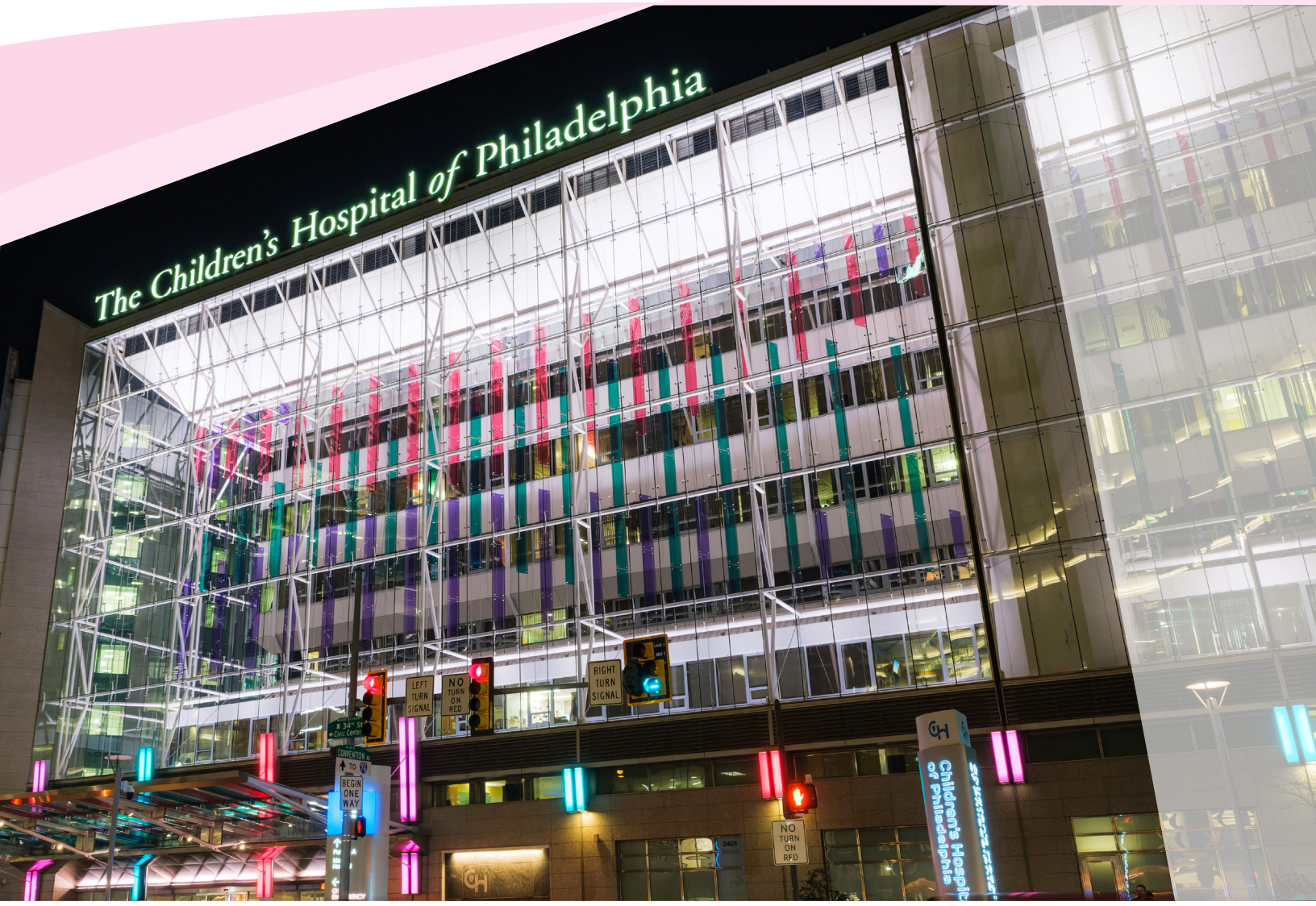
Department of Anesthesiology and Critical Care Medicine

Annual Report 2024



Children's Hospital of Philadelphia®
Anesthesiology & Critical Care Medicine

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MESSAGE FROM THE CHAIR

As I reflect on the past year, I am filled with gratitude and admiration for the incredible work happening across our Department of Anesthesiology and Critical Care Medicine. Each page of this annual profile tells a story—not only of clinical excellence, research innovation, and educational leadership—but of a team deeply committed to purpose, people, and progress.

This past year, we continued to advance our mission in meaningful ways. Our clinicians delivered expert, compassionate care to some of the most vulnerable patients. Our researchers pushed the boundaries of knowledge, asking bold questions and delivering impactful answers. Our educators shaped the next generation with intention, creativity, and rigor. And throughout, our entire team—faculty, staff, trainees, and partners—demonstrated resilience, integrity, and a shared commitment to excellence.

We also took time to reflect and reimagine. Through strategic planning, new initiatives, and conversations across the Department, we recommitted ourselves to three foundational aspirations:

- To be the **best place to work**, where people feel valued and inspired.
- To advance **safe patient care**, with systems that prioritize safety and reliability.
- To lead in **academic output**, with an integrated approach to innovation, quality, and inquiry.

As part of this vision, we are embracing the power of artificial intelligence to help us work smarter, faster, and more effectively. We are committed to becoming a leading department in the thoughtful use of AI—leveraging it to improve workflows, reduce burnout, and enhance our ability to deliver on our research, education, and clinical care missions.

Underpinning all of this is a belief that who we are is as important as what we do. Our values shape our culture and guide our collective pursuit of excellence:

- **Building a Community based on Compassion, Collaboration, and Teamwork** – We prioritize respectful collaboration across all divisions and treat everyone—patients, families, and colleagues—with empathy and kindness. We believe exceptional care is a team effort, enriched by diverse perspectives in a caring, supportive environment.
- **Dedicated to Personal and Collective Growth Through Accountability, Humility, and Trust** – We embrace humility and self-awareness while being dependable and accountable. We seek feedback, support one another's growth, and foster a culture of trust and psychological safety.
- **Shared Commitment to Excellence, Innovation, and Advancement** – We are united in our dedication to clinical excellence, education, and research. We view excellence as a journey—driven by curiosity, innovation, and collaboration—that elevates the field and each other.

Thank you for the passion you bring, the excellence you pursue, and the difference you make every day. I hope this profile book is a source of pride, reflection, and renewed inspiration.

With deep appreciation,

John A. Fiadjoe, MD, MBA, Hon. Dsc
Chair of the Department of Anesthesiology and Critical Care Medicine

MISSION, VISION AND VALUES

Our Mission

To innovate, deliver clinical excellence, and globally educate and lead pediatric anesthesiology, critical care, and pain medicine.

Our Vision

To lead the way in providing exceptional patient care, and be a Department where people are valued, and data powers change.

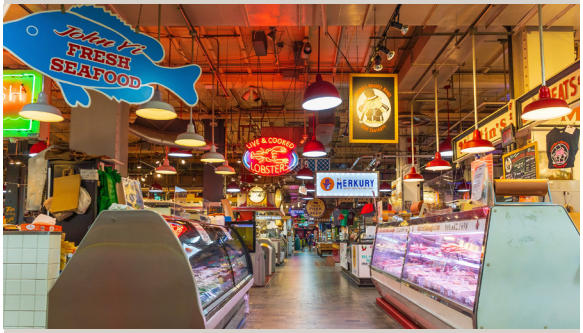
Our Values

"We not Me"
Building a community based on compassion, collaboration, and teamwork

"Teach and Learn"
Personal and collective growth through accountability, humility, and trust

"Elevate Together"
Shared commitment to excellence, innovation, and advancement

PHILADELPHIA HIGHLIGHTS



Philadelphia is a vibrant and historically rich city that offers a unique blend of urban amenities and cultural significance, making it an appealing place to live. Philadelphia is steeped in American history with many culturally significant places to visit.

Beyond its history, Philadelphia is a city of diverse neighborhoods, each with its own character. From the charming cobblestone streets of Old City to the trendy, youthful vibe of Fishtown and South Philly, there's a community for everyone.

Culturally, Philadelphia is a hub for arts and entertainment with a thriving food scene. From the Philadelphia Museum of Art to the vibrant restaurants, bars, and neighborhood coffee shops, residents have access to world-class cultural experiences. Philadelphia's sports culture is deeply embedded in the city's fabric and offers a fun and unique experience for individuals of all ages at 76ers, Eagles, Flyers, Union and Phillies games year-round.

For young families, the city and surrounding area offers excellent public parks like Fairmount Park and the Schuylkill River Trail and Banks. Philadelphia is centrally located along the East Coast making it convenient to travel to destinations such as Washing D.C., New York City, and the Jersey Shore. Additionally, just a short distance from the city you can enjoy beautiful State Parks ideal for outdoor activities including biking and hiking.

With its combination of history and culture, Philadelphia is a great place to call home.

CHOP HISTORY HIGHLIGHTS

Children's Hospital of Philadelphia®

A HISTORY OF FIRSTS...

