

# INTERCHANGE

Society of Critical Care Anesthesiologists Newsletter Volume 36 | Issue 3 | September 2025

# Opportunities in Critical Care

pgs 3-14

Also	in	this	issue	

Critical	Currents	.15
----------	----------	-----

Nominations Committee	
Chair Update	21

## In Remembrance:

George W. Williams, II.....22



# INTERCHANGE

Society of Critical Care Anesthesiologists Newsletter Volume 36 | Issue 3 | September 2025

# President's Message

ur themed issue, "Opportunities in Critical Care" is a timely one, and something deeply personal for me. Perhaps never has Anesthesiology been such a target-rich environment. It's a sellers' market and it seems that everyone is hiring. As the subspecialty that extends our abilities to more venues than any other in the profession, this phenomenon means that critical care anesthesiologists are the most versatile of any potential hire. Tough case? We can do it! Problem in the PACU? We are there! Preoperative question? We do that! Post operative critical care? Of course!

I am an optimist, but there are other perspectives. Some will look at the current situation with well-grounded concerns. Low numbers of applicants to critical care fellowships certainly correlate with lucrative first year attending salaries. A year of delayed compensation has a very real short-term cost and potentially larger consequences for the long term. Although we remain a small group, this fact also makes us special. We support



Mark E. Nunnally, MD, FCCM President, SOCCA New York University Langone Medical Center New York, NY

each other and share our knowledge freely. The field of critical care anesthesiology is strong.

However, I haven't even touched on our greatest opportunities. Leading a critical care team is leading a health care team. Improving processes of care is improving capabilities. Managing a census and emergencies is operational

work at a high level. The jump from rounding in the ICU and running major clinical operations is not a hard one. As anesthesia services grow and extend to new venues, we know how to do our work outside the walls of the traditional operating room. We know how to support an entire organization's activities in a workmanlike way that few outside our profession can fully grasp.

Have you noticed how much teaching you can do? Are there better teaching venues than in the ICU and the OR? We consistently stack the rosters of master lecturers, especially concerning complex topics. Undoubtedly, this is because we think, eat and breathe complex physiology, read avidly and

#### CONTENTS

res	dent	's l	<i>l</i> lessage	
-----	------	------	------------------	--

<u>OPPORTUNITIES IN CRITICAL CARE</u>
---------------------------------------

Beyond the Drapes: A Candid Case
for the Anesthesiology Critical Care
Fellowship

#### Q&A With SOCCA Members: Professional Paths in Anesthesiology Critical Care .......5

# Leading the Future of Critical Care: Unlocking Women's Potential in Leadership.......9

#### Redefining Critical Care -Anesthesiology's Role in Innovation and System Transformation ......12

New Faculty Perspectives on
Becoming a Critical Care
Anesthesiologist

#### CRITICAL CURRENTS

Bridging Clinical Care and
Reimbursement: Demystifying
ICU Billing and DRGs

Program Directors Advisory Council
(PDAC): Reflections on the 2025
Fellowship Match: Growth,
Challenges, and New Opportunities 19

ominations	Chair	Update	 2

In Remembrance:	
George W. Williams,	II22

SOCCA	Board	of Direc	tors	23
SOCCA	Inform	ation		24

Click here to view or print the SOCCA INTERCHANGE newsletter.

commit ourselves to lifelong learning in a profession that is constantly evolving. Learner needs are only growing in a growing profession. We are there to fill that need and can frankly teach anything.

Some of you have heard me comment that critical care is like the diplomatic corps of an anesthesia department. Think about the close relationships we keep with surgeons as a consequence of caring for their sickest patients in and out of the operating rooms. We build the kinds of relationships through these interactions and our very visible dedication to longitudinal care that are the envy of many. We are true consultants.

In my own career, it is consistently the mentorships, sponsorships, role models and opportunities that have come from critical care that have built the foundations of my own professional development. I know that there are many of us just like that. I now look forward to providing opportunities and guidance to a new generation of intensivists and anesthetists with a goal of leaving my profession in better hands and advancing my specialties. These goals perhaps best explain what I see as tremendous, fulfilling opportunities. I hope you share my enthusiasm!



### Editor's Welcome

As we continue our publication of themed issues of Interchange, our authors were given the freedom to explore a broad topic of "Opportunities in Critical Care." The intent is to not only educate practicing intensivists, but also to enlighten trainees to the broad range of practice available to critical care physicians. We hope you enjoy reading and welcome your feedback by emailing: info@socca.org.

# Beyond the Drapes: A Candid Case for the Anesthesiology Critical Care Fellowship

#### Introduction

nesthesiology is a dynamic and evolving specialty offering an exciting landscape of opportunities. With a strong job market and growing recognition of anesthesiologists' broad skill set, it's reasonable to question the need for additional training—especially in critical care. While fellowships in this area have historically faced recruitment challenges (1), a closer look reveals that anesthesiology critical care is not a detour, but a powerful accelerator. It unlocks advanced clinical mastery, leadership, and a deeper connection to the "why" behind our profession.

#### **Reframing the Challenges**

Common deterrents to fellowship—such as delaying an attending salary or concerns about ICU intensity—are valid but incomplete. That extra year of training is an investment in confidence, competence, and career flexibility. The ICU may be demanding, but it's also where the most rewarding work happens. And while optional, critical care fellowship is a transformative opportunity for those drawn to high-acuity medicine and leadership.

#### **Expanding Your Skill Set**

As modern medicine advances, older and more complex patients increasingly require surgical care. According to CDC data, U.S. life expectancy continues to rise, along with surgical interventions in patients over age 65 (2,3). Anesthesiologists are central to managing perioperative risk in

these high-stakes cases. Fellowship training sharpens your ability to handle instability, anticipate complications, and lead rapid interventions. You gain hands-on experience with life-saving technologies like ECMO, Impella, and LVADs—skills that demand high-level expertise (4–6).

#### Leadership in Action

Critical care is systems-level medicine. The ICU is where multidisciplinary collaboration reaches its peak. As an anesthesiologist-intensivist, you lead interprofessional teams, coordinate care plans, and guide families through difficult decisions. The Society of Critical Care Medicine emphasizes the importance of team leadership, communication, and situational awareness (7,8). These skills are essential not only for patient care but also for clinician resilience and effective leadership (9).

#### **Broader Career Options**

Dual training in anesthesiology and critical care opens doors in clinical practice, education, research, and administration. It enhances job security, especially in an evolving healthcare landscape marked by shifting Medicaid reimbursement and the expanding role of midlevel providers (10–12). Fellowship positions you for leadership in perioperative medicine, quality improvement, and academic growth. Institutions value the flexibility and depth that dual-trained physicians bring.



Laurent Del Angel Diaz, MD Member, SOCCA Education Committee Case Western Reserve University Hospital Cleveland, OH



Mohamed
Ginina, MD
Member, SOCCA
Education Committee
University of Louisville
Louisville, KY



Mada Helou, MD Member, SOCCA Education Committee University Hospitals Case Medical Center Cleveland, OH

#### Beyond the Drapes continued from previous page

#### **Hidden Perks: Autonomy and Flexibility**

One lesser-known benefit of ICU work is schedule autonomy. Unlike the OR, ICU workflows are not surgeon-dependent. Many intensivist roles offer block schedules like 7-on/7-off, providing generous and predictable time off. These blocks allow for travel, family time, academic pursuits, or moonlighting. Dual certification also enables moonlighting in both ICU and OR settings, expanding clinical and financial flexibility.

#### **The Human Connection**

Critical care allows for deeper, more sustained relationships with patients and their families. These moments—often during life's most vulnerable periods—can be profoundly meaningful. Unlike the episodic nature of intraoperative care, ICU work reconnects many physicians with the core values that drew them to medicine in the first place.

#### A Personal Reflection

During residency, even at a quaternary center with strong support, I questioned whether I was fully prepared for independent practice. Despite excellent training, I felt a strong drive to go further—to understand the mechanisms behind complications, care for patients across the perioperative continuum, and play a pivotal role in their recovery. The ICU offered the challenge, purpose, and growth I was seeking. (a reflection from author Dr. Del Angel Diaz)

#### Conclusion

Critical care isn't for everyone—and that's okay. But for those drawn to complexity, acuity, leadership, and impact, it's a path worth serious consideration. It strengthens your clinical foundation, protects against workforce uncertainty, and realigns you with the purpose of our profession. For many of us, fellowship was not a year lost—it was the piece that completed our career vision.

