were initially stable, though oxygen saturation and end-tidal CO₂ subsequently declined. Electrocardiography demonstrated diffuse ST-segment elevation followed by ventricular tachycardia, ventricular fibrillation, and asystole. Cardiopulmonary resuscitation was initiated per ACLS guidelines.

After 17 minutes of resuscitation, return of spontaneous circulation was achieved. Given persistent hemodynamic instability, VA-ECMO was initiated in the operating room, and the patient was transferred to the cardiac catheterization laboratory. Coronary angiography revealed no obstructive disease, and transesophageal echocardiography demonstrated global biventricular hypokinesis without focal structural abnormalities.

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Early-Onset Intraoperative Anaphylaxis Requiring VA-ECMO *continued from previous page*

The patient was admitted to the cardiovascular intensive care unit with a diagnosis of cardiogenic shock secondary to suspected anaphylaxis. She was treated with an epinephrine infusion, corticosteroids, and antihistamines. Initial serum tryptase was markedly elevated at 104.0 ng/mL, confirming severe anaphylaxis, with normalization on repeat testing. Ventricular function improved rapidly and she was successfully decannulated from ECMO on postoperative day (POD) 1.

Her subsequent hospital course was notable for delayed extubation due to suspected angioedema which resolved with corticosteroid therapy. She was extubated on POD 4, transferred to the general cardiology service on POD 6, and discharged home on POD 8 with mild residual cognitive impairment but no focal neurologic deficits. Outpatient allergy evaluation revealed positive skin testing to chlorhexidine and negative testing to all other perioperative agents.

Discussion

POA may result from IgE-mediated hypersensitivity or non-IgE-mediated mast cell activation, frequently involving the Mas-related G protein-coupled receptor X2 (MRGPRX2) [7]. These mechanisms produce clinically indistinguishable syndromes, complicating diagnosis. Hypotension is the most common presenting sign of POA while bronchospasm and cutaneous findings may be absent or masked intraoperatively.

In this case, profound vasoplegia and myocardial depression led to cardiac arrest, a rare but recognized manifestation of severe POA. The markedly elevated tryptase level supported the diagnosis, though normal tryptase values do not exclude anaphylaxis [8]. Early administration of epinephrine remains the cornerstone of treatment in conjunction with aggressive fluid resuscitation to counteract capillary leak and vasodilation. Adjunctive therapies, including corticosteroids and antihistamines, have limited evidence for acute benefit.

VA-ECMO provided critical circulatory support during refractory shock and likely contributed to the patient's favorable neurologic outcome. This case also highlights chlorhexidine as an underrecognized but clinically significant cause of POA, particularly given its widespread use and potential for repeated exposure during invasive procedures.

Conclusion

Perioperative anaphylaxis may present abruptly with isolated hypotension and rapid cardiovascular collapse, often without classic mucocutaneous signs. Failure to respond to escalating vasopressors should prompt immediate consideration of anaphylaxis and early epinephrine administration. In cases of refractory cardiogenic shock or cardiac arrest, VA-ECMO can be lifesaving. This case emphasizes the need for heightened awareness of POA, including chlorhexidine hypersensitivity, and readiness to deploy advanced resuscitative strategies to reduce morbidity and mortality.

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Two Hearts, One Lifeline: Mechanical Circulatory Support in Pregnancy

Mechanical circulatory support (MCS) in pregnancy is a rare but increasingly recognized intervention when maternal cardiogenic shock or cardiac arrest threatens both mother and fetus. Cardiovascular disease is the leading cause of maternal mortality in high-income settings, and the physiologic demands of pregnancy can unmask or exacerbate underlying cardiac conditions. In these situations, devices such as the intra-aortic balloon pump (IABP), Impella™, left ventricular assist devices (LVADs), and extracorporeal membrane oxygenation (ECMO) provide temporary stabilization and can serve as bridges to recovery, delivery, and/or transplantation. Emerging evidence from obstetric populations underscores the importance of timely deployment and coordinated multidisciplinary care, including evolving strategies such as standby ECMO for high-risk scenarios.¹

The IABP is often considered first because of its relative simplicity and safety profile, offering modest afterload reduction and improved coronary perfusion, with experience in pregnancy largely from case series and expert consensus.² The Impella provides more robust ventricular unloading and has been used successfully in peripartum cardiogenic shock when left ventricular failure predominates, though data remain limited and decisions must be individualized.³ LVADs, traditionally reserved for advanced heart failure, have been implanted in select pregnant or postpartum patients as durable therapy or bridges to transplant; case reports and series describe successful maternal support through delivery and postpartum recovery when anticoagulation and obstetric planning are carefully coordinated.^{4,5} ECMO, particularly veno-arterial ECMO, offers both cardiac and respiratory support and is invaluable in refractory shock or cardiac arrest; reports in obstetric cohorts suggest encouraging maternal survival alongside meaningful fetal outcomes when instituted promptly and managed by experienced teams.^{1,6,7}

Clinical indications for MCS in pregnancy include peripartum cardiomyopathy, massive pulmonary embolism, amniotic fluid embolism, severe preeclampsia with cardiac decompensation, and decompensation of congenital or acquired heart disease. Each case presents unique challenges: anticoagulation increases bleeding

risk during delivery, cannulation sites can complicate obstetric procedures, and the gravid uterus alters anatomy, affecting device placement and hemodynamics. These complexities highlight the need for tightly integrated care among cardiology, anesthesiology, critical care, obstetrics, and neonatology, with pre-planned delivery strategies and contingency pathways for maternal and fetal emergencies.^{1,6,8}