FIRST HOSPITAL DEDICATED EXCLUSIVELY TO PEDIATRICS IN THE UNITED STATES

PIONEERING TREATMENTS

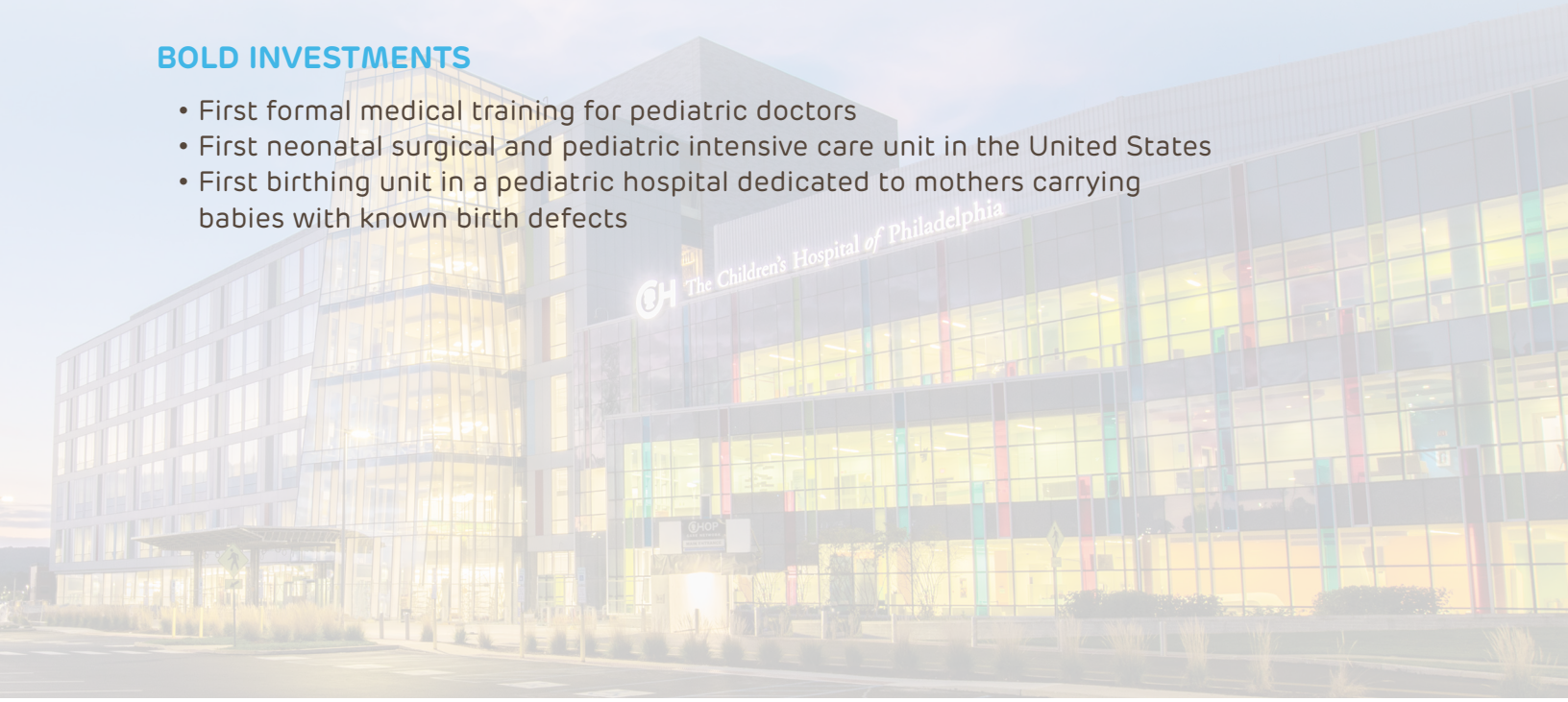
- First vaccines for mumps, whooping cough, influenza, and rotavirus
- First cell therapy for cancer
- First gene therapy for blindness
- First FDA-approved treatment for thoracic insufficiency syndrome

TRAILBLAZING PROCEDURES

- First bilateral hand transplant in a pediatric patient
- First balloon catheter for treatment of heart defects
- First successful fetal surgery for sacrococcygeal teratoma and established fetal surgery as a standard of care for spina bifida
- More conjoined twin separation surgeries than anywhere else in the world

BOLD INVESTMENTS

- First formal medical training for pediatric doctors
- First neonatal surgical and pediatric intensive care unit in the United States
- First birthing unit in a pediatric hospital dedicated to mothers carrying babies with known birth defects



CHOP AT A GLANCE

Children's Hospital of Philadelphia®

3 hospital locations,
including one dedicated exclusively to behavioral health

More than **50** Care Network sites

1 outpatient behavioral health center

34,000+ admissions and **1.6M** outpatient visits

CHOP sees children from all **50** states and **65+** countries

$368.7 million in external research funding

29,800 workforce members, including:
1,800+ credentialed physicians & dentists
170 residents
343 fellows

690+ beds (in use)

$500 million+ in community impact investment

DEPARTMENT HISTORY

THE CHILDREN'S HOSPITAL OF PHILADELPHIA DEPARTMENT OF ANESTHESIOLOGY AND CRITICAL CARE MEDICINE: AN ORIGIN STORY

Scott D. Cook-Sather, A. Michael Broennle, Mark S. Schreiner

In the late 1940s, Dr. C. Everett Koop, Chief of Surgery at the Children's Hospital of Philadelphia (CHOP) from 1946-1980, asked Dr. Robert Dunning Dripps, Chair of the Department of Anesthesiology at the University of Pennsylvania School of Medicine to help him grow anesthesia services at CHOP, then located at 18th and Bainbridge Streets in Center City Philadelphia. At the time, anesthesia services were a division within the Department of Surgery and Dr. Koop wanted to further improve perioperative care of neonates, infants, and children by hiring and training academic anesthesiologists dedicated to these young patients. Dr. Dripps deployed Dr. Margot van Deming who led this effort until, in 1955, Dr. Leonard Bachman was recruited from the Johns Hopkins University to serve as the Chief of Anesthesiology at CHOP.

Though tiny compared to its present state, CHOP was already a hub of innovation in pediatric medical and surgical care. The Bainbridge Street hospital had 4 operating rooms and was the site of the first neonatal intensive care and neonatal surgical units in the nation, both opened in 1962. Dr. John J. (Jack) Downes, who had trained under Dr. Dripps and rotated at CHOP as a resident, was recruited to join the faculty in 1963. He found his passion studying respiratory physiology, pediatric pulmonary disease processes, and the rapidly evolving mechanical ventilation equipment and strategies. After his NIH-funded travel abroad to see early European versions of pediatric intensive care units (PICUs), Dr. Downes established the first PICU in North America in 1967. It opened with 6 beds. When Dr. Bachman was appointed Pennsylvania Secretary of Health, Dr. Downes became the Chair of the Department of Anesthesia in 1972, with Dr. Russell Raphaely then assuming the helm of the PICU.

Please see this link for Dr. Mark Scheiner's 2016 interview with Dr. Raphaely – https://vimeo.com/271040913 password med

Dr. A. Michael Broennle joined the faculty in 1973 and headed the Department's education program, quickly becoming the country's premier. Dr. Eugene (Gene) K. Betts arrived in the Spring of 1974 and led preparations for organizing and equipping the new operating rooms. Significantly, he spearheaded CHOP's acquisition of Compurecord, an early automated anesthesia record. Through 1974, the Department of Anesthesia grew to 9 faculty members who not only took care of intraoperative patients, but who also managed pre and postoperative care in the PICU for an increasingly complex surgical caseload.

Watch "A Legacy of Hope at CHOP's Department of Anesthesiology and Critical Care Medicine"

In 1974 and in one of the most expensive building projects of the time, the hospital moved to its current location in West Philadelphia on the site of the former Philadelphia General Hospital and adjacent to the University of Pennsylvania. It opened with 6 operating rooms to address an expanding surgical volume. The new 30 bed PICU was full within 6 months. The Department was radically challenged to grow and specialize further again in 1983 when Dr. William Imon (Bill) Norwood, Jr joined CHOP as Chief of Pediatric Cardiothoracic Surgery. Within a year, cardiac surgery volume increased from fewer than 200 annual cases to nearly 500. Dr. Norwood, who pioneered care for infants with single ventricle

DEPARTMENT HISTORY

physiology, insisted on further subspecialty care with a limited roster of anesthesiologists, hence the creation of the division of Pediatric Cardiac Anesthesia. The inimitable Dr. Susan Nicolson, recruited as faculty member #10, led and honed this division for nearly 4 decades. With the creation of Pediatric Critical Care Medicine Fellowship training program in 1986 the department's name changed to the Department of Anesthesiology and Critical Care Medicine. Our academic and clinical missions in the General Division grew simultaneously under the expert leadership of Drs. Schreiner (#11) and C. Dean Kurth (#16) in research and David Cohen (#12) in Pain Management. These first faculty were our pioneers in pediatric anesthesia. [*See photo below.*] It was telling when Dr. Koop, who was later appointed as U.S. Surgeon General by President Ronald Reagan (thus becoming Dr. Bachman's boss!), returned to celebrate his legacy at CHOP. In an address to members at the College of Physicians of Philadelphia, he made a special point of acknowledging the Department of Anesthesiology and Critical Care Medicine for the fundamental role it had played in improving pediatric care in the perioperative space.

This 1992 photo from Dr. Downes 60th birthday gala includes all who had served as full-time or part-time faculty from 1955 onward. *Front row: Honoratio Nicodemus, Chuck Richards, Leonard Bachman, Jack Downes, Russ Raphaely, Terry Lee. Back row: John Willens, David Swedlow, Mark Heiser, Rudy Godinez, Jim Steven, Tom Keon, Dean Kurth, Susan Nicolson, Drew Costarino, David Jobes (from Penn), David Cohen, Bob Kettrick, Mark Schreiner, Mike Broennle.*
Not pictured: Sharon Pilmer and Pina Templeton.

DEPARTMENT LEADERSHIP

John E. Fiadjoe, MD, MBA
Chair, Department of Anesthesiology and Critical Care Medicine

Paul Stricker, MD, MHCM
Associate Anesthesiologist-in-Chief, Associate Chair, Faculty Affairs

Marissa Malcolm, MBA
Vice Chair of Administration

Andrew T. Costarino Jr., MD, MSCE
Division Chief, Cardiac Critical Care

Andreas W. Loepke, MD, PhD, FAAP
Division Chief, Cardiac Anesthesia

Jessica DeLeon
Senior Finance Director

Heather A. McClung Pasqualino, MD
Interim Division Chief, General Anesthesia

Robert Michael Sutton, MD, MSCE
Division Chief, Critical Care Medicine

Daniela H. Davis, MD, MSCE, FCCM
Associate Chair, Quality and Safety

Todd Kilbaugh, MD
Associate Chair, Research

Justin L. Lockman, MD, MSEd, FAAP
Associate Chair, Education

Margaret A. Priestly-Hill, MD
Associate Chair, Inclusion and Belonging

Matt Orlando, MBA
Director, Research

DEPARTMENT ADMINISTRATIVE TEAM

Emily Falciani, JD
Senior Academic Coordinator

Elizabeth Moneka, MHA
Clinical Program Operations Manager

Annette Ferraro
Executive Associate I

Norma Rentas
Administrative Manager,
Office of the Anesthesiologist in Chief
and Academic Affairs

DIVISION OF CRITICAL CARE MEDICINE

DIVISION LEADERSHIP

Robert Michael Sutton, MD, MSCE
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Julie C. Fitzgerald, MD, PhD, MSCE, FCCM
Associate Chief, Research

Suzanne Gronikowski, MHA
Senior Administrative Director

Alexis Topjian, MD, MSCE
Associate Chief, Faculty Affairs

Donald L. Boyer, MD, MSEd
Associate Chief, Education

Nadir Yehya, MD, MSCE
Associate Chief, Research

Daniela H. Davis, MD, MSCE, FCCM
Associate Chief, Clinical Operations and Quality and Safety

Margaret A. Priestly-Hill, MD
Associate Chief, Organizational Operations and Strategy

DIVISION OF CRITICAL CARE MEDICINE

The Division of Critical Care Medicine (CCM) at the Children's Hospital of Philadelphia (CHOP) is one of the largest, most dynamic, and academically productive pediatric critical care programs globally, setting benchmarks for excellence in clinical care, research, and education. Serving over 4,000 patients annually in its 69-bed Pediatric Intensive Care Unit (PICU) and 25-bed Progressive Care Unit (PCU), the division consistently achieves superior patient outcomes, including the best risk-adjusted mortality rates among peer institutions. Additionally, CCM faculty lead CHOP's Critical Care Outreach Team (CCOT), providing rapid assessment and intervention for acutely ill patients outside critical care areas.