#### REFERENCES

- National Resident Matching Program. Results and Data Specialties Matching Service, 2024 Appointment Year: Critical Care Medicine (Anesthesiology). [NRMP.org]
- Arias E, Xu JQ. United States Life Tables, 2020. National Vital Statistics Reports. 2022;71(1).
- Etzioni DA, Liu JH, Maggard MA, Ko CY. The aging population and its impact on the surgery workforce. Ann Surg. 2003;238(2):170–177.
- Abrams D, Combes A, Brodie D. Extracorporeal membrane oxygenation in cardiopulmonary disease in adults. J Am Coll Cardiol. 2014;63(25 Pt A):2769–78.
- O'Neill WW, Schreiber T, Wohns DH, et al. The current use of Impella 2.5 in acute myocardial infarction complicated by cardiogenic shock: results from the USpella Registry. J Interv Cardiol. 2014;27(1):1–11.
- Mehra MR, Naka Y, Uriel N, et al. A fully magnetically levitated circulatory pump for advanced heart failure. N Engl J Med. 2017;376(5):440–450.
- Manthous CA, Hollingshead AB. Team science and critical care. Chest. 2011;139(2):517–523.
- Curtis JR, Downey L, Back AL, et al. Effect of communication skills training for residents and nurse practitioners on quality of communication with patients with serious illness: a randomized trial. JAMA. 2013;310(21):2271–81.
- Klein C, Ciuffetelli I, Olson K, et al. Crisis resource management in critical care medicine: current concepts and future directions. Can J Anesth. 2020;67(6):768–782.
- Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: a review. JAMA Surg. 2017;152(3):292–298.
- 11. Wunsch H, Wagner J, Herlim M, Chong DH. ICU staffing: workforce, workload, and workflow. Crit Care Clin. 2020;36(4):525–540.
- Dulisse B, Cromwell J. No harm found when nurse anesthetists work without supervision by physicians. Health Aff (Millwood). 2010 Aug;29(8):1469-75.

# Q&A: Professional Paths in Anesthesiology Critical Care

ecent investigations into the critical care physician workforce show that anesthesiology intensivists make up only 5% of intensivists nationally. 1,2,5 A majority of these have found employment in cardiothoracic ICUs.3,5 Over the last few years there has been an apparent waning interest in the field as we have observed fewer applications for the critical care fellowship programs and positions going unfilled.<sup>4,5</sup> In the following question and answer presentations we will explore niches within the field that trainees may find exciting and compel them to apply to fellowship training programs. While these experts share their own critical care career paths, the list is by no means exhaustive. Other career paths beyond those interviewed include, but are not limited to: administration, rapid response programs, tele-critical care, surgical ICU, burn ICU, critical care transport, private practice, research, international critical care, and transfusion medicine.



**Dr. Megan Hicks** completed her training in critical care and cardiac anesthesia at Vanderbilt University and she now practices at Wake Forest University, where she staffs both the cardiac ICU and ORs while continuing to advance the education of trainees.

# KB: What interests you about cardiac critical care and how did you find your way into this field?

MH: Entering residency, I was pretty sure that I wanted to do cardiac anesthesiology, as I had initially been drawn to anesthesiology because of the fascinating real-time physiology and the coordinated, collaborative dance that is cardiac surgery. However, as I spent more time in the OR, I realized that I was consistently wondering what happened to my patients after I handed them off and ultimately realized that I just truly missed the comprehensive care, the softer sides of patient and family interaction and goals of care, and ultimately, truly "feeling like a doctor" in the intensive care unit. When I imagined my career, I couldn't imagine fully enjoying it without either component, so I decided to pursue dual fellowship training. As I've honed my interests, I have enjoyed the interplay between my fields which uniquely prepared me to care for complex cardiac surgical patients, manage mechanical

circulatory support, and contribute to perioperative optimization through my research in glucose control.

# KB: Can you describe how your training is utilized in practice? What does a typical day entail?



MH: The best part of my job is that there isn't a "typical day!" On a given day, I could be caring for patients in any number of settings, from the cardiac OR to a general OR to the cardiovascular ICU or a community medical-surgical ICU. Both sides of my training make me stronger in the other aspects of my job, as I truly feel that I am a better anesthesiologist by being an intensivist and visa versa. I am well-equipped to care for most any patient in the operating room (just no infants, please!) and function as a true anesthesiology consultant, allowing me to thoughtfully discuss and plan complex cases or assist with emergency diagnostics and resuscitation, including via echocardiography.

KB: What advances have you seen in your field during your career and what do you anticipate in the future?

MH: The expanding mechanical cardiac support capabilities (a walking, talking patient in ventricular fibrillation?!) including percutaneous options and other developments in transplantation continue to blow me away. This is particularly true about organ care systems and regenerative medicine technologies for cardiac and lung transplant, which would allow us to expand the pool of available organs.

KB: Why did you choose the academic pathway and what suggestions would you have for someone considering this?

MH: As the daughter of two educators, teaching is in my blood and I have always enjoyed the role of educator. I get great joy in working with residents throughout training, discussing complex topics in an approachable way, and mentoring trainees through their next steps and career choices. Further, I love the close peer to peer interactions with co-faculty, which allows me to continue learning with excellent mentorship and collaboration. While I have only recently developed a true research career, I have

#### Q&A: Professional Paths in Anesthesiology Critical Care continued from previous page

also always enjoyed the inquisitive nature of academic medicine and a focus on improving care and quality.

Personally, as a wife and mother, I also appreciate the staffing redundancy that academics provides, allowing flexibility in scheduling for important events and relief when there are emergencies or illness. Further, the post-call time that is built in to many academic critical care positions, including mine, is excellent for work-life balance. I think key things to look for in those seeking academic positions are the strength of faculty development and mentorship infrastructure as well as the overall priority of academic endeavors as compared to clinical responsibilities as well as the degree of protection and incentive tied to them. An established pattern of academic productivity, even through education and quality improvement, if not clinical research and publication, is key to effective recruitment; one must keep in mind that academics does not solely hinge on an enjoyment of teaching, however.



**Dr. Kiersten Norby** completed her training in neuro-critical care at the University of Pennsylvania and her surgical critical care at the University of Hawaii. She currently practices at the University of Missouri, where she staffs the neuro-critical care unit.

## KB: What brought you to the field of neuro critical care?

**KN:** I had somewhat of a winding road into neuro-critical care probably beginning in medical school after I had several impactful experiences with patients and became involved more and more in research in neurosurgery and neurology. Witnessing the evacuation of a subdural hematoma for the first time, the urgency and efficiency of the operating room team when setting up and beginning an emergent decompressive craniectomy and the anatomy on display in a retrosigmoid craniotomy for trigeminal neuralgia as a medical student were experiences that stayed with me as reminders of how quickly things can change in life and in medicine, how impressive the healthcare system can be when we work as an effective team and the elegance of the human body. Life ultimately led me into general surgery residency and onto surgical critical care fellowship during which time I again had impactful experiences with patients and also with mentors in the neuro-critical care field. Having subsequently left general surgery residency and starting anesthesia residency I gravitated towards those

neurosurgical and neuroendovascular cases reminding me of my interest in those patients and pathologies I had as a medical student. Having such a varied background across different specialties has impressed upon me how isolated we often can be in our specialty and coming out of anesthesia residency and into neuro-critical care I find myself continually trying to improve perioperative care for these patients as well as communication not only among ourselves as physicians but also to patients and families as well. While the effects of neurological disease can be devastating we are also an adaptive species and part of what captivates my attention in the field is the pathology of the central nervous system and its capacity for recovery and how we apply that to an individual and their disease process.

## KB: Can you describe the new process of obtaining certification in neuro critical care?

KN: Because of my varied path into anesthesia and neurocritical care I would say I have less of an understanding of the traditional pathway into the specialty. All of my cofellows were from neurology residencies and in practice our fellowship has had both neurosurgery and internal medicine candidates. It is my understanding that first one must complete a residency in neurology, neurosurgery, anesthesiology or internal medicine followed by a neurocritical care fellowship. Following the fellowship, one must then pass a certification exam either from the American Board of Psychiatry and Neurology or the United Council for Neurologic Subspecialties. I would recommend anyone interested in the field, especially if they are from a less common residency (such as internal medicine or otherwise) to reach out to a program director or mentor in the field to talk through whether it would be a worthwhile option.

# KB: What advances have you seen in your field during your career and what do you anticipate in the future?

KN: It is an exciting field with advancements in the area of neuroprognostication following cardiac arrest, in expanding treatments for those patients who have had either ischemic or hemorrhagic strokes as well as improving perioperative care for those patients undergoing neurosurgical or neuroendovascular procedures. Often times we are consulted on patients who are in coma following cardiac arrest and while there are guidelines to follow in terms of what an evaluation should consist of and the timeline for which it should be conducted research into different modalities of evaluation, more subtle exam findings and longer follow up are going to be critical in terms of better

#### Q&A: Professional Paths in Anesthesiology Critical Care continued from previous page

assisting patients and their families during this critical time. Emergent thrombectomy for ischemic stroke and less so minimally invasive hematoma evacuation for hemorrhagic stroke has become a treatment option for more and more patients with improvement in outcomes often which we can witness during their ICU stay. Enhanced recovery after surgery protocols are seeing more applications in both neurosurgery spine and craniotomy patients which leads to better postoperative outcomes and perioperative care of these patients. Lastly there seems to be an application for noninvasive monitoring techniques whether hemodynamic monitoring, ICP monitoring, cEEG monitoring which I hope to see continue to advance our understanding of pathophysiology as well as early detection and warning signs so we can intervene early for these patients.