Recent data highlights both promise and limitations. A systematized review of standby ECMO in obstetric patients outlines practical criteria for pre-emptive preparation, team activation, and cannulation strategies tailored to maternal physiology and delivery timing, emphasizing that readiness can shorten time to support and potentially improve outcomes.¹ Focused reviews of peripartum cardiogenic shock synthesize device selection by hemodynamic phenotype—left-sided failure favoring Impella or IABP, biventricular or combined respiratory failure favoring VA-ECMO—and stress the role of early recognition and escalation.³ Case reports further humanize the impact of these devices: for example, a young woman at 27 weeks with cardiogenic shock after viral illness survived with sequential VA-ECMO, IABP, and Impella support, allowing delivery and maternal recovery despite complications². Parallel population studies on cardiac arrest during delivery hospitalization provide context for preparedness, resource allocation, and the potential role of advanced support when conventional measures falter.^{7,8}

Looking forward, research gaps remain. Optimal device selection by gestational age and hemodynamic profile, strategies to minimize fetal compromise during maternal support, anticoagulation protocols around neuraxial anesthesia and delivery, and long-term maternal and neonatal outcomes require ongoing research efforts. Creating combined national registries within SOCCA, SCA, SOAP could help further investigation. Greater awareness, standardized activation pathways (including standby ECMO where appropriate), and timely initiation of support can save lives. Equally important is keeping




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continued on next page

Two Hearts, One Lifeline: MCS in Pregnancy *continued from previous page*

the human core of this work in view—meeting families at the crisis point with clarity, compassion, and coordinated expertise—so that technology serves not only physiology but possibility.^{1,3,6} 

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ECMO Billing and Financial Considerations: Key Lessons

Introduction

Extracorporeal membrane oxygenation (ECMO) remains one of the most resource-intensive yet life-saving therapies in critical care. While discussions often focus on outcomes and innovation, financial sustainability is equally essential to maintain program viability. As ECMO utilization expands, institutions must understand how outcomes, resource utilization, and reimbursement, cost structures, and patient mix interact to sustain both quality and access.

Drawing on the authors' experience as medical directors of university-based ECMO programs, this article summarizes practical billing and financial considerations that significantly influence program performance, focusing on length of stay, run duration, payor mix, and cost drivers.

Length of Stay and ECMO Run Days

Length of stay (LOS) remains a key financial determinant for ECMO cases. Longer ECMO runs nearly always extend total LOS, driving higher resource consumption and narrowing contribution margins. Programs that maintain efficient workflows and structured daily goals tend to achieve better alignment between costs and reimbursement. Maintaining average stays below the Medicare Expected LOS has been associated with improved financial performance without compromising outcomes.

Typical ECMO hospitalizations may cost between \$8,000 and \$10,000 per day, with ICU stay, continuous ECMO management, and medication use comprising most expenses. While initial circuit and equipment costs are substantial, the ongoing ICU cost becomes dominant after the first several days on support.

Payor Mix and Reimbursement Variability

For small- to medium-sized ECMO programs, payor mix can be the single most important factor determining financial stability. A handful of under-reimbursed cases (e.g., Medicaid or self-pay) can markedly affect an annual balance sheet, whereas a few well-reimbursed commercial encounters can stabilize it.

Medicare and most governmental payors reimburse ECMO through Diagnosis-Related Group (DRG 003)–based payments, providing a fixed amount per hospitalization regardless of the actual cost. Commercial payors typically negotiate reimbursement as a percentage of billed charges, leading to significant variation.

Professional billing remains more nuanced. CPT codes distinguish between initiation (33946, 33947), the initial cannulation (such as 33952–33956 for peripheral cannulation) and the daily management codes (typically 33948–33949) that reflect the complexity of ongoing ECMO support. Accurate, precise documentation, including cannulation site, configuration (VA vs. VV), and physician involvement, directly influences compliant billing and appropriate reimbursement. As anesthesiologists increasingly lead ECMO decisions to cannulate, cannulation, transport, and daily ECMO and critical care management, familiarity and application with these codes is essential.

Programs that maintain awareness of their payer mix and proactively engage in contract negotiations and coding accuracy reviews are better positioned to remain sustainable. Collaboration between the ECMO clinical team and hospital finance departments ensures that billing reflects the complexity of care delivered.

Major Cost Drivers

Understanding and managing cost drivers is essential for ECMO program budgeting. The largest contributors typically include:

- ICU stay and staffing (nursing, respiratory therapy, and critical care coverage)
- 24/7 ECMO management and specialist support



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ECMO Billing and Financial Considerations: Key Lessons *continued from previous page*

- Pharmaceuticals and blood products
- Disposable circuit, cannulas and oxygenator components
- Procedural and consultative costs (e.g., tracheostomy, vascular interventions, imaging)
- Periodic review of cost data helps identify efficiency opportunities, such as supply optimization, medication standardization, and earlier readiness assessments for ECMO weaning or decannulation.

Strategies for Financial Sustainability

Financial stewardship need not conflict with clinical excellence. Successful ECMO programs typically share several operational strategies:

- **Continuous LOS monitoring:** Real-time dashboards help identify outlier cases and guide proactive interventions.
- **Integrated finance and clinical leadership:** Regular meetings between ECMO, finance, and coding teams enhance reimbursement accuracy.

- **Optimized staffing models:** Aligning ECMO specialist coverage with case volumes balances safety with cost efficiency.
- **Data-driven resource use:** Tracking medication, blood product, and equipment utilization informs budget forecasting and quality improvement.
- **Proactive payer engagement:** Understanding each payor's contractual terms and approval requirements reduces denials and payment delays.

When implemented consistently, these measures can preserve financial health while maintaining the high standards expected of ECMO centers.

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