EXCELLENCE IN CLINICAL CARE AND OPERATIONS

The division's clinical programs span a comprehensive range of specialties, including neurocritical care, extracorporeal membrane oxygenation (ECMO), sepsis management, respiratory critical care, and post-cardiac arrest care. Cross-disciplinary collaborations drive innovations in point-of-care ultrasound (POCUS), airway management, sedation, and palliative care. Several programs are internationally recognized for their leadership and excellence, including the ECMO program, which was the first children's hospital program to earn the Extracorporeal Life Support Organization's Platinum Award.

Quality improvement initiatives are a cornerstone of the division's success. Projects like alarm management optimization and resuscitation improvement have set new standards in patient safety and care delivery. Notable innovations include the "Getting Rid of Stupid Stuff" initiative, which streamlines workflow by eliminating inefficiencies, and the development of clinical pathways adopted globally, such as those for ICU delirium, critical asthma, and spinal muscular atrophy.

EDUCATION INITIATIVES AND TRAINING

CHOP's Division of Critical Care Medicine is a global leader in pediatric critical care education, training future leaders through its prestigious fellowship programs. The ACGME-accredited Pediatric Critical Care Medicine (PCCM) fellowship, one of the largest and most selective in the U.S., trains 19 fellows annually. The program's impact is profound, producing leaders in academia, research, and clinical care both nationally and internationally. Additional advanced fellowships in Neuro-critical Care and Cardiac Critical Care offer specialized training aligned with the division's clinical and research strengths.

Educational programs extend beyond traditional fellowships. The division pioneered the PCCM Fellow Boot Camp, now a national program training nearly 70% of incoming PCCM fellows in the U.S. annually. Rotating trainees from Pediatric Emergency Medicine, Hospitalist Medicine, and medical schools nationwide benefit from the division's comprehensive curriculum, which includes simulation-based education and communication training via the VitalTalk methodology.

The division has been recognized as the "Best Teaching Division" at CHOP five times in the last eight years, reflecting its dedication to fostering a culture of mentorship and professional development. Faculty-led initiatives ensure smooth onboarding for new staff and provide structured mentoring for early-career clinicians, reinforcing CHOP's reputation as a nurturing environment for growth and excellence.

DIVISION OF CRITICAL CARE MEDICINE

RESEARCH AND INNOVATION ADVANCEMENTS

Research is a defining strength of the division, with multiple programs achieving international recognition for their contributions to resuscitation science, sepsis, lung injury, and neurocritical care. Faculty members lead or collaborate with premier research networks, including the Collaborative Pediatric Critical Care Research Network (CPCCRN) and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI). Research mentorship is central to the division's culture, with faculty receiving prestigious awards for their guidance and mentorship.

Annually, CCM faculty publish hundreds of peer-reviewed articles, including landmark studies in journals like NEJM, JAMA, and The Lancet. The division's 58 active grants, including 37 federally funded projects, underscore its leadership in advancing pediatric critical care knowledge. Programs like Pedi-RESQ and NEAR4Kids, led by CCM faculty, exemplify the division's commitment to leveraging research for real-world clinical impact.

CLINICAL WELLBEING

The division prioritizes provider wellbeing, diversity, equity, and inclusion (DEI) through comprehensive initiatives designed to foster a supportive and inclusive work environment. The Wellness Committee has implemented practical improvements, such as streamlining documentation, enhancing work-life balance, and creating dedicated spaces for relaxation and connection. DEI efforts, guided by the DEI Committee established in 2019, include anti-racism training, panel discussions, and active measures to enhance diversity in recruitment and leadership.

During the COVID-19 pandemic, the division adapted quickly, introducing flexible work arrangements and virtual engagements to maintain staff morale and collaboration. These efforts reflect the division's proactive approach to addressing challenges and supporting its team.

FACULTY, LEADERSHIP, AND TEAM STRUCTURE

CCM faculty are internationally recognized for their contributions to critical care. Awards include the American Heart Association's Lifetime Achievement Award in Cardiac Resuscitation Science, the Society of Critical Care Medicine's Grenvik Ethics Award, and numerous mentorship accolades. Faculty members also hold prestigious leadership roles in organizations like the Society of Critical Care Medicine, the American Heart Association, and the Extracorporeal Life Support Organization.

LOOKING AHEAD – STRATEGIC PRIORITIES

As the division continues to grow, it remains committed to addressing emerging challenges, including expanding capacity through new facilities like the 16-bed PICU at CHOP's King of Prussia Hospital and the planned inpatient tower. Investments in faculty development, such as the CHOP Physician Leadership Development Program and operational training, ensure a pipeline of future leaders. With a legacy of excellence in clinical care, education, and research, the Division of Critical Care Medicine at CHOP is poised to shape the future of pediatric critical care on a global scale.

DIVISION OF CRITICAL CARE MEDICINE

DIVISION FACULTY

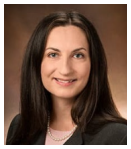
Alicia M. Alcamo, MD, MPH

Elorm F. Avakame, MD, MPP, FAAP

Robert A. Berg, MD, FAHA, FAAP, MCCM

Donald L. Boyer, MD, MSEd

Benjamin B. Bruins, MD



Katie Chiotos, MD, MSCE

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Daniela H. Davis, MD, MSCE, FCCM

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Julie C. Fitzgerald, MD, PhD, MSCE, FCCM

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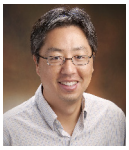


Jimmy Huh, MD

Garrett Keim, MD, MSCE

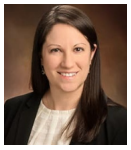
DIVISION OF CRITICAL CARE MEDICINE

DIVISION FACULTY

Martha F. Kienzle, MD

Todd Kilbaugh, MD

Matthew Kirschen, MD, PhD, FAAN, FNCS



Elizabeth Laverriere McGovern, MD, MPH, FAAP

Richard Lin, MD

Brad Lindell, MD, FAAP

Justin L. Lockman, MD, MSEd, FAAP

Steven Loscalzo, MD, FAAP

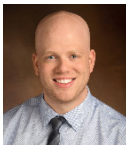
Paula Magee, MD, MPH, FAAP

Kelly Martin, MD, MSEd

Vanessa Mazandi, MD

John J. McCloskey, MD

Sanjiv D. Mehta, MD, MBE



Ryan W. Morgan, MD, MTR

Wynne Morrison, MD, MBE

Vinay Nadkarni, MD, MS

Akira Nishisaki, MD, MSCE

Christie Osborne, MD, MSCS

DIVISION OF CRITICAL CARE MEDICINE

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Robert Michael Sutton, MD, MSCE

Alexis Topjian, MD, MSCE

Heather A. Wolfe, MD, MSHP

Charlotte Z. Woods-Hill, MD, MSHP

Nadir Yehya, MD, MSCE

DIVISION OF CRITICAL CARE MEDICINE

ADMINSTRATIVE TEAM

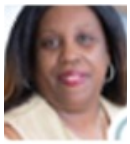
Ranee DiBeneditto
Physician Operations Manager

Caitlin Boesenhofer
Program Coordinator Residency/ Hospital Physicians

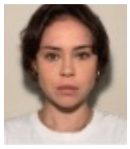
Eugene Bland
Program Coordinator International Observership/CME Conf.

Ailin Cornelius
Program Coordinator PCCM and NCC Fellowships

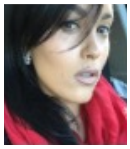
Zach Rissler
Clinical Project Manager Clinical Operations/ Qgenda Scheduler



Cassie Simpson-Dukes
Program Coordinator Faculty Affairs/Education



Sarah Pellegrino
Program Coordinator Ultrasound Teaching/ Fellowship



Melissa Pulinario
Executive Associate to Chief
Assist. to Division Chief

Alex Wells
Resource Coordinator Assist. To Basic Scientists/ CCM Faculty

Johnny Walker
Resource Coordinator FEDS/CQI

DIVISION OF GENERAL ANESTHESIOLOGY

DIVISION LEADERSHIP

Heather A. McClung Pasqualino, MD
Interim Division Chief

Victoria Otarola
Senior Administrative Director

Stephanie Black, MD, EdM
Associate Chief Education and Faculty Development

Elizabeth T. Drum, MD, FAAP, FCPP, FASA
Associate Chief, Clinical Operations

Annery Garcia-Marcinkiewicz, MD
Associate Chief, Belonging and Inclusion

Rajeev Iyer, MBBS, MD, MS
Associate Chief, Quality and Safety

Allan F. Simpao, MD, MBI
Associate Chief, Research

DIVISION OF GENERAL ANESTHESIOLOGY

The Division of General Anesthesiology (GA) at the Children's Hospital of Philadelphia (CHOP) stands as one of the nation's largest and most academically productive pediatric anesthesia programs. Working as a multidisciplinary team, the division supports a diverse range of clinical, research, and educational activities.

FACULTY AND LEADERSHIP

With 56 faculty members and 29 certified registered nurse anesthetists (CRNAs), the division demonstrates a strong commitment to diversity, mentorship, and professional development. Nearly 45% of faculty are women, and 38% identify as racially or ethnically diverse. A significant portion of faculty (43%) are early-career professionals, underscoring the division's focus on fostering new talent. The division invests heavily in leadership development and mentoring, sponsoring faculty participation in the CHOP Physician Leadership Course and providing robust support systems for onboarding new clinicians.

CLINICAL OPERATIONS

The GA division supports over 40 daily care sites across CHOP's main campus, specialty units, and ambulatory surgery centers (ASCs), as well as non-operating room anesthesia (NORA) services for radiology, interventional procedures, and sedation. The opening of the King of Prussia Hospital (KOPH) in 2022 has expanded the division's reach, requiring meticulous planning and adaptation to meet growing demands.

Signature clinical programs include:

- **Ambulatory Surgery Centers (ASCs):** Performing approximately 8,000 surgeries annually, the ASCs cater to various specialties, from orthopedics to oncology. Medical directors oversee quality, operations, and patient experience, with continued emphasis on operational enhancements and staff education.
- **Anesthesia Resource Center (ARC):** ARC facilitates pre-anesthesia evaluations and consultations for medically complex patients, providing continuity of care for families navigating recurrent procedures.
- **Radiology/NORA Services:** The division manages anesthesia for advanced imaging and procedures, ensuring patient safety and optimizing scheduling amidst growing demand.
- **Special Delivery Unit:** On our obstetric unit, anesthesiologists provide labor and delivery care for mothers carrying babies with known birth defects.