# KB: Why did you choose the academic pathway and what suggestions would you have for someone considering this?

KN: While it is not a choice I made intentionally when embarking on training and practice it seems to have evolved naturally out of my wanting to practice both anesthesia and neuro-critical care, participate in resident/ fellow education and conduct a small amount of research. I would say I felt like there was a point somewhere along my varied training experiences (and probably once my children were born) that I really took to heart that my time is limited and finite. I had to evaluate whether I was doing things simply to check a box or because I truly enjoyed them. After approaching any projects, or my career in general, with that in mind it became much easier to determine what practice context would be best for me. I would encourage anyone thinking of going into the field to also reach out to any mentors or people that you have worked with in the field as they can often provide some insight or perspective into the benefits/drawbacks of a particular practice setting.



**Dr. Joseph Deng** completed his critical care training at Loma Linda University. In addition to his anesthesiology background he is also board certified in family medicine and neuro-critical care. Practicing in Portland, OR he is the leader of a team of ECMO experts who

deploy to surrounding communities to initiate mechanical circulatory support (MCS) and then transport back to the hub from the spoke for further management.

# Q: How did your fellowship training prepare you for this aspect of critical care?

JD: I attended a relatively new fellowship and many things were not "set in stone." This allowed for and also required a fair amount of custom tailoring and personal diligence to get the training experience I wanted. That is the single most important lesson I learned in fellowship: Don't get put in a box of someone else's making. Do what you need to, to get the experience you need, to have the career you want.

My current job is great. It requires a doctor who can practice internal medicine, surgery, administration, and yes echocardiography too. Without my fellowship experience, I think this opportunity would have come and gone.

## Q: What does being a part of the ECMO response team entail?

JD: It's a lot of things but in the end, it means a *gut check*. My mentor who founded our program in 1985 told me that in order to "do ECMO" you need to "have it in your DNA". That means...rolling out of bed in the middle of night and kissing your wife and kids goodbye, to maybe get on a small bumpy airplane, to god knows where, for lord knows who, that did heaven knows what to themselves...(that last part was my addition to the saying). And when you get back, get right back to work with a smile on your face and maybe doing the same thing the next night...

And yes, it means being able to lead a team — be the surgeon if they need one. An anesthesiologist when they need one. And even letting your team RN place the IV when you know you can do it better so that they can build confidence...and then you must be their biggest cheerleader.

You must be whatever and whomever your team needs.

# KB: If you were hiring a new colleague, what would you desire in their training?

**JD:** Some medicine training, some surgical training. There must be evidence that they have grit and are able to persevere and "get in the trenches." Over focus on compensation and "work-life-balance" would be red flags.

It is difficult to figure out who will fit or not fit so we never hire "from the street." ECMO team members are currently promoted from within after working with them for some time.

#### Q&A: Professional Paths in Anesthesiology Critical Care continued from previous page



**Dr. Yanni Angelidis** has completed training in cardiac anesthesia, obstetric anesthesia, and critical care medicine in addition to other advanced training. He currently practices at the University of Pittsburgh.

KB: Considering obstetric critical care is a relatively new field, what has changed in the practice landscape to create this need?

YA: Over the past decade, we've seen a significant rise in maternal morbidity and mortality in the United States. driven by increasing rates of chronic health conditions in pregnant patients, such as cardiovascular disease, obesity, hypertension, and diabetes. In parallel, maternal age is rising, and more patients are entering pregnancy with preexisting complex medical conditions. At the same time, there has been greater recognition that pregnant and postpartum patients with critical illness benefit from care that integrates both obstetric and critical care expertise. These changes have created a clear need for specialized care models, dedicated obstetric ICUs, and clinicians trained at the intersection of maternal-fetal medicine, anesthesia, cardiology, and intensive care. Our evolving understanding of conditions like peripartum cardiomyopathy, amniotic fluid embolism, and severe preeclampsia also demands a multidisciplinary, systemslevel approach—precisely what obstetric critical care provides.

# KB: What is the training path and what is a typical day like for you?

YA: There is no single pathway into obstetric critical care, making the field flexible and richly multidisciplinary. Most physicians come from backgrounds in anesthesiology, internal medicine, or maternal-fetal medicine, often combining their foundational training with additional fellowships. In my journey, I've completed three fellowships—in obstetric anesthesia, cardiac anesthesia, and critical care medicine—which have uniquely positioned me to care for pregnant patients with complex cardiac and critical illness.

A typical day varies depending on my clinical assignment. I might be managing cardiothoracic ICU patients, leading care for high-acuity obstetric patients in a specialized OB critical care unit, or coordinating perioperative planning for complex deliveries. I also spent 45 % of my clinical

time managing complex adult cardiac cases in the cardiothoracic OR. Beyond clinical work, my time is also dedicated to research, developing institutional protocols, mentoring trainees, and advancing maternal safety initiatives through national society work. The diversity of each day is one of the most fulfilling aspects of this career.

# KB: For someone contemplating this career path, what should they look for in a training program?

YA: Please look for programs that embrace interdisciplinary care and actively support maternal critical care initiatives. Key features include:

- Intense exposure to both medical and surgical ICU environments
- Opportunities to care for critically ill obstetric patients, whether through high-risk obstetrics services, OB anesthesia, or specialized ICUs
- Mentorship from faculty with an interest in cardioobstetrics or maternal-fetal medicine
- Institutional commitment to maternal health equity, quality improvement, and team-based care

Seeking out programs with formal collaborations between anesthesiology, OB/GYN, and medicine departments. Participation in national societies such as SOCCA and SOAP provides essential networking, education, and leadership opportunities.

#### REFERENCES

- Halpern, NA et al. Intensivists in U.S. acute care hospitals. Crit Care Med. 2019; 47:517-525.
- SCCM statistics. Available at: <a href="https://www.sccm.org/Communications/">https://www.sccm.org/Communications/</a> Critical-Care-Statistics
- Shaefi, S et al. Nationwide clinical practice patterns of anesthesiology critical care physicians: A survey to members of the Society of Critical Care Anesthesiologists. Anesth Analg. 2023; 136:295-307.
- 4. SF match. Available at: https://www.sfmatch.org/
- Flynn, B et al. Sustainability of the Subspecialty of Anesthesiology Critical Care: An Expert Consensus and Review of the Literature. Journal of Cardiothoracic and Vascular Anesthesia, Volume 38, Issue 8 1753 – 1759

# Leading the Future of Critical Care: Unlocking Women's Potential in Leadership

Critical care medicine is one of the most complex and rewarding areas in healthcare. It is a specialty that thrives on decisive action, strategic thinking, and the ability to lead diverse teams under intense pressure. In this high-stakes environment, leadership is not simply a title—it is a commitment to advancing patient care, research, and education.

Women physicians have been steadily increasing their presence in critical care, both in training programs and clinical practice. Yet, leadership opportunities in this field remain an area of tremendous potential. The question is no longer whether women can lead in critical care—it is how we can best equip and support them to do so.

A recent comprehensive review published in *Critical Care Explorations* shines a spotlight on this very question.

Authored by members of the SOCCA **Women in Critical Care** group, the study—*Siddiqui, Shahla MBBS, MSc, FCCM; Gali, Bhargavi MD, MHA; Cotter, Elizabeth MD; Short, Margo MD; McNichol, Megan; Mulaikal, Teresa A. MD; Cassavaugh, Jessica MD, PhD; Chow, Jarva MD, MS, MPH, FASA; Russell, Cortessa MD; Golhar, Shweta Y. MD; Ben-Jacob, Talia K. MD, MS, FCCM. Women Physicians in Leadership Roles in Critical Care Medicine or Academic Medicine—A Systematic Literature Review. Critical Care Explorations* 7(4):p e1249, April 2025.

DOI: 10.1097/CCE.0000000000001249—offers valuable insights into how we can shape the future of leadership in critical care.

#### The Review at a Glance

The review analyzed 892 studies published between 2011 and 2024, ultimately including 39 that met strict criteria for relevance. While only two studies focused specifically on critical care medicine (CCM), the broader findings from academic medicine offer valuable lessons.