SPECIALIZED CLINICAL PROGRAMS

The division houses several specialized services, including:

- **Fetal Anesthesia:** This team provides care for mothers and unborn babies with severe birth defects. Their expertise spans open fetal surgeries, minimally invasive procedures, and neonatal surgical interventions, supported by continuous quality improvement and academic productivity.
- **Pain Services:** The Acute and Chronic Pain Service employs holistic approaches to manage pediatric pain. Programs include the Acute Pain Service (APS), the Chronic Pain Clinic, and a regional anesthesia program, all committed to advancing research, education, and care delivery.
- **Liver Transplant Program:** A dedicated team manages perioperative care for liver transplants, focusing on standardized guidelines, multidisciplinary collaboration, and innovation in managing complex cases.

DIVISION OF GENERAL ANESTHESIOLOGY

EDUCATIONAL INITIATIVES

Education is a cornerstone of the GA division, with programs that set national benchmarks in pediatric anesthesiology training:

- **Pediatric Anesthesia Fellowship Program:** This ACGME-accredited program combines robust mentorship, comprehensive didactics, and innovative recruitment pathways to prepare future leaders in pediatric anesthesia.
- **Simulation-Based Learning:** The division leads simulation boot camps for fellows, residents, and advanced practice providers, fostering interdisciplinary learning and patient safety.
- **Resident and Medical Student Education:** Rotating learners benefit from mentorship, hands-on clinical experiences, and targeted didactics that enhance their exposure to pediatric anesthesiology.

RESEARCH AND INNOVATION

The GA division's research endeavors focus on informatics, quality improvement, and outcomes research.

Signature programs include:

- **Pedi-INQUIRE:** A collaborative effort advancing perioperative care through informatics and multidisciplinary research.
- **Airway Research:** The airway program has gained international acclaim for its publications, workshops, and innovations in difficult airway management.
- **Biomedical Informatics:** This initiative utilizes advanced data analytics to improve perioperative outcomes, with faculty publishing extensively in high-impact journals.

Recent achievements include over 200 annual peer-reviewed publications and several prestigious grants. The division continues to prioritize balancing clinical demands with protected academic time to sustain its research momentum.

QUALITY AND SAFETY

The GA division maintains a robust quality and safety program. Key metrics include documentation, infusion pump programming, and fiberoptic intubation competence. Collaborative projects with CHOP's Biomedical Informatics group and Wake Up Safe database have elevated patient care standards. Ongoing initiatives aim to leverage Epic for real-time data, enhance faculty QI output, and increase improvement resources.

WELLBEING AND DEI

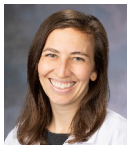
The division has been recognized as a model for physician wellbeing, implementing targeted initiatives that improve professional fulfillment and reduce burnout. A dedicated DEI committee integrates anti-bias training and recruitment strategies to enhance diversity and inclusivity across teams.

LOOKING AHEAD

As the GA division expands its clinical, research, and educational reach, future goals include expanding operations at KOPH, advancing simulation and education programs, and strengthening specialized services like regional anesthesia and chronic pain management. With a culture rooted in collaboration, innovation, and excellence, the Division of General Anesthesiology at CHOP remains a leader in pediatric anesthesiology on a global scale.

DIVISION OF GENERAL ANESTHESIOLOGY

DIVISION FACULTY



Savannah Aepli, MD

Anthony Alexander, MBBS

Lenard W. Babus, MD

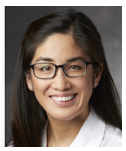
Jessica A. Berger, MD, MHS

Stephanie Black, MD, EdM

Benjamin B. Bruins, MD

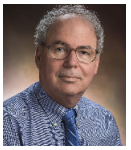
John Campbell, DO

Christine Chang, MD



Frances Chen, MD

Goretti Chiang, DO



David E. Cohen, MD

Scott Cook-Sather, MD

Anushree K. Doshi, MD

Elizabeth T. Drum, MD, FAAP, FCPP, FASA

Scott R. Dubow, MD

Jeffrey M. Feldman, MD

Arjunan Ganesh, MBBS, FRCS

Harshad Gurnaney, MBBS, MPH

DIVISION OF GENERAL ANESTHESIOLOGY

DIVISION FACULTY


Kathleen A. Harris, MD


Alicia A. Henderson, MD


Julia M. Hickey, MD, CM

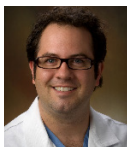

Ashley S. Hodges, MD

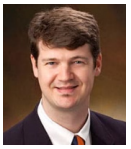

Rebecca S. Isserman, MD


Rajeev Iyer, MBBS, MD, MS


Denis H. Jablonka, MD


Nickolas W. Julian, MD


Todd Kilbaugh, MD


F. Wickham Kraemer, MD


Charles Dean Kurth, MD


Lucy Tianou Li, MD


Elaina E. Lin, MD


Nathaniel Liu, DO, MBA


Justin L. Lockman, MD, MSEd, FAAP

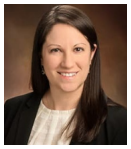

Annery Garcia-Marcinkiewicz, MD


Christopher B. Massa, MD, PHD


Vanessa Mazandi, MD

DIVISION OF GENERAL ANESTHESIOLOGY

DIVISION FACULTY



Elizabeth Laverriere McGovern, MD, MPH, FAAP

Madeline D. Miano, MD

Richard M. Missett, DO

Wallis T. Muhly, MD

Jacqueline Nager, MD

Olivia Nelson, MD

Sheri Jones Oguh, MD

Elizabeth M. O'Brien, MD

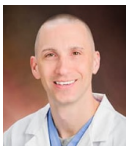
Victoria Otarola

Febina Padiyath, MBBS

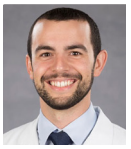
Marc Alexander Parris, MD, MPH

Heather A. McClung Pasqualino, MD

Caroline A. Pasquariello, MD, FAAP, FCPP



Matthew F. Pearsall, MD



Bryan M. Perez, MD

Laura Petrini, MD

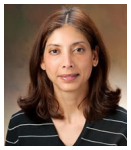
Andrew Renuart, MD, MSc

Kumaran Senthil, MD

DIVISION OF GENERAL ANESTHESIOLOGY

DIVISION FACULTY

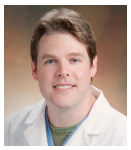
Allan F. Simpao, MD, MBI



Devika Singh, MD

Petrus Paulus Steyn, MD

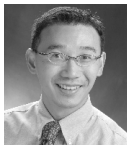
Paul Stricker, MD



Brian P. Struyk, MD

Tori N. Sutherland, MD, MPH

Alexandria Trakimas, MD



Kha Tran, MD

Elliot Turkiew, MD, MS

Allison Mara Ulrich, MD

Christopher G. Ward, MD

Jack Wasey, MD

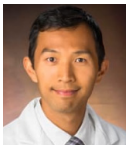
Audra Webber, MD

Ari Weintraub, MD

Meryl William, DO

Monica Williams, MD

Kara Ryan Yao, MD



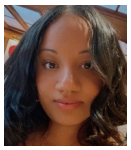
Ian Yuan, MD

DIVISION OF GENERAL ANESTHESIOLOGY

ADMINSTRATIVE TEAM

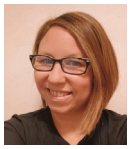
Mia Morrison
Practice Operations Manager

Yulonda Motley
Office Manager - Administrative Operations

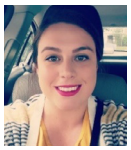


Jennifer Then
Program Coordinator Quality & Safety/Wellness

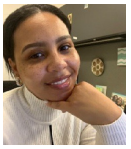
Naisha Robinson
Office Administrator Scheduling Coordinator



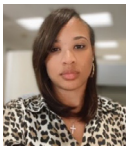
Janell Giambuzzi
Office Administrator OR Admin/DEI Admin



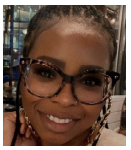
Chelsey Zappacosta
Office Manager - Clinical Operations



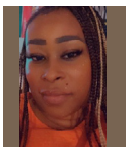
Sharese Garvin
Program Coordinator Anesthesia Fellowship



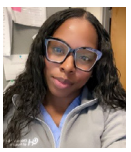
Deana Miley
Program Coordinator Residency & Education



Sashay Kelly
Admin & Clinical Service Coordinator/ DEI Admin



Shakeena Parker
Admin & Clinical Service Coordinator OR Admin



Aileen Thompkins
Admin & Clinical Service Coordinator OR Admin/CQI

Lori Wright
Office Administrator CME Coordinator

DIVISION OF GENERAL ANESTHESIOLOGY

CERTIFIED REGISTERED NURSE ANESTHETISTS

Jennifer Raynor, MSN, CRNA
Chief CRNA, General Anesthesiology

Alexis L. Armstrong, MSN, CRNA

Jennifer Babia-Espiritu, CRNA, MSN, BSN

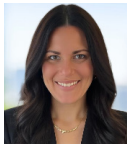
Kirby K. Begley, DNP, CRNA

Sherell M. Bernard, CRNA, MSN

Lauren N. Bice, DNP, CRNA

Heather Bostancic, MSN, CRNA

Dorothea L. Connolly, MSN, CRNA, APN



Stephanie Constantin, MSN, CRNA

Shayla Davis, DNP, CRNA

Kathryn Dolphin, MSN, CRNA

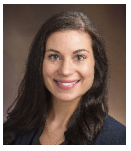
Heather Farrell, MSN, CRNA

Keri L. Gilbert, MSN, CRNA, CCRN

Abigail Holden, DNP, CRNA

Andria R. Janos, MSN, CRNA

Kimberly Laliberte, MSN, CRNA

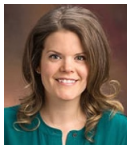


Lauren K. Lewis, MSN, CRNA

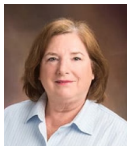
Kelly McNellis, MSN, CRNA

DIVISION OF GENERAL ANESTHESIOLOGY

CERTIFIED REGISTERED NURSE ANESTHETISTS



Rebekah Mickles, MSNA, CRNA



Pamela Mitchell, MSN, CRNA

Kristen E. Newbrough, DNP, CRNA

Kimberly Raspa, MSA, CRNA

Jessica Sadvari, DNP, MS, CRNA

Eric H. Scheu, MSN, CRNA

Tatiana Smaliak, MSNA, CRNA

Mia Sommer, BSN, CRNA

Mercedes Vallecillo, MSNA, CRNA

Robert Weiland, MSN, CRNA

Sean Zajdel, CRNA

Joshua Zarnawski, MSN, CRNA

Kim Ziedonis, MSN, CRNA,

GA CRNAs:

CLINICAL EDUCATION PROGRAM

The General Anesthesiology CRNA Team at The Children's Hospital of Philadelphia administers anesthesia to neonatal, pediatric, and adolescent patients across various specialties. They embody the hospital's mission, vision, and values, while actively participating in quality improvement, community outreach, simulation training, and well-being initiatives.

Over the past year, the CRNAs have made significant contributions. Jess Sadvari co-chaired the division's Airway Symposium, with Eric Scheu providing valuable airway education. Eric has also become POCUS certified and shares his expertise with the team. Sherell Bernard continues to oversee SRNA education and was awarded "Preceptor of the Year." Rebekah Mickles and Kirby Begley also assist with SRNA orientation. The CRNA team supports CHOP's educational mission by precepting SRNAs in the OR.

Andria Janos shares her expertise in pediatric anesthesia through local nurse anesthesia program lectures. She also coordinates lead orders, RQI program questions, and team continuing education. Josh Zarnawski and Andria coordinate new CRNA onboarding and orientation.

Several CRNAs, including Rebekah Mickles, Jen Babia-Espiritu, Kim Laliberte, Jess Sadvari, Shayla Davis, and Kim Ziedonis, are involved in well-being initiatives, providing support, team-building events, and celebrations. Additionally, Stephanie Constantin and Lauren Bice support community outreach, participating in food bank efforts, charity donations, and events like the Gift of Life House.

In terms of diversity, equity, and inclusion, the team has engaged in multiple efforts, such as Sherell Bernard's DEI Newsletter, Jen Babia-Espiritu's involvement in the Diversity in Nurse Anesthesia Mentorship Program, and celebrating heritage months to strengthen team bonds and promote understanding.

The team also hosted a festive Holiday Breakfast in December, turning the 9th-floor conference room into a winter wonderland. Simulation training is essential for maintaining life-saving skills, with Kim Laliberte coordinating a recent session and more planned.

Recruitment efforts are led by the team's interaction with SRNAs and events like "A Day in the Life of a CRNA" and the Nurse Anesthesiology Resident Association conference in New York. Jen Babia-Espiritu also represented the team at the American Association of Nurse Anesthetists (AANA) recruitment booth.

The CRNA team at CHOP is committed to advancing patient care and contributing to the anesthesia field everyday!

DIVISION OF CARDIAC CRITICAL CARE MEDICINE

DIVISION LEADERSHIP

Andrew T. Costarino Jr., MD, MSCE
Division Chief

Rebecca Cardoso, MHA
Administrative Director

Venkat R. Shankar, MBBS, MBA
Associate Chief, Clinical Operations

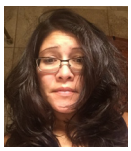
David A. Hehir, MD, MS
Associate Chief, Quality and Safety

Maryam Y. Naim, MD, MSCE
Associate Chief, Research and Belonging and Inclusion

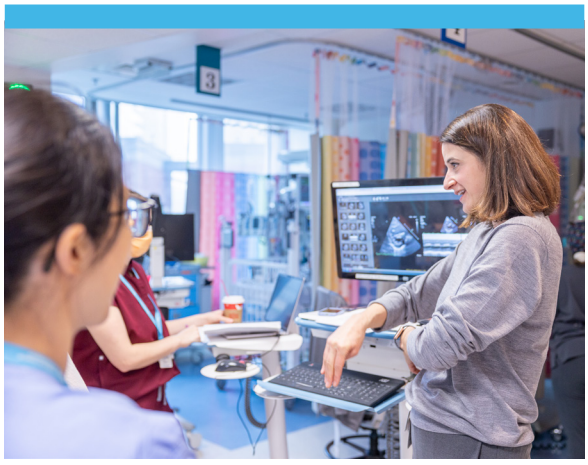
ADMINISTRATIVE TEAM

Cassandra Barbetti, MHA
Practice Operations Manager

Jessica Ross
Administrative and Clinical Services Coordinator



Carmen Girona
Office Administrator



DIVISION OF CARDIAC CRITICAL CARE MEDICINE

The Division of Cardiac Critical Care Medicine (CCCM) at the Children's Hospital of Philadelphia (CHOP) delivers specialized care to patients with congenital and acquired heart conditions in the Evelyn and Daniel M. Tabas Cardiac Intensive Care Unit (CICU). As the primary physician team for CICU patients, CCCM faculty lead the diagnostic and treatment efforts for some of the most complex cardiac cases, ensuring seamless collaboration across cardiology, cardiac surgery, and cardiac anesthesiology disciplines.

FACULTY AND LEADERSHIP

The CCCM division consists of 15 faculty physicians, supported by four advanced fellows and four administrative professionals. Additionally, 17 advanced practice providers (APPs) work collaboratively with faculty to provide front-line care. Faculty members are highly accomplished, with 47% being women, 50% within five years of training, and all holding appointments at the Perelman School of Medicine. Leadership includes Dr. Andrew Costarino (Division Chief), supported by Dr. Venkat Shankar (Associate Chief of Operations), Dr. David Hehir (Associate Chief of Quality and Safety), and Dr. Maryam Naim (Associate Chief of Research and Wellbeing Lead).

CLINICAL OPERATIONS

The CICU operates 24/7, staffed by CCCM faculty who oversee three daytime teams and one overnight team, with plans to expand to four daytime and two overnight teams due to growing demand. Recently, the CICU expanded capacity from 28 to 32 beds, with surge capabilities for 38. The unit has experienced a significant increase in patient days, rising by over 15% in two years, and a growing average length of stay (11.6 days), reflecting the complexity of conditions treated.

Key programs include:

- **Mechanical Circulatory Support:** Expanded use of advanced intra-corporeal and extra-corporeal devices.
- **Vascular Access and Monitoring:** Enhanced bedside procedural capabilities and novel monitoring strategies.
- **Cardiac Arrest Prevention and Response:** Standardized bedside preparation scripts have reduced arrest rates and improved outcomes.

Clinical activity drives significant revenue, with $8.9M in net patient service revenue in FY21, highlighting the division's critical role in CHOP's operations.

QUALITY AND SAFETY

The CCCM division leads quality improvement (QI) efforts through its integrated QI and Safety Core, chaired by Dr. Hehir. This multidisciplinary team includes physicians, nurses, respiratory therapists, and pharmacists, focusing on reducing harm, improving outcomes, and optimizing patient experience. The Core hosts regular forums, including biweekly MMI meetings and neonatal surgical reviews, to analyze patient outcomes and foster continuous learning.

Recent QI achievements include:

- Reducing central line-associated bloodstream infections (CLABSI) and peripheral IV infiltration/extravasation events (PIVIE).

DIVISION OF CARDIAC CRITICAL CARE MEDICINE

- Publishing and presenting findings at national forums, including three peer-reviewed publications and four national presentations.
- Enhancing vascular access protocols and establishing lesion-specific access guidelines.

EDUCATIONAL INITIATIVES

Education is central to CCCM's mission, offering learning opportunities for medical students, residents, fellows, and allied professionals.

Signature programs include:

- **Weekly Educational Forums:** Professor Rounds, core lectures, and journal clubs ensure continuous learning for clinicians.
- **Advanced Fellowship in Cardiac Critical Care Medicine:** This PGY-7+ program attracts trainees from top institutions worldwide. Directed by Dr. Jodi Chen, the fellowship has earned a reputation for excellence.
- **CICU Bootcamp:** An innovative program delivering high-level cardiac critical care concepts to fellows, attended by trainees from 12 institutions and highly rated for its remote and simulation-based learning.

CCCM faculty have received multiple teacher-of-the-year awards, reflecting their dedication to educational excellence.

RESEARCH AND INNOVATION

Under the guidance of Dr. Naim, the CCCM research program integrates clinical, translational, and basic science investigations. Faculty actively participate in multicenter research initiatives, including the Pediatric Cardiac Critical Care Consortium, Pediatric Heart Network, and ICU-RESUS studies.

Highlights include:

- **Neuro-Cardiac EEG Program:** A nine-year database examining neonates post-cardiopulmonary bypass, led by Dr. Naim.
- **Biomarker Studies:** Research into post-cardiac arrest myocardial dysfunction and neonatal outcomes following bypass, spearheaded by Dr. Gardner.
- **Predictive Analytics:** Innovative modeling to enhance patient outcomes, led by Dr. Goldsmith.

Over the past five years, CCCM faculty have published more than 110 peer-reviewed articles, averaging 2.9 publications per faculty member in FY21. Funding sources include NIH grants, CHOP endowments, and Cardiac Center awards.

WELLBEING AND FUTURE GOALS

CCCM emphasizes faculty and staff wellbeing, with initiatives led by Dr. Naim. Programs address work-life balance, resilience, and professional fulfillment, aligning with CHOP's broader wellness framework.

Looking forward, the division aims to expand CICU capacity and staffing, enhance educational offerings with in-person bootcamps, and deepen its research portfolio in areas such as vascular access and predictive analytics. With its multidisciplinary approach, innovative programs, and commitment to excellence, the Division of Cardiac Critical Care Medicine at CHOP is shaping the future of pediatric cardiac care.

DIVISION OF CARDIAC CRITICAL CARE MEDICINE

DIVISION FACULTY


Pilar Anton-Martin MD, PhD, MD


Geoffrey L. Bird, MD, MSIS, FAAP


Marissa A. Brunetti, MD


Rebecca Cardoso, MHA


Jodi Chen, MD, MS


Andrew T. Costarino Jr., MD, MSCE


Aaron G. DeWitt, MD


J. Wesley Diddle, MD


Thomas W. Dietzman, MD


Monique-Anne Maslak Gardner, MD


Michael P. Goldsmith, MD


David A. Hehir, MD, MS


Elizabeth Herrup, MD


Benjamin Kozyak, MD


Felina K. Mille, MD


Maryam Y. Naim, MD, MSCE


Jayant Pratap, MB, BChir, MRCPCH, FRCA

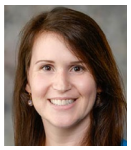

Amy J. Romer, MD

DIVISION OF CARDIAC CRITICAL CARE MEDICINE

DIVISION FACULTY

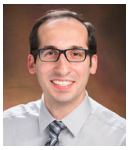
Venkat R. Shankar, MBBS, MBA

George Spyropoulos, MD



Jamie Weller, MD

Renee C. Willett, MD



Mahsun Yuerek, MD

DIVISION OF CARDIAC ANESTHESIOLOGY

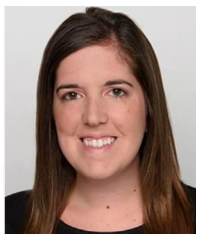
DIVISION LEADERSHIP

Andreas W. Loepke, MD, PhD, FAAP
Division Chief

Rebecca Cardoso, MHA
Administrative Director

Eduardo Goenaga Diaz, MD
Associate Chief, Quality and Safety

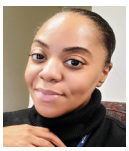
Lindsey M. Loveland-Baptist, MD
Associate Chief, Education and Faculty Development



Jennifer M. Lynch, MD, PhD
Associate Chief, Research

ADMINISTRATIVE TEAM

Cassandra Barbetti, MHA
Practice Operations Manager



Jessica Ross
Administrative and Clinical Services Coordinator

Maxine Abrams
Office Administrator

DIVISION OF CARDIAC ANESTHESIOLOGY

The Division of Cardiothoracic Anesthesiology experienced another year of transformative change. While advancing our mission of providing world-class clinical care for critically ill children with congenital heart disease, driving groundbreaking clinical and basic science research, and training the next generation of Pediatric Cardiac Anesthesiologists, Pediatric Anesthesiologists, and Certified Registered Nurse Anesthetists (CRNAs), we also welcomed an unprecedented number of new team members into our group.