The authors identified key themes that influence the trajectory of women into leadership roles:

- Pipeline Development Women are entering the field in greater numbers, yet leadership roles require intentional cultivation of skills and visibility.
- Mentorship and Sponsorship –
  Career advancement is strongly
  linked to access to experienced
  mentors and advocates who can
  open doors to opportunities.
- Institutional Support Flexible policies, transparent promotion pathways, and leadership development programs help sustain career momentum.
- Visibility and Research Leadership Participation in high-profile academic activities, committees, and conference roles enhances leadership readiness.

Rather than focusing on barriers, the review emphasizes the systems and strategies that have already shown promise in supporting women's advancement.



Leadership in critical care is uniquely impactful. Leaders influence patient care protocols, direct research priorities, and shape the professional development of entire teams. In academic settings, leadership roles also drive curriculum design, fellowship training, and institutional policy.

When leadership draws from a broad talent pool—including the many highly capable women in the field—it fosters:

- Innovation Diverse perspectives stimulate creative problem-solving and novel approaches to patient care.
- Team Strength Leaders who value collaboration strengthen the cohesion and performance of critical care teams.



Shahla Siddiqui, MD, MSc, FCCM WICC Member, SOCCA Harvard Medical School

#### Leading the Future of Critical Care continued from previous page

• Improved Outcomes – Leadership diversity correlates with higher patient satisfaction and better clinical results.

The expansion of women's leadership in CCM is not only an equity objective; it is a strategic priority for the specialty's continued excellence.

#### The Pipeline: From Training to Leadership

The past decade has seen steady growth in the proportion of women in critical care training programs—rising from 26% to nearly 37%—and an increase from 14% to 26% among practicing intensivists. This creates an unprecedented opportunity to strengthen the leadership pipeline.

The review notes that pipeline strength depends on:

- Early Exposure to Leadership Skills Integrating leadership training into residency and fellowship equips physicians with strategic thinking and team management skills from the start.
- Targeted Development Programs Opportunities such as leadership fellowships and national training initiatives prepare physicians for administrative, academic, and policy roles.
- Role Models Visible examples of women in leadership inspire trainees and normalize diverse representation in high-level positions.

## Mentorship and Sponsorship: Catalysts for Advancement

Mentorship is repeatedly identified as one of the most powerful accelerators of career growth. Effective mentors provide guidance on navigating complex systems, balancing clinical duties with academic pursuits, and preparing for leadership responsibilities.

Sponsorship goes a step further—mentors advocate directly for their mentees, nominating them for committees, speaking opportunities, and leadership positions. This active promotion can significantly shorten the time it takes to move from early career to leadership roles.

Programs like **ELAM** (**Executive Leadership in Academic Medicine**) serve as national models for structured mentorship and leadership development,

producing graduates who often assume high-impact positions in academic and clinical leadership.

## Institutional Support: Creating the Conditions for Success

The review highlights institutional policies and resources as essential to sustaining leadership readiness. Examples include:

- Flexible Work Arrangements Scheduling that supports work-life integration helps leaders sustain longterm careers.
- Childcare and Family Support Onsite childcare, parental leave, and dependent care resources enable continuity of leadership responsibilities.
- Transparent Promotion Processes Clearly defined criteria and regular feedback ensure that career progression is based on merit and achievement.

Such measures not only benefit women but also improve retention and satisfaction across the entire critical care workforce.

#### Visibility: Building Professional Presence

Leadership readiness is enhanced when physicians are visible in their field. This includes:

- Speaking at Conferences Presenting research and leading panel discussions builds reputation and authority.
- Committee Participation Active roles in professional societies create networks and influence policy directions.
- Research Leadership Serving as principal investigator or leading multi-center studies establishes credibility and expertise.

The review points to a direct connection between visibility in academic and professional arenas and subsequent appointment to leadership roles.

#### A Collective Effort

Strengthening women's leadership in critical care is not a solo endeavor—it is a collective mission. Professional

#### Leading the Future of Critical Care continued from previous page

societies, academic departments, healthcare institutions, and individual leaders all have a role to play.

By cultivating leadership skills early, providing mentorship and sponsorship, and ensuring supportive institutional structures, the specialty can make the most of its full talent pool.

Importantly, the authors note that leadership development is not just about filling positions. It is about creating leaders who will drive innovation, enhance patient care, and mentor the next generation—sustaining the specialty's growth for decades to come.

**Looking Ahead** 

The findings from the *Women in Critical Care* review provide both a snapshot of the current landscape and a roadmap for future action. Expanding women's leadership in CCM requires ongoing commitment to:

- **Training and Development** Embedding leadership training into all stages of medical education.
- Mentorship and Sponsorship Ensuring every earlycareer physician has access to guidance and advocacy.

- Institutional Engagement Implementing policies that support long-term leadership sustainability.
- Professional Visibility Encouraging active participation in conferences, societies, and research leadership.

As the authors conclude, the potential for growth in women's leadership in critical care is immense. With intentional strategies, the specialty can ensure that its future leaders reflect the full breadth of talent, skill, and vision within the field.

#### Citation:

Siddiqui, Shahla MBBS, MSc, FCCM¹; Gali, Bhargavi MD, MHA²; Cotter, Elizabeth MD³; Short, Margo MD³; McNichol, Megan⁴; Mulaikal, Teresa A. MD⁵; Cassavaugh, Jessica MD, PhD¹; Chow, Jarva MD, MS, MPH, FASA⁶; Russell, Cortessa MD⁵; Golhar, Shweta Y. MD¹; Ben-Jacob, Talia K. MD, MS, FCCM⁻. Women Physicians in Leadership Roles in Critical Care Medicine or Academic Medicine—A Systematic Literature Review. Critical Care Explorations 7(4):p e1249, April 2025. DOI: 10.1097/CCE.0000000000001249



QUALITY + COMPASSION + BENEVOLENCE

Women in Critical Care (WICC) is a subcommittee of SOCCA that is committed to advancing the careers and well-being of women in critical care anesthesiology.

Connect with us: www.socca.org/women-in-critical-care

# Redefining Critical Care - Anesthesiology's Role in Innovation and System Transformation

erioperative critical care led by anesthesiology sits at a powerful intersection. Our work spans the operating room and ICU while increasingly shaping decisions at the health system. Insights from McKinsey, Deloitte, PwC, and NCQA highlight three major forces shaping the future of healthcare:

- 1. Rapid adoption of technologies like AI and automation.
- Redesign of care into integrated, digitally connected networks.
- Stronger focus on the whole patient, including social, behavioral, and community determinants of recovery.

These are not abstract trends but can be considered as a framework to create concrete opportunities to lead, not only at the bedside but across entire health systems. As anesthesiologists, we are at the forefront of these innovations, shaping the future of perioperative critical care.

#### **Technology as a Catalyst**

Technology is moving quickly from promise to practice. At Johns Hopkins, an Al-driven sepsis platform reduced mortality by nearly 18% across multiple hospitals.

[1] Prenosis's Sepsis ImmunoScore became the first FDA-authorized Al-based sepsis risk tool. [2] At the same time, new wearable and device-based systems are being developed to detect deterioration hours before it becomes clinically apparent. (https://arxiv.org/html/2505.01305v1#S6) Ventilation is also evolving closed-loop modes such as INTELLiVENT-ASV can automatically adjust settings in real time, standardizing care and reducing variability. [3] Meanwhile, tele-ICU models pioneered at Mayo Clinic extend critical care expertise to rural hospitals, now layered with Al-driven analytics.

For anesthesiologist–intensivists, these technologies are more than gadgets; they are strategic levers to enhance patient safety, efficiency, and influence in hospital-wide decision-making.

#### **Perioperative Critical Care Without Walls**

Critical care is no longer confined to the ICU. Increasingly, ICU-level expertise is being brought to patients across

the hospital and even into their homes. This patient-centered approach ensures that the sickest patients receive the care they need and high-risk surgical patients are co-managed on the wards with enhanced monitoring, predictive analytics, and intensivist consults. This preserves ICU capacity while extending the safety net of critical care across the perioperative continuum.



Ranjit Deshpande, MD, MBA, FCCM Chair, Transplant Critical Care (SATA) Workgroup Yale School of Medicine New Haven, CT

Consider a patient undergoing

a liver transplant. Instead of a default ICU admission, some centers now employ step-down units equipped with remote telemetry and daily intensivist oversight. The patient remains stable, recovers faster, and avoids both ICU-associated complications and excess cost. This is what perioperative critical care without walls would look like in practice.