UNPARALLELED GROWTH

Our highly successful recruitment efforts over the past two years, including our current recruitment targets, will more than double our faculty numbers compared to just two years ago. We now have 15 attending anesthesiologists as part of our group. Additionally, our CRNA recruitment campaign brought 3 new colleagues to our division, increasing our total to 8 CRNAs and strengthening our capacity for exceptional patient care.

DELIVERING EXPERT, HIGH-ACUITY CARE

Our team provided comprehensive peri-procedural care for over 3,100 patients. We manage some of the highest-acuity patients in the hospital, including the largest number of neonates (> 300 per year) with congenital heart disease in the nation. We deliver life-saving care in the cardiac ORs and catheterization labs, including Immediate Postpartum Access to Cardiac Therapies (IMPACT) procedures, offering expectant parents with a severe prenatal cardiac diagnosis a chance for life-saving treatment for their unborn child.

ADVANCING EDUCATION AND FELLOWSHIP TRAINING

This year, we proudly graduated our second class of Accreditation Council for Graduate Medical Education (ACGME)-certified Pediatric Cardiac Anesthesiology fellows and are currently training three Advanced Cardiac Anesthesiology fellows. Our fellowship program continues to shape the future leaders of our specialty, combining world-class clinical experience with cutting-edge research opportunities.

THE YEAR IN NUMBERS

Staff

15 Attending Anesthesiologists
8 Cardiac CRNAs
3 Advanced CA Fellows
1 Nurse Practitioner

Cases

3,140 Anesthetics
828 OR Cases
1,558 Cath Lab Cases
438 Cardiac MRIs
3 IMPACT Cases
316 Other

DIVISION OF CARDIAC ANESTHESIOLOGY

RESEARCH HIGHLIGHTS

The Division of Cardiothoracic Anesthesiology had a highly productive 2024, advancing pediatric cardiac anesthesiology through translational and clinical research. Susan Nicolson served as CHOP's site PI for several multi-center trials. Asif Padiyath launched a collaboration with Vanderbilt researchers on non-invasive venous waveform analysis. Nick Pratap received the prestigious Cardiac Center Innovation Award for the CHD Panorama project, which aims to streamline cardiac care by integrating multi-source data into a single application. The Jolley Laboratory continues groundbreaking work in 3D imaging and computational modeling of congenital heart defects. Matthew Jolley also earned a Cardiac Center Innovation Award to lead a CHOP-Penn interdisciplinary team studying biomechanical reasons behind systemic semilunar valve repair failures. Additionally, Jennifer Lynch secured a renewal of her Innovation Award to advance optical neuromonitoring technologies for neonatal cardiac surgery.

Our division published extensively and presented at major conferences, including CHOP's Cardiology conference and the Congenital Cardiac Anesthesia Society meeting. Notably, Nicolina Ranieri from the Lynch Lab won the CCAS Best Abstract Award. Members also participated in Additional Ventures, AHA Scientific Sessions, and Optica Biophotonics.

WELLBEING INITIATIVES

In 2024, the Division of Cardiothoracic Anesthesiology prioritized wellbeing and team-building initiatives to foster a supportive and collegial environment. We hosted our first holiday party in recent history, bringing together faculty, staff, and trainees to celebrate our collective achievements. Our division division also participated in CHOP's Cardiac Center's Philly Spin-In, raising funds for critical cardiac research while promoting teamwork and wellness. Additionally, we organized team-building activities such as potlucks and a holiday door decorating contest, strengthening camaraderie within the division.

A SMALL BUT IMPACTFUL TEAM, GUIDED BY CORE VALUES

Our work is guided by our CARDIAC values, thoughtfully developed by the entire team and championed by the Cheer Committee—Lea Matthews, Lindsey Weidmann, and Manal Mirreh.

Living these core values requires daily dedication. We will lead by example and inspire every member of the healthcare team to uphold these principles. Together, these values empower us to delivery exceptional care, build stronger teams, and keep our patients at the heart of everything we do.

DIVISION OF CARDIAC ANESTHESIOLOGY

DIVISION FACULTY

Molly F. Deacutis, MD, MP

Eduardo Goenaga Diaz, MD

Matthew A. Jolley, MD

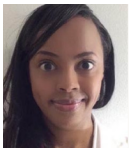
Andreas W. Loepke, MD, PhD, FAAP

Lindsey M. Loveland-Baptist, MD

Jennifer M. Lynch, MD, PhD

Lea Matthews, MD

John J. McCloskey, MD



Manal Mirreh, MD

Reese Murray-Torres, MD

Susan C. Nicolson, MD

Asif Padiyath, MBBS

Jayant Pratap, MB, BChir, MRCPCH, FRCA

Deborah A. Romeo, MD, ScM

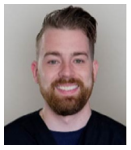
Lindsey V. Weidmann, DO, MS

DIVISION OF CARDIAC ANESTHESIOLOGY

CERTIFIED REGISTERED NURSE ANESTHETISTS

Lisa A. Jones, MSN, BSN, CRNA
Chief CRNA, Cardiac Anesthesiology

Therese Brady, MSN, CRNA

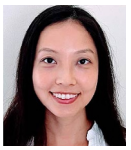


Peter Caruso, DNP, CRNA

Deirdre McFillin, MSN, CRNA

Christopher R. McMichael, DNP, CRNA

Jamie L. Sloan, MSN, CRNA



Lapio Tkach, DNP, CRNA

CARDIAC ANESTHESIOLOGY

CRNAS

The Cardiac Anesthesiology CRNA team is comprised of 8 CRNAs, led by Chief Cardiac CRNA, Lisa Jones. The Cardiac CRNAs partner with the Cardiac Anesthesiologists to provide safe and effective anesthesia care for children with congenital and acquired cardiac disease undergoing the full range of procedures in CHOP's Cardiac Center. This includes managing children undergoing procedures on cardiopulmonary bypass, interventional procedures, lymphatic procedures, and Cardiac MRIs.

In addition to clinical care, our CRNA team is involved in education and quality improvement work. In 2024, Lisa Jones was asked to serve as Co-Moderator for the Advanced Practice Provider Symposium portion at the 2025 SPA-AAP Pediatric Anesthesiology Meeting. Therese Brady gave a lecture on Lymphatics Procedures as part of the Division's Cardiac Basics lecture series, which is attended by a variety of learners, including new Fellows, new CRNAs and SRNAs. Jamie Sloan provided leadership for an eye protection project that sought to decrease corneal abrasions for anesthetized patients. Recently, Chris McMichael assumed the role of Student Clinical Coordinator for the division. In this role, he coordinates and supports the educational and clinical experience for the Student Registered Nurse Anesthetists that complete rotations in our division, which is typically two per month.

As part of our efforts to spark interest in our specialty and add to our growing team, Jamie Sloan, Chris McMichael and Lisa Jones participated in the CHOP program, "A Day in the Life of a CRNA," a session geared towards ICU nurses interested in CRNA careers. The session provides information about Accredited Anesthesia programs, as well as simulation opportunities, including hands on exposure to intubation and ultrasound IV placement.

EDUCATION IN THE DEPARTMENT OF ACCM

The Department's education mission is led by the Associate Chair for Education, who provides oversight and strategic direction for education in addition to mentorship for education leaders in the department. The Associate Chair's responsibilities include monitoring educational programs, ensuring compliance with CHOP Graduate Medical Education Committee (GMEC) and ACGME guidelines, and leading the Departmental Education Council. The department offers eight fellowship programs as outlined below across four clinical divisions, in addition to resident and medical student rotations, nurse anesthetist education, and faculty professional development opportunities. Departmental faculty also contribute heavily to institution-wide education programs for physicians and advanced practice providers, and play a role in CHOP's global mission for pediatric healthcare.

The Education Council, which meets monthly, helps foster innovation and collaboration in education within Pediatric Anesthesiology and Critical Care Medicine. This group advises the Associate Chair for Education and allows leaders of the many outstanding education programs at CHOP to work together to problem solve and achieve superb outcomes. The Education Council is made up of the leaders for education in each clinical division as well as departmental leaders for simulation education, resident and medical student education, airway education, ultrasound education, and international education/global health.

Fellowship training in CHOP ACCM includes ACGME-accredited fellowships in Pediatric Critical Care Medicine, Pediatric Anesthesiology, and Pediatric Cardiac Anesthesiology. In addition, the department offers CHOP GME-accredited training in Pediatric Cardiac Critical Care Medicine, Pediatric NeuroCritical Care, Ultrasound, Extracorporeal Membrane Oxygenation, and Education Administration. There is a well-established simulation fellowship at CHOP with which departmental faculty are highly involved. There is also a unique 2-year academic pediatric anesthesiology fellowship in the Department.

The Simulation education program, Airway education program and Ultrasound education program each offer a variety of educational products, including ongoing professional development for faculty and trainees, regularly recurring CME-accredited workshops, and asynchronous and synchronous learning modules for learners.

The international education program works to develop multidirectional education collaborations with international partners. In addition to other components, this work includes short- and long-term observerships at CHOP, lectureships and visiting professorships at international sites, a yearlong course in Guangzhou, China run by faculty with both virtual and in-person components, and multiple recurring education-based and clinical-based mission trips to international sites. Through this work, the program extends the department's educational reach globally to improve the care of children and the education of pediatric healthcare experts beyond the walls of CHOP.

An Education Innovation Grant process, established to foster educational innovation in the Department, provides funding for new educational initiatives proposed by any member of the Departmental community. This internal grant program offers up to $40,000 annually to fund novel ideas within the Department and CHOP (as well as beyond). The Department funds these initiatives because leaders believe that investing in innovation is critical to maintaining CHOP's position as a leader in Pediatric Anesthesiology and Critical Care Education nationally and internationally.