Hospital-at-home programs are also redefining recovery. At Mayo Clinic, the Advanced Care at Home program combines remote monitoring, daily virtual rounds, and in-home services to deliver hospital-level care in familiar surroundings. [4] Mount Sinai has implemented a similar model through its Hospitalization at Home program, which has been shown to reduce costs, improve patient satisfaction, and safely manage both surgical and medical patients outside the hospital. [5] Atrium Health's Hospital at Home program, profiled by the AMA, goes a step further: during enrollment, paramedics assess social determinants such as housing safety and food insecurity, connecting patients with community resources to support safe recovery. [6] Together, these models illustrate a huband-spoke future: the ICU remains the hub for the sickest patients, while perioperative critical care radiates outward to hospital floors, emergency departments, and homes. [7]

Anesthesiologists already play central roles across specialized ICUs like cardiac, transplant, neuro, obstetric, and even organ donation management. The question is whether we will lead in reshaping the future of critical care. To remain at the forefront, we must continue to evolve, adopting models that extend our expertise beyond

#### Redefining Critical Care continued from previous page

traditional walls and into the changing landscape of healthcare delivery.

#### Social and Behavioral Determinants of Recovery

Recovery after surgery and critical illness is not just a physiologic journey, it is shaped by social and behavioral realities. Atrium Health screens patients for food insecurity, unstable housing, and transportation barriers before discharge. These efforts not only improve outcomes but also align with financial imperatives as value-based contracts increasingly tie reimbursement to addressing social determinants. For perioperative critical care anesthesiologists, this is an opportunity to strengthen both patient care and our influence in system-level negotiations.

#### **Workforce and Culture Transformation**

The future of perioperative critical care depends on people. Burnout, staffing shortages, and rising patient complexity remain pressing challenges. [8] Several Innovative models are emerging, including APP-integrated teams that allow for more flexible staffing, simulation, and Al-augmented training to prepare clinicians for rare but high-stakes events, as well as automation to reduce documentation burdens. These are not just workforce fixes; they are culture shifts that help clinicians stay engaged and focused on what matters most: caring for patients.

Rethinking perioperative staffing is part of this transformation. Anesthesiologist–intensivists are accustomed to managing multiple unstable patients in the ICU and uniquely equipped to lead hub-and-spoke perioperative models where one physician supervises several rooms supported by APPs or residents. Combined with remote monitoring and AI-driven alerts, these approaches can preserve safety while improving efficiency, a model that directly mirrors the ICU.

#### A Call to Action

Health systems increasingly reward leaders who combine clinical excellence with operational and financial stewardship. Anesthesiologist intensivists are uniquely positioned to deliver both. By embracing technology, rethinking care delivery inside and outside the ICU,

addressing social and behavioral drivers of recovery, and building resilient teams, we can transform how health systems define critical care.

We already know how to lead in the operating room and stabilize crises in the ICU. The next step is to bring that same clarity, adaptability, and leadership into the boardroom. The future of critical care will be written with us or without us. The question is whether we will choose to lead.

#### **REFERENCES**

- Henry, K.E., et al., Factors driving provider adoption of the TREWS machine learning-based early warning system and its effects on sepsis treatment timing. Nat Med, 2022. 28(7): p. 1447-1454.
- Akhil Bhargava, M.S., Carlos López-Espina, M.S., Lee Schmalz, B.S., Shah Khan, Ph.D. Gregory L. Watson, Ph.D., Dennys Urdiales, B.S., Lincoln Updike, B.S., Niko Kurtzman, M.D., Alon Dagan, M.D., Amanda Doodlesack, M.D., Bryan A. Stenson, M.D., Deesha Sarma, M.D., Eric Reseland, M.D., John H. Lee, M.D., Ph.D. Max S. Kravitz, M.D. Peter S. Antkowiak, M.D., M.P.H., Tatyana Shvilkina, D.O., Aimee Espinosa, M.D., Alexandra Halalau, M.D., Carmen Demarco, M.D., Francisco Davila, M.D., Hugo Davila, M.D., Matthew Sims, M.D., Ph.D., Nicholas Maddens, M.D., Ramona Berghea, M.D., Scott Smith, M.D., Ashok V. Palagiri, M.D., Clinton Ezekiel, M.D., Farid Sadaka, M.D., Karthik lyer, M.D., Matthew Crisp, M.D., Ph.D., Saleem Azad, D.O., Vikram Oke, M.D., Andrew Friederich, M.D., Anwaruddin Syed, M.D., Falgun Gosai, M.D., Lavneet Chawla, M.D., Neil Evans, M.D., Kurian Thomas, M.D.,, Roneil Malkani, M.D., Roshni Patel, M.D., Stockton Mayer, D.O., Farhan Ali, M.D., Lekshminarayan Raghavakurup, M.D., Muleta Tafa, M.D., M.P.H, Sahib Singh, M.D., Samuel Raouf, M.D., Sihai Dave Zhao, Ph.D., Ruoqing Zhu, Ph.D., Rashid Bashir, Ph.D., Bobby Reddy, Jr., Ph.D., Nathan I. Shapiro, M.D., M.P.H., FDA-Authorized AI/ML tool for sepsis prediction: development and validation. NEJM AI, 2024. 1 NO. 12.
- Botta, M., et al., Effect of Automated Closed-loop ventilation versus convenTional VEntilation on duration and quality of ventilation in critically ill patients (ACTiVE) - study protocol of a randomized clinical trial. Trials, 2022. 23(1): p. 348.
- Maniaci, M.J., et al., Provider Evaluation of a Novel Virtual Hybrid Hospital at Home Model. Int J Gen Med. 2022. 15: p. 1909-1918.
- Levine, D.M., et al., Hospital-Level Care at Home for Acutely III Adults: A Randomized Controlled Trial. Ann Intern Med, 2020. 172(2): p. 77-85.
- Future of Health Case Study: Atrium Health. Available from: https:// www.ama-assn.org/system/files/future-health-case-study-atriumhealth.pdf.
- Patrick H. Conway, M., MSc, Home-Based Care Faces Growing Patient Volume and Acuity. NEJM Catal Innov Care Deliv, 2023. 4.
- Haines, K.J., et al., Enablers and Barriers to Implementing ICU Follow-Up Clinics and Peer Support Groups Following Critical Illness: The Thrive Collaboratives. Crit Care Med, 2019. 47(9): p. 1194-1200.

# New Faculty Perspectives on Becoming a Critical Care Anesthesiologist

fter years of residency and fellowship, the day finally comes: you're officially the attending. No more "presenting to the boss"—because now, you are the boss. To those still in training, this moment can feel like the finish line, the day you finally get to call the shots and follow your own plan. But what does it really feel like when you step into that role for the first time? I reached out to two former trainees, now finishing their first year as critical care anesthesiology faculty, to hear how the transition looks from the other side.

Dr. Nowak reflected: "The most striking change after training is realizing you are now the bottom line. When ICU residents turn to you for guidance on a patient's swollen extremity, when transplant attendings ask your advice on a difficult extubation, or when you're the one who has to tell a surgeon to abort a case for an intraoperative cardiac event—you recognize the responsibility rests with you. That weight never fully goes away, but it becomes easier and more comfortable with time. While trainees often long to create and follow their own plan, as an attending the real goal is to craft a safe, patient-centered plan that also allows proceduralists to do their work—or to make the difficult call to delay or cancel if conditions aren't right. Training in the ICU uniquely equips us to make these complex decisions, both inside and outside the OR, and to facilitate critical conversations among subspecialists when timing or patient readiness is in question."

Dr. Lopez added: "Balancing responsibilities across two distinct clinical settings—ICU and OR—can feel like needing two different brains. Yet that dual practice is what makes us stronger physicians. It gives us a broader set of tools to provide the best possible care. In training, I worked with over 100 intensivists from varied backgrounds. The best among them combined deep ICU knowledge with leadership finesse and extraordinary communication skills—empathy, collaboration, and the ability to build consensus. Our training allows us to translate different perspectives into a unified plan, benefiting patients across ORs, ICUs, and non-OR settings with radiologists, cardiologists, and gastroenterologists. This flexibility and understanding of logistics directly serve our patients, and as one of my mentors taught me, the ICU environment cultivates

the leadership skills that define outstanding physicians."

Both physicians agreed that fellowship training enhanced their clinical confidence and broadened their skill sets. Dr. Nowak highlighted how ICU training builds comfort with invasive lines, vasoactive medications, and perioperative ultrasound—skills that improve patient care in and out of the operating room. Dr. Lopez emphasized the ability to provide seamless perioperative care. manage acute decompensation, and stabilize even the sickest patients through mastery of vascular access, airway management, and anesthetic expertise. Together, their reflections underscore how critical care training expands the anesthesiologist's role far beyond the OR.