EDUCATION

GENERAL ANESTHESIA DIVISION

The Division of General Anesthesiology's dynamic educational offerings are led by a talented team of education-dedicated faculty, focusing on advancing the quality and safety of patient care through innovative didactic and experiential learning initiatives, comprehensive fellowship and residency training, simulation education, and professional development programs.

The Pediatric Anesthesia Fellowship Program offers a premier training experience, providing an unparalleled educational culture that blends graded autonomy with expert supervision. The ACGME-accredited program offers robust case exposure and structured faculty mentorship for 11 fellows per year, ensuring preparation for both academic and clinical success. Opportunities for professional development are enhanced through fellow retreats, scholarly projects, national presentations, and delivery of mentored didactics, as well as leadership/administrative experience in academic medicine. Dedicated rotations include regional and cardiac anesthesiology, a mentored supervisory experience, and blocks devoted to difficult airway management, pediatric critical care and pediatric pain management. We offer additional elective time in cardiac and ambulatory anesthesia for children. Of note, we offer advanced second year fellowships in Academic Pediatric Anesthesiology and Pediatric Cardiac Anesthesiology.

Resident Education in pediatric anesthesiology at CHOP includes ACGME-core rotations for several Philadelphia area anesthesiology residency programs, and trains over 70 residents per year. The resident experience is exceptionally robust and includes integrated simulation, dedicated faculty mentorship, and daily didactics provided by world leaders in in the field. Resident electives beyond the core rotation are available in the CHOP main OR, pediatric critical care, pediatric cardiac anesthesiology and pediatric pain medicine.

The Simulation Education program is dedicated to developing, delivering, and researching simulation-based education that drives quality care and enhances patient safety. The flagship CHOP Pediatric Anesthesiology Fellowship Bootcamp is the first and largest of its type, and currently hosts learners from across the globe. Other offerings include regular simulation integrated into resident and fellow educational blocks, annual boot camps for pediatric anesthesiology residents and CRNAs, as well as outreach programs for medical students. The simulation program also integrates interprofessional simulations to improve workflows and clinical outcomes in diverse medical settings.

The Professional Development Program emphasizes lifelong learning and career sustainability, with programs tailored to support educational excellence across disciplines. The initiative offers a broad spectrum of opportunities, including Grand Rounds, professional development seminars and workshops, and a national collaboration with visiting professor exchanges. This program ensures that faculty and fellows alike have access to cutting-edge educational content while fostering an engaged, collaborative learning environment.

We also offer a wide range of specialized educational programs, including pediatric airway skills education for non-anesthesiologists, flagship point of care ultrasound education, an advanced fellowship in regional anesthesia and acute pain, and international fellowship programs. These initiatives are designed to equip trainees with the necessary skills and knowledge to thrive in pediatric anesthesiology, with a focus on mentorship, hands-on training, and academic research.

Together, these comprehensive educational programs provide exceptional training, foster collaborative learning, and ensure a continuous commitment to advancing patient care through educational excellence.

EDUCATION

PEDIATRIC CRITICAL CARE MEDICINE DIVISION

The Pediatric Critical Care Medicine (PCCM) Division continues to take great pride in advancing the education mission of our Department. FY'25 brought several notable accomplishments, including:

- Creating an interprofessional education steering committee, charged with evaluating and optimizing the educational experiences for our team. Chaired by the Associate Chief for Education, this team is comprised of leaders representing our education programs, from medical student & resident rotations to the fellowship program, and includes leaders for Simulation, Global Health, and multidisciplinary education, including APP team leads;
- Surveying the Division to determine current strengths and opportunities for growth in our educational/conference programming. Data from this survey is now being used to revise the weekly conference schedules, including: more frequent multidisciplinary conferences and M&Ms; a new conference focused on collaborative care with referring hospitals; and increased skills-based sessions;
- Transitioning fellowship program leadership roles and welcoming **Dr. Sam Rosenblatt** as Director. Sam is joined by **Drs. Steve Loscalzo**, **Katie Chiotos**, **Jessica Fowler**, **Kelly Martin**, and **Amy Romer** as Associate Program Directors (APDs), and we gratefully acknowledged the service of Dr. Julie Fitzgerald as a former APD;
- Welcoming 9 new fellows into the CHOP PCCM family, including one who is pursuing dual-boarding in PCCM and Pediatric Anesthesiology;
- Recruiting 7 incoming fellows, representing a variety of residency programs across the United States. One of our incoming fellows will enter as a board-eligible cardiologist, after completing Cardiology fellowship here at CHOP;
- Appointing our first Educational Leadership fellow (**Dr. Andrew Becker**), who played a vital role in advancing our education mission and contributing to educational scholarship. Dr. Becker is now serving on faculty at Jersey Shore University Medical Center/Hackensack Meridian Health;
- Collaborating with the CICU to welcome the inaugural Extracorporeal Life Support advanced fellow, **Dr. Hera Mahmood**, who will be joining us as a faculty member in FY'26; and

PCCM 1st-year Fellows: (Left to right) *PD Rosenblatt; Liz, Reese, Laura, Bryce, Jill, Raymond, Steven, and Ashitha*

PCCM Graduating Fellows: (Left to right) *Shyam (PCCM '24), Alex (PCCM '24), Bhavesh, Steffi, Vanessa, Megan (PCCM FY'26), Annie, and Laura*

- Celebrating the success of each of our graduating fellows as they determined where they will be continuing their careers:

Dr. Dan Balcarcel – CHOP

Dr. Laura Bricklin – Dayton Children's Hospital

Dr. Steffi Cramer – Cincinnati Children's Hospital Medical Center

Dr. Vanessa Denny – CHOP

Dr. Annie Gula – Nationwide Children's Hospital

Dr. Jill Hsia– CHOP CICU

Dr. Morgann Loaec – CHOP

Dr. Bhavesh Patel – Children's Healthcare of Atlanta/Emory University

Dr. Jeremy Zuckerberg – Pediatric Anesthesia Fellowship – CHOP

***(Dr. Shyam Deshpande** – CHOP PCCM & Anesthesiology) – 2024 PCCM Graduate*

EDUCATION

CARDIAC CRITICAL CARE MEDICINE DIVISION

The Cardiac Critical Care Medicine Division continues to foster excellence in education with an advanced fellowship program, led by Dr. Jodi Chen, designed to meet the ever-growing needs of our field. The program continues to attract candidates that are poised to become future leaders.

Recent accomplishments include national collaboration to standardize the recruitment process as well as develop entrustable professional activities and define the clinical practice of cardiac intensivists. An innovative and novel Extracorporeal Life Support advanced fellowship is now available, under the co-leadership of Dr. Marissa Brunetti, and the program had its first inaugural fellow in 2024-2025.

Our division is also proud to offer a senior fellow cardiac critical care bootcamp, co-directed by Dr. Felina Mille and Dr. Amy Romer which has attendance by over 35 senior level clinical physician trainee fellows in cardiology and critical care medicine from 13 institutions across the East coast and drew faculty from 7 leading institutions. Based on the exceptional evaluations and continued high demand for this educational offering, the division plans to host this every year, with plan to increase the number of participants and institutions across the East coast. Dr. Benjamin Kozyak and Dr. Mahsun Yuerek are our divison's leaders in ultrasound education and continue to be faculty instructors in the CHOP Point-of-Care Ultrasound Course which is offered twice annually to a national audience.

The division continues to provide essential training to Pediatric Critical Care Medicine, Pediatric Cardiology, Neonatal-Perinatal and Cardiac Anesthesiology fellows, as well as fellows from other hospitals. Additional educational initiatives include a medical student elective through the University of Pennsylvania School of Medicine, a resident elective, regular simulation training sessions for inpatient providers, and an observership with Global Pediatric Education. The division faculty members have actively participated in nursing education, simulation programs, ultrasound workshops and communication workshops locally, regionally, and nationally. Many faculty members have received teaching awards both within and outside the division for their contributions.

EDUCATION

CARDIAC ANESTHESIOLOGY DIVISION

The Division of Cardiac Anesthesiology at CHOP supports education at multiple levels, including advanced training through our accredited Pediatric Cardiac Anesthesiology Fellowship—one of the first and among only 15 accredited programs nationwide out of 24 total. This year, we are proud to train three outstanding fellows who exemplify our division's commitment to education, patient care, and research.

Beyond our core fellows, we deeply value the contributions of the 11 pediatric anesthesia fellows who each rotated with our division for two months, spending over 300 clinical days with us. These fellows enrich our learning environment, as we hope to do for them.

We also host fellows from the Cardiac ICU, other external fellowships, and residents from the University of Pennsylvania. This year, we welcomed six CA3 residents for one-month electives in pediatric cardiac anesthesia and look forward to continuing this opportunity in the years ahead. Interest in our subspecialty continues to grow among anesthesia residents rotating at CHOP, and we coordinate one- to two-day shadowing experiences to give them insight into the field.

We also welcome medical students, international physicians, and observers—even occasionally from local high schools.

Our fellows and rotating trainees benefit from close collaboration with cardiac surgery, cardiology, and intensive care teams. They participate in multidisciplinary rounds, joint simulations, and combined teaching sessions that deepen their understanding of the full continuum of care for patients with congenital heart disease.

Faculty in the division are deeply involved in education—delivering daily teaching, leading structured didactics, facilitating journal clubs, and mentoring in high-fidelity simulation settings. These varied teaching modalities support diverse learning styles and provide robust preparation for managing complex cases. Faculty also present locally, regionally, nationally, and internationally on topics ranging from cardiac anesthetic techniques and congenital heart disease to medical education and patient safety.

QUALITY IMPROVEMENT AND PATIENT SAFETY

Led by Dr. Daniela Davis, the Quality Improvement and Patient Safety Program within the Department of Anesthesiology and Critical Care Medicine at CHOP focuses on optimizing healthcare delivery for patients and enhancing provider experiences. Dr. Davis, as Associate Chair for Quality and Safety, oversees strategic direction, resource allocation, and collaboration with CHOP's Center for Healthcare Quality and Analytics (CHQA). She also chairs the Quality and Safety Council, which unites leaders across divisions to address clinical productivity, patient satisfaction, and safety.

KEY INITIATIVES AND STRUCTURE

The Quality and Safety Council is a multidisciplinary body that aligns its activities with CHOP's enterprise priorities, focusing on projects with high impact and regulatory compliance. Members include divisional quality leaders and deputy patient safety officers (dPSOs) from Anesthesiology, Critical Care, and the Cardiac Center. The council facilitates system-wide improvements, supports academic productivity, and benchmarks metrics across safety, outcomes, and patient experiences.

Recent priorities include:

1. **Safety Framework Development:** Establishing consistent protocols for identifying and addressing safety events, increasing accountability among divisional leadership.
2. **Vascular Access Optimization:** Implementing strategies like early identification of difficult access cases, enhanced communication tools, ultrasound-guided procedural access training, and bedside midline/PICC placement to ensure "the right line at the right time."
3. **CLABSI Reduction:** Standardizing protocols for lymphatic drainage systems and antibiotic treatments to minimize infections in high-risk populations.

DIVISION METRICS AND OUTCOMES

Each division tracks quality metrics organized around safety, outcomes, and patient experience, benchmarking against national standards. Examples include:

- Critical Care Medicine: Mortality ratios, intubation adverse events, and Press Ganey satisfaction scores.
- General Anesthesiology: Postoperative nausea/vomiting rates and delirium assessments.
- Cardiac Services: Cardiac arrest and failure-to-rescue rates, tracked via the PC4 registry.
- Cardiac Anesthesiology: Reporting of safety events, critical incident debriefing, and quantitative monitoring of neuromuscular blockade

Annual quality metrics are also integrated into physician incentive programs to encourage targeted improvements.

QUALITY IMPROVEMENT AND PATIENT SAFETY

HIGHLIGHTED ACHIEVEMENTS

- Developed an innovative vascular access program, including the VIPER service, which ensures best practices for central line maintenance.
- Enhanced workflows and safety protocols during COVID-19, including pre-procedure testing and negative-pressure ventilation systems.
- Improved alarm management in the PICU and implemented "Getting Rid of Stupid Stuff" (GROSS), an initiative addressing system inefficiencies.

EDUCATIONAL AND STRATEGIC GOALS

To foster a culture of continuous improvement, the program emphasizes QI training, academic productivity, and leadership development. Faculty attend conferences like IHI's International Forum on Healthcare Safety and Quality, with funding support for training and mentorship. Future goals include publishing impactful projects, securing extramural funding, and strengthening CHOP's leadership in QI and safety.

LOOKING AHEAD

The council plans to expand academic focus and implement an internal grant process for QI projects.

INCLUSION AND BELONGING

The department continues to prioritize diversity, equity, and inclusion (DEI) through its educational, recruitment, and community outreach efforts. In education, General Anesthesia sponsors cultural heritage celebrations such as Black History Month, Women's History Month, Ramadan, PRIDE Month, and Diwali. The DEI Committee publishes a quarterly newsletter and maintains a DEI Mini Library for staff. Faculty, including Cody Gathers and Maryam Naim, have received grants to study racial, ethnic, and socioeconomic disparities in bystander CPR provision. The department actively recruits underrepresented minority fellowship candidates and supports initiatives like the Summer Underrepresented Minority Medical Student Research (SUMMR) program. Women faculty also participate in leadership programs like CHOP's Leadership Physician Program. Mentorship initiatives, such as the Ron Litman Mentorship Award, support projects on healthcare literacy and airway management, fostering collaboration across institutions.

Community outreach is a key focus, with faculty such as Marc Parris, Jennifer Babia, and Annery Garcia-Marcinkiewicz presenting at schools to inspire interest in pediatric anesthesiology. The department collaborates with CHOP's Center for Health Equity to provide CPR education at Community Health Partnership Clinics (CHPC), which promote family health through education and resources.

For recruitment and retention, Jessica Fowler serves as the Associate DIO for Diversity & Inclusion, and several anesthesiologists participate in CHOP's Graduate Medical Education Diversity Sub-committee, strengthening recruitment efforts.

The department also focuses on quality improvement and research. Initiatives address microaggressions in the perioperative space, improve the experience for gender-diverse patients, and enhance interpreter use in critical care settings. Projects include improving post-ICU experiences for families with public insurance and conducting interviews with Black caregivers in the PICU. The department partners with the Gender and Sexuality Development Program to improve perioperative outcomes for gender-diverse patients and participates in the multicenter PARTAY Registry, which focuses on enhancing perioperative care. Ongoing research emphasizes health equity and disparities in care, with a dedicated research core producing peer-reviewed contributions and fostering cross-division collaboration.

Faculty are actively involved in several DEI-focused committees, including the Penn/CHOP Alliance of Minority Physicians Executive Board, CHOP's Diversity & Inclusion Council, and the CHOP Research Institute DEI Committee. These roles help guide DEI initiatives and support institutional change.

Through these comprehensive efforts, the department is advancing DEI, improving health equity, and contributing to research on healthcare disparities.

FACULTY AFFAIRS COUNCIL

The Faculty Affairs Council in the Department of Anesthesiology and Critical Care Medicine serves as a cornerstone for faculty engagement, professional development, and well-being. Its mission is to steward departmental programs that promote professional fulfillment, active faculty engagement, and overall well-being, ensuring that faculty feel supported in their pursuit of excellence and personal growth.

VISION

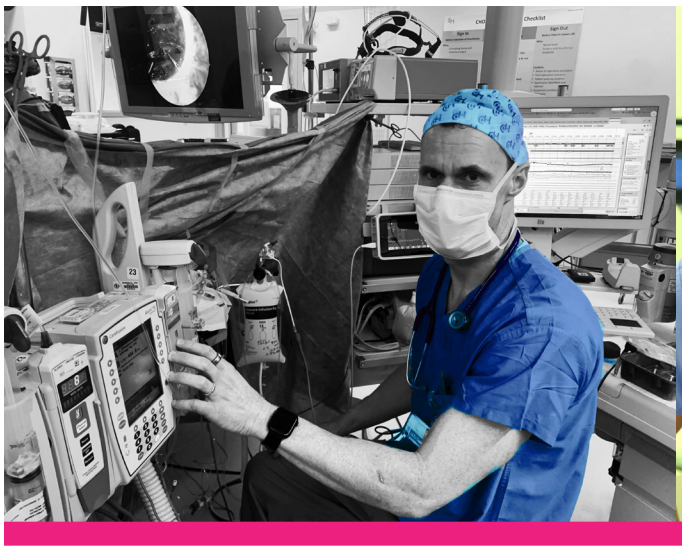
The council's vision centers on fostering a culture of fulfillment and engagement within the department. It aims to build a supportive environment where faculty members across all divisions—Critical Care Medicine, Cardiac Anesthesiology, Cardiac Critical Care, and General Anesthesiology—thrive professionally and personally, contributing to the collective strength of the department.

MEMBERSHIP

The Faculty Affairs Council is composed of a diverse and multidisciplinary team to ensure broad representation and inclusivity. The 2024 membership includes:

- Council Leader: Dr. Paul Stricker, MD, MHCM (Associate Chair for Faculty Affairs)
- Department Faculty Affairs Coordinator: Norma Rentas
- Divisional Leaders:
    - Alexis Topjian, MD, MSCE (Critical Care Medicine)
    - Stephanie Black, MD, Med (General Anesthesiology)
    - Jodi Chen, MD, MS (Cardiac Critical Care Medicine)
    - Lindsey Loveland Baptist, MD (Cardiac Anesthesiology)
    - Maryam Naim, MD, MSCE (Cardiac Critical Care Medicine)
    - Annery Garcia-Marcinkiewicz, MD, MSCE (General Anesthesiology)
    - Meryl William, DO (General Anesthesiology)

The Council's diverse membership ensures the council remains attuned to the varied needs and aspirations of faculty across the department.



FACULTY AFFAIRS COUNCIL

CORE ACTIVITIES

The Faculty Affairs Council's activities are divided into three main pillars: programming, engagement, and advocacy.

- **Programming:**
  - Support faculty navigating the Penn promotions process by providing guidance and up-to-date academic incentive templates.
  - Offer mentorship resources, including materials for both mentors and mentees.
  - Develop and implement a departmental peer coaching program.
  - Deliver faculty life programming, covering personal finance, retirement planning, and faculty well-being.
- **Engagement:**
  - Conduct activities to identify and address key faculty concerns.
  - Foster a sense of community and shared purpose across the department.
- **Advocacy:**
  - Serve as a platform for faculty concerns, ensuring they are communicated to leadership.
  - Collaborate with divisional and departmental leaders to address identified issues.

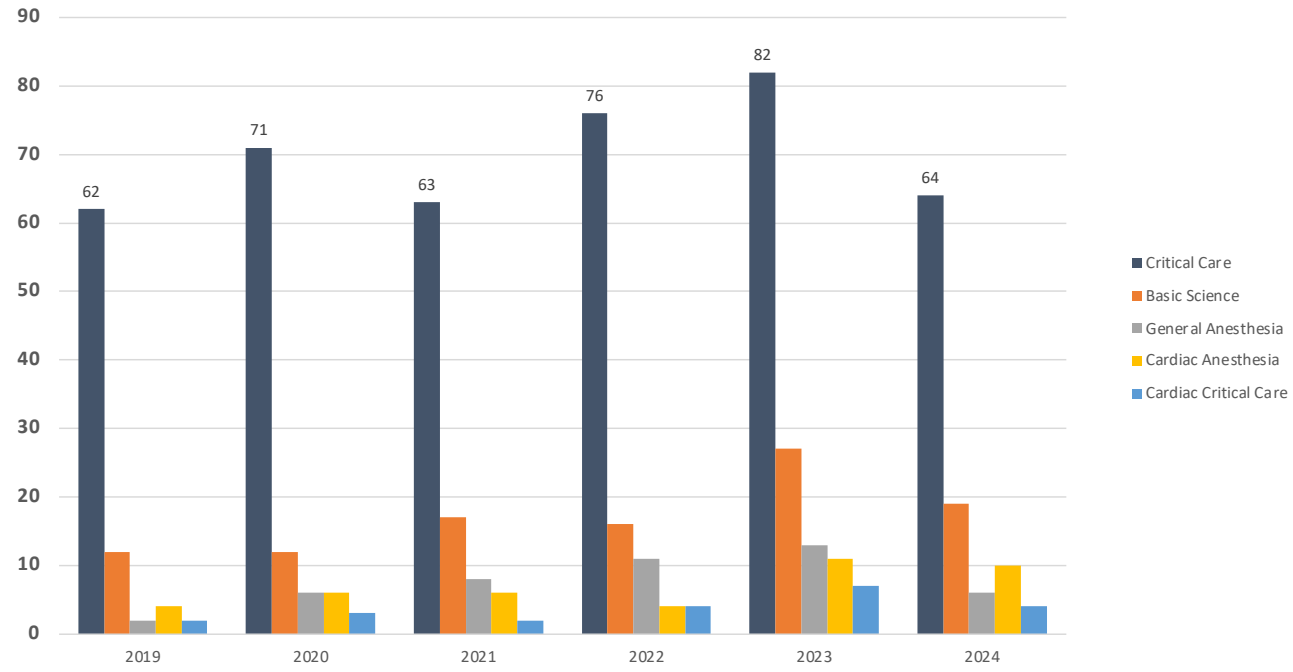
The council also supports recruitment and retention initiatives by partnering with division chiefs to attract and retain top talent while promoting a culture of inclusion and growth.

IMPACT