Finally, both offered advice to those still "in the weeds" of training. Dr. Nowak encouraged humility and openness: "Don't be afraid to ask for help. Our patients deserve our best, and sometimes that means putting ego aside and seeking guidancewhether from senior or even junior colleagues. We must also commit to evidence-based practice and continue learning throughout our careers. Be the role models you wanted as a trainee, and show grace—to others and yourself. And don't forget your mentors; even years later, they remain invaluable sources of perspective." Dr. Lopez



Beth M. T.
Teegarden, MD, FASA
Membership Committee
Member
University of Texas
Galveston, TX



Lindsay D. Nowak, MD SOCCA Member Rush University Medical Center Chicago, IL



Lopez Valencia, MD, PhD SOCCA Member Baylor College of Medicine Houston, TX

echoed this sentiment, reminding future colleagues that critical care anesthesiologists carry not only a unique skill set but also the responsibility to lead with collaboration, empathy, and resilience.

# E CRITICAL CURRENTS

A space dedicated to exploring topics of general interest to the SOCCA membership, curated by the Interchange editors to inspire thought, dialogue, and themes for future issues.

## Bridging Clinical Care and Reimbursement: Demystifying ICU Billing and DRGs

#### Introduction

or intensivists, time is often our most precious resource. Between rounding, procedures, and family meetings, few of us receive formal training in the systems that translate our clinical work into reimbursement. This article provides an overview of the key components of billing in the ICU setting, specifically focusing on professional billing of critical care services and hospital billing via Diagnosis-Related Groups (DRGs) and Case Mix Index (CMI).

#### **Professional Billing**

Professional billing refers to how individual physicians are reimbursed for services rendered. In the ICU, this most often involves billing for critical care time using CPT (Current Procedural Terminology) codes. According to the Centers for Medicare & Medicaid Services (CMS), critical care services are defined as the direct delivery of care to a critically ill or injured patient where there is a high probability of imminent or life-threatening deterioration of one or more vital organ systems. These services require high-complexity decision-making to assess, manipulate, and support failing organ systems or to prevent further decline.<sup>1</sup>

Two CPT codes form the backbone of critical care billing: 99291 is used for the first 30 to 74 minutes provided on a given calendar day, while 99292 is used for each additional 30-minute increment beyond that. To qualify for these codes, the physician must be immediately available and must not be concurrently providing care to other patients. Time spent at the bedside, reviewing diagnostics, coordinating care with consultants, and family meetings (more on this below) may all count toward total billable critical care time—so long as the work pertains directly to the ongoing management of the critically ill patient<sup>1</sup>.

It's important to understand what does and does not count as separately billable procedures when providing care. Certain services—such as ventilator management, interpretation of chest X-rays, and examination of physiologic data—are bundled into critical care time and cannot be billed separately. However, procedures that require distinct clinical effort—such as endotracheal intubation, arterial or central lines, or bronchoscopies—should be billed independently using their own CPT codes. Importantly,



Nitin
Mehdiratta, MD
Membership Committee
and Clinical Practice
Committee, SOCCA
Duke University
Hospital
Durham NC

the time spent performing these procedures is excluded from your total critical care time for that day.<sup>2</sup>

Family discussions can be billed as part of critical care time when the patient lacks decision-making capacity, and the conversation directly influences medical decision-making. To meet billing requirements, documentation must clearly state that the patient was unable to participate and that the discussion was essential to guiding care. Routine daily updates with family members does not qualify and should not be included in critical care time.<sup>3</sup>

#### **Hospital Billing**

While physicians bill for professional services, hospitals are reimbursed through a different mechanism: DRGs. DRGs are the main component of Medicare's payment system, where hospitals receive a fixed payment based on the classification of the patient's hospital stay, regardless of the actual length or intensity of care. The DRG is determined at the time of *discharge* by certified coders who review the principal diagnosis, secondary diagnoses,

#### Bridging Clinical Care and Reimbursement continued from previous page

procedures performed, and discharge disposition amongst other variables.

Each DRG is associated with a relative weight, which reflects the average resources consumed for a given diagnosis or procedure. More resource-intensive conditions and interventions carry higher relative weights and, thus, lead to higher hospital reimbursement. For example, DRG 871: Sepsis with Major Complication or Comorbidity (MCC) has a relative weight of approximately 2.0, while DRG 312: Syncope without MCC has a relative weight closer to 0.87.4 Hospitals multiply this weight by a hospital base rate to determine reimbursement.

Secondary diagnoses that meet certain clinical and coding criteria can be classified as Complications or Comorbidities (CC) or Major CCs (MCC). These modifiers increase the DRG weight and reflect the greater resource utilization associated with managing complex patients. Surgical procedures can also shift a patient from a medical DRG to a more highly weighted surgical DRG, particularly when major interventions like a tracheostomy or exploratory laparotomy are performed. These differences underscore how documentation of acuity can substantially influence payment. Let's explore a short fictional example:

A 65-year-old woman is status post right hemicolectomy for perforated diverticulitis. Post-operatively, she is tachycardiac, hypotensive, hypoxemic, and has rising creatinine and white blood cell count. If you document: "Patient with leukocytosis, low urine output, increasing oxygen requirements", this may get coded to DRG 331, Bowel Procedure without CC/MCC with a relative weight of 1.65. Instead, if you wrote: "Patient with signs concerning for early sepsis physiology, new acute kidney injury, escalating oxygen requirements consistent with acute hypoxemic respiratory failure", the DRG would be 329, Major bowel procedure with MCC with a relative weight of 4.59<sup>4</sup>. This is not upcoding, it is accurately reflecting the patient's acuity!

The CMI is the average DRG weight across all discharged patients in a given time and serves as a surrogate marker for clinical complexity and resource allocation of a hospital's patient population. Academic centers and ICUs often have higher CMIs due to the

greater acuity and procedural intensity. Accurate and complete documentation is essential to capture this complexity; failure to document acute organ dysfunction or comorbidities like chronic kidney disease can result in under-coding which could diminish DRG weight and reduce reimbursement.

Moreover, DRGs play a critical role in hospital performance metrics, such as Observed/Expected (O/E) mortality ratios which are often risk-adjusted using DRG data. Documentation of clinically significant comorbidities improves severity adjustment and can more accurately reflect the complexity of ICU care provided.<sup>5</sup>

#### Conclusion

Critical care is one of the most resource-intensive domains of medicine, and appropriate billing—both at the professional and hospital level—ensures recognition of that value. Understanding critical care billing and DRG assignment empowers physicians to advocate for appropriate resources and improves transparency in performance metrics. While billing may not be the most glamorous part of ICU practice, it is a vital one, and engaging with these systems helps align clinical care with operational success.

#### **REFERENCES**

- Centers for Medicare & Medicaid Services (CMS). Evaluation and Management Services Guide. Medicare Claims Processing Manual Chapter 12, Rev 13012, 2024.
- American Medical Association. CPT 2024 Professional Edition. AMA Press.
- CGS Medicare. Critical Care Services Fact Sheet. Updated 2021. https://cgsmedicare.com/pdf/critical\_care\_fs.pdf
- FY 2025 IPPS Final Rule Home Page, Table 5 Final Rule and Correction Notice . https://www.cms.gov/medicare/payment/ prospective-payment-systems/acute-inpatient-pps/fy-2025-ippsfinal-rule-home-page
- Shine D. Risk-adjusted mortality: problems and possibilities. Comput Math Methods Med. 2012:829465.

#### Acknowledgements:

The author used ChatGPT (OpenAI) to assist with grammar, spelling, and language clarity during preparation of this article. All content and interpretations are the authors' own.

# From a Garage Across the Ocean to our Operating Rooms: How Collaboration and 3D Printing Is Transforming and Expanding Emergency Airway Training at the University of Minnesota

ricothyrotomy has the potential to be life-saving in the event of a failed intubation, but it is a procedure that few anesthesia providers have the opportunity to practice. And in a specialty like anesthesiology, procedural confidence in an emergency can mean the difference between hesitation and a life saved. Cadaver or veterinary models to practice cricothyrotomy are sometimes available at academic centers, but these options and commercially-available high-fidelity simulation models are often prohibitively expensive or difficult to come by.

Here at the University of Minnesota, Dr. Megan Kakela, a CRNA and DNP leader of our SRNA training program, worked with Tori Kotz, an SRNA, on a cricothyrotomy "Check off" project to ensure that all anesthesia providers at our institution - providers with both physician and nursing backgrounds - could have adequate hands-on experience to report feeling comfortable with the procedure. In order to provide adequate opportunities for over a hundred trainee

and staff providers to get intensive, highvolume practice on high-fidelity simulation equipment, Dr. Kakela and Ms. Kotz utilized 3D printing to cheaply create a large number of airway manikins.

# 3D Printing as a cost-effective way to scale training

Informal polling suggests that every anesthesia provider at the University of Minnesota is at least vaguely familiar

with the potential of 3D printing (and that's probably true for most people these days) but no one had significant personal experience in creating materials. So it was eye-opening for all of us to learn more about what was necessary to obtain 3D-printed training equipment for Megan and Tori's project. We are sharing our experience

as it may be inspirational to other programs.

The models Dr. Kakela selected (https://www.thingiverse.com/ thing:6047559) were originated by Dr. Archie Port, an anesthetist at a moderate-sized regional acute-care community hospital in Hawke's Bay, New Zealand. Dr. Port has been creating 3D printed training material for many years now, and freely shares his creations on open-access websites with hospitals across New Zealand and the world. He reports that he began designing and printing medical trainers in his garage using open-source tools like TinkerCAD and a personal Prusa XL printer. "I have no formal training in design or tech," he says. "I just make them for fun." Dr. Port says he gets no reimbursement for his work, but the cost per trainer is minimal (he pays \$40 NZD for 1kg of printing filament, and each model weighs only a few hundred grams), although he does



Anna Budde, MD Vice-Chair, SOCCA Education Committee University of Minnesota Minneapolis, MN



W. Kirke Rogers, MD
Member, SOCCA
University of Minnesota
Minneapolis, MN

note that developing and testing models can be a significant time investment. The current iteration of his cricothyrotomy trainers that the University of Minnesota printed and uses include an articulated "head/face" to encourage the motion of lifting a chin to expose the cricothyroid membrane, the ability to attach a test lung to the "trachea," and a means to securely attach simulated "skin" material.

One of the academic medical labs at the University of Minnesota had a pre-existing collaboration with Stratasys (https://www.stratasys.com/en/, a Minnesota-based global provider of industrial 3D printers and printing materials), so we were able to harness that relationship to print multiple models at no cost. However, even if we would have had to pay for materials and equipment, the estimated cost to produce our models would have been about \$50-\$100 per model, significantly below the cost of commercially-

#### From a Garage Across the Ocean continued from previous page

produced training manikins, which can be many hundreds of dollars each.

#### Interested in creating your own training tools?

Access to some sort of 3D printer is likely available to anyone interested in obtaining training equipment, regardless of practice location. For example, many moderately-sized community hospital systems have access to so-called "innovation hubs" intended to generate bespoke patient care equipment. Even in smaller communities, it is now common for places such as public libraries or community colleges to have "Maker Spaces" with 3D printers available to the general public for free or at a nominal cost.

Further, a number of companies, like Treatstock (www. treatstock.com) and Xometry (www.xometry.com) offer low-volume 3D-printing and manufacturing services directly, and websites like www.makexyz.com let you upload a design and connect with local printers.

You can find free, medically oriented models to print through repositories like the NIH 3D Print Exchange (https://3d.nih.gov/) and Thingiverse (www.thingiverse.com) - simply search for terms like "airway" or "larynx" and "anatomical models" (besides cricothyroidotomy trainers, things like tracheal models to practice double-lumen intubation are available). Reaching out to the broader maker-medical community may also be productive: many clinicians and designers, like Dr. Port, are happy to share their STL files and may even walk you through adapting them for your own requirements. Indeed, many of Dr. Port's original designs have been tweaked and edited and re-shared by users on Thingiverse to either make generic improvements or create products more bespoke to a specific institution's needs.

Having access to someone experienced in 3D printing may be necessary to help select what components and material to use (although often the designers of models will include recommendations for material in their plans). Dr. Port used standard PLA material when he created his original models for ease in printing, but based on recommendations from technicians managing our project, our models combined a more durable ABS and more flexible TPU materials to

help replicate the tactile experience of a real procedure and provide appropriate functionality for heavy use. Dr. Kakela added sheets of tattoo practice skin (\$25 for 30 pieces) and durable packing tape to mimic cartilage, to increase the tactile realism of our models. A thorough review describing the various types of material used in 3D printing and other considerations for building medical models is available from BMJ Simul Technol Enhanc Learn. 2017 Dec 9;4(1):27–40. (doi: 10.1136/bmjstel-2017-000234) if you do not otherwise have access to advice about choosing materials.

One of the biggest surprises for those of us not familiar with 3D printing was just how long the process can take. Each individual model took approximately 80 hours to print, and after printing, the parts were washed at 70°C to dissolve QSR support material, then rinsed and dried. Printers often break and require maintenance, or may require cleaning between prints, which can also slow down the printing process - especially when making multiple versions of a product, as we did.

#### Conclusion:

The biggest learning point for us in the Department of Anesthesiology at the University of Minnesota was that 3D printing of medical training equipment isn't just about technology—it's about accessibility, collaboration, and creativity. Options for easily acquiring low-cost 3D-printed training materials proved remarkably abundant once we learned how to access them. Based on our experience, we believe that whether you're at a major academic center or a rural hospital, with a gumption and initiative, you can readily find a way to bring high-quality procedural manikins to your learners.

Article contributors include:

W. Kirke Rogers, MD Rachel Larson BA, RDCS
Madeline A. Wethington, MBS Megan Kakela, DNP
Nicholas (Archie) Port, Victoria Kotz, BS
MB, ChB, FANZCA Anna Budde, MD

With special thanks to Paul laizzo, PhD, the Visible Heart® Laboratories at the University of Minnesota, and Stratasys®.

# Reflections on the 2025 Fellowship Match: Growth, Challenges, and New Opportunities

he Anesthesiology Critical Care Medicine (ACCM) fellowship match continues to serve as a crucial benchmark for trainees and programs, shaping the trajectory of our specialty and ensuring a strong pipeline of future intensivists. The results of the 2025 fellowship match cycle show some interesting trends while also highlighting opportunities for ongoing vigilance and the need for proactive measures to safeguard the growth and stability of our subspecialty.

#### Match Cycle 2024 vs 2025

Compared to 2024, the 2025 fellowship match results show progress but also underscore ongoing challenges facing fellowship programs. In total, the number of training programs participating in the match increased from 64 in 2024 to 66 this year. However, the total number of positions offered in the match decreased slightly, from 226 to 223 (Table 1). This slight decrease is likely related to the increasing number of positions being reserved for emergency medicine (EM) applicants, which are structured as two-year tracks, potentially reducing the pool of available one-year positions. Encouragingly, the overall number of filled positions increased from 145 in 2024 to 150 during this match cycle, indicating a subtle improvement in match outcomes. However, the proportion of unfilled slots remains significant, highlighting our ongoing recruitment challenges.

Table 1. Fellowship Match Results: 2024 vs 2025

	2024	2025
Participating Programs	64	66
Positions Offered	226	223
Positions Filled	145	150
Positions Unfilled	81	73
ACTA-ACCM Positions	23	25
Positions Filled by EM Applicants	39	51

#### **Shifts in Applicant Composition**

A closer examination of the fellowship applicant pool highlights some significant directional changes. The applicant pool for the dual adult cardiac anesthesiology

and critical care medicine fellowship positions overall remained stable, with a total of 25 applicants matching into the dual fellowship positions.

Since the American Board of Medical Specialties decision in 2013 to allow joint sponsorship between the American Board of Anesthesiology and the American Board of Emergency Medicine, trainees with a background in emergency medicine have had a defined pathway to obtain certification in Anesthesiology Critical Care Medicine through a 24-month training program. Over the past decade, the number of ABA-approved fellowship programs offering this two-year training pathway has grown to 46.1 The impact of the increase in available programs offering 24-month training is now evident in the rising number of EM physicians matching into ACCM fellowships, with the number of EM residents accepted into fellowships growing significantly from 39 in 2024 to 51 in 2025.



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



Nazish Hashmi, MBBS Member, SOCCA Duke University Hospital Durham NC

#### **Implications for Programs and Applicants**

For applicants, the match results highlight both opportunity and competitiveness. For anesthesiology applicants, a broad range of fellowship slots remains available across the country. In contrast, applicants with an emergency medicine background face a more competitive landscape, as the number of EM-designated positions, while growing, remains comparatively limited relative to demand. For programs, the increase in the EM-CCM applicant pool may favor fellowship programs that offer such positions.

Overall, the increasing number of EM trained physicians matching into ACCM fellowships will strengthen the diversity and resilience of the intensivist workforce. Yet it

#### PDAC Update continued from previous page

also introduces some fundamental structural questions: How should programs balance one-year anesthesia-based positions with two-year EM fellowships? What are the long-term implications for workforce distribution, recruitment strategies, and the educational direction of ACCM as a subspecialty? The answers to these questions are crucial for program directors and specialty leadership in the coming years, as they represent pivotal decisions that have the potential to influence the trajectory of our subspecialty.

#### **Future Directions**

The 2025 fellowship match reflects both the strength and adaptability of anesthesiology critical care medicine.

Planning forward, several initiatives led by the Program Directors Advisory Council (PDAC) aim to reinforce recruitment and visibility. These include active outreach at national meetings, leveraging social media to highlight the specialty's impact, and fostering continued innovation in education and training. Together, these efforts ensure that the fellowship match is not simply an annual endpoint but part of a larger, continuous cycle of innovation and growth.

#### REFERENCES:

 The American Board of Anesthesiology. (2025). Anesthesiology and critical care. Retrieved August 21, 2025, from https://www.theaba. org/training-programs/anesthesiology-and-critical-care/

### **SOCCA MENTORING PROGRAM**

SOCCA's mission is to support the development of anesthesiologists who care for critically ill patients. Recognizing the key role of mentorship in development, SOCCA is thrilled to offer mentorship resources to its membership.

Members at all levels of experience can now connect with individuals who have elected to volunteer their time and expertise to help others learn and grow in their knowledge about clinical practice, administration, leadership, research, organizational volunteerism, and other domains. These bidirectional relationships are not only mutually beneficial but foster a robust spirit of community within the organization.

Members seeking to identify a SOCCA mentor may navigate directly to SOCCA's Mentor Directory (member login required) where mentors are organized by their primary area of interest. Upon reviewing the directory, mentees are encouraged to identify their preferred mentor via the brief Mentee Submission Form.

You may also navigate to the Mentor Directory from SOCCA's public Mentoring Program page.

Thank you for your interest in becoming a SOCCA Mentee—and thank you to the many SOCCA members who have graciously offered to serve as Mentors.

Visit SOCCA's Mentor Directory today!



# Nominations Committee Chair Update

he true strength of SOCCA lies in its members' incredible talent, passion, and energy. Volunteering is one of the most meaningful ways to contribute to our community, and each year the SOCCA Nominations Committee helps guide this process by reviewing nominees and preparing the election ballot for Officer and Director positions.

In this election cycle, SOCCA will elect two members to the Board of Directors (3-year terms) and seek a Secretary (1-year term). The Bylaws were amended in late 2024 to transition Officer terms from two years to one year. This means that officers will now succeed in new positions annually, and starting with this election cycle, a new secretary will be elected each year.

To help members better understand SOCCA's evolving governance structure, we've provided resources here: updated <u>Society Bylaws</u>, <u>criteria for evaluating volunteer leaders</u>, and the newly implemented <u>Committee Policy</u>.

Looking ahead, we are also excited to share that in 2026, additional opportunities to serve will be available on SOCCA committees, including Clinical Practice, Communication, Education, Membership, and Research.

For those interested in elected positions (Director or Secretary), please send a letter of interest, a photograph, and a curriculum vitae. The Call for Volunteers will open on **November 1, 2025**, and close on **December 31, 2025**. Newly elected leaders and appointed committee volunteers will officially begin their service at the Annual Business Meeting in early May 2026 at the IARS/SOCCA Annual Meeting in Canada.



Michael H. Wall MD, FCCM, FASA Chair, Nominations Committee, SOCCA University of Minnesota Minneapolis, MN

If you have any questions about these opportunities, please contact SOCCA Society Director Jennifer Rzepka, CAE. She will be happy to connect you with the right resources.

We look forward to your enthusiasm, engagement, and leadership as we continue growing. Thank you for all you do to make SOCCA such a vibrant and inspiring community!



# In Remembrance

# George W. Williams, II

Tribute written by SOCCA President, Mark Nunnally

OCCA regrets the untimely passing George W. Williams II on August 28, 2025, at the age of 45. George served as Chair in the early leadership of our Clinical Practice Committee. He was a bright spirit in the community of anesthesiology and critical care – always smiling, always supportive, and always rocking that bow tie. I have a special memory of all the times we met. He always had a friendly hug and something inspiring to say. His smile could light up a room and I will be forever thankful that it will never fade from my memory. Goodbye, George.



Join SOCCA Leadership and Members for the onsite gatherings at ASA this year:

ANESTHESIOLOGY®

annual meeting

OCTOBER 10 - 14, 2025

Henry B. Gonzalez Convention Center

→ San Antonio, TX →

#### **SATURDAY, OCTOBER 11**

11:00 - 11:50 am

**Subspecialty Networking Event for Residents** 008AB (Convention Center)

12:00 - 12:50 pm

Subspecialty Networking Event for Medical Students

008AB (Convention Center)

4:00 - 5:00 pm

SOCCA - Year in Review (Session SPE24)
206B (Convention Center, Meeting Level)

#### SUNDAY, OCTOBER 12

9:30 - 10:00 am

**SOCCA Board of Directors Meeting (HYBRID)** 

Contact info@socca.org for location

1:30 - 2:30 pm

**SOCCA Member Meet-Up** 

Lounge A (Convention Center)

6:00 - 7:00 pm

**SOCCA Social** 

Visit www.socca.org for location details.

### **SOCCA Board of Directors**

#### **OFFICERS**

DIRECTORS

President
Mark E. Nunnally,
MD, FCCM
New York University
Langone Medical Center
New York, NY



Director
Allison Dalton, MD
University of Chicago
Chicago, IL



Director
Gozde Demiralp, MD
University of
Wisconsin-Madison
Madison, WI



President-Elect Linda Liu, MD University of California San Francisco, CA



Director Ranjit Deshpande, MD Yale School of Medicine New Haven, CT



Director
Erin Hennessey,
MD, MEHP
University of Virginia
Charlottesville, VA



Treasurer
Brigid C. Flynn, MD
University of Kansas
Medical Center
Kansas City, KS



Director
Kunal Karamchandani,
MD, FCCP, FCCM
University of Texas
Southwestern
Dallas, TX



Ashish K. Khanna MD,FCCP,FCCM,FASA Atrium Health Wake Forest Baptist Medical Center Winston-Salem, NC



**Secretary** 



Director Brent Kidd, MD University of Kansas Kansas City, KS



Director Sheela Pai Cole, MD Stanford University Stanford, CA



Craig S. Jabaley, MD, FCCM Emory University School of Medicine Atlanta, GA

Immediate Past President Michael H. Wall, MD, FCCM

Minneapolis, MN

University of Minnesota



Director
Alisha Sachdev, MD
RUSH University
Medical Center
St. Charles, IL



Director Shahla Siddiqui, MD, MSc, FCCM Harvard Medical School Boston, MA



ASA Delegate (Ex-Officio) Liza M. Weavind, MBBCh, MMHC, FCCM Vanderbilt University Nashville, TN



ASA Alternate
Delegate
Betsy Cotter, MD
University of Kansas
Kansas City, KS





### **SOCCA Information**

#### **EMAIL**

Meetings: SOCCAmeetings@iars.org

Membership information: info@socca.org

X (TWITTER)

@SOCCA\_CritCare

**FACEBOOK** 

https://www.facebook.com/SOCCAcritcare

**INSTAGRAM** 

https://www.instagram.com/soccacritcare/

LINKEDIN

https://www.linkedin.com/company/society-of-critical-care-anesthesiologists-socca/

VISIT THE SOCCA WEBSITE at: www.SOCCA.org

#### **MEMBERSHIP**

Membership in SOCCA is open to all anesthesiologists who have an interest in critical care medicine; non-anesthesiologist physicians and scientists who are active in teaching or research relating to critical care medicine; residents and fellows in approved anesthesiology programs; and full-time medical students in an accredited school of medicine.

#### **MEMBERSHIP BENEFITS**

- Free access to SOCCA Doc Matter Community
- Discounted pricing for the SOCCA Annual Meeting, a forum for the specialist with broad-based interests, including respiratory therapy, postoperative cardiac surgical, neurological and transplant management, and trauma care
- · Virtual education / eLearning
- · onDemand learning
- Discounted membership in the IARS, which includes access to two peer-reviewed journals – Anesthesia & Analgesia and A&A Case Reports, free journal CME, and eligibility to apply for IARS research grants
- Free ICU Residents' Guide
- Free digital newsletter, which covers ethically controversial issues, survey of practice patterns, and historical aspects of anesthesiology
- Timely member news and information via SOCCA Drip
- SOCCA Speakers Bureau
- SOCCA Mentoring

Renew or join today at <a href="https://www.socca.org/member-benefits-categories">https://www.socca.org/member-benefits-categories</a>

#### - EDITORIAL NOTES :

**Editor:**Kyle Bruns

**Kyle Bruns, DO**University of Missouri Columbia, MO

**Associate Editor:** Liang Shen, MD Weill Cornell Medical College New York, NY Immediate
Past Editor:
Madiha Syed, MD
Cleveland Clinic
Cleveland, OH

#### **Editorial Policy**

The opinions presented are those of the authors only, not of SOCCA. Drug dosages, accuracy, and completeness of content are not guaranteed by SOCCA.

#### **SOCCA INTERCHANGE NEEDS YOU!**



Interchange seeks to deliver timely, relevant, and high-quality content to SOCCA members. Contributions from members are not only welcome but essential to ensure that Interchange meets these goals. If you are interested in authoring content concerning clinical challenges, emerging research findings, member accomplishments, or anything of general interest to the membership, please reach out to the SOCCA office: info@socca.org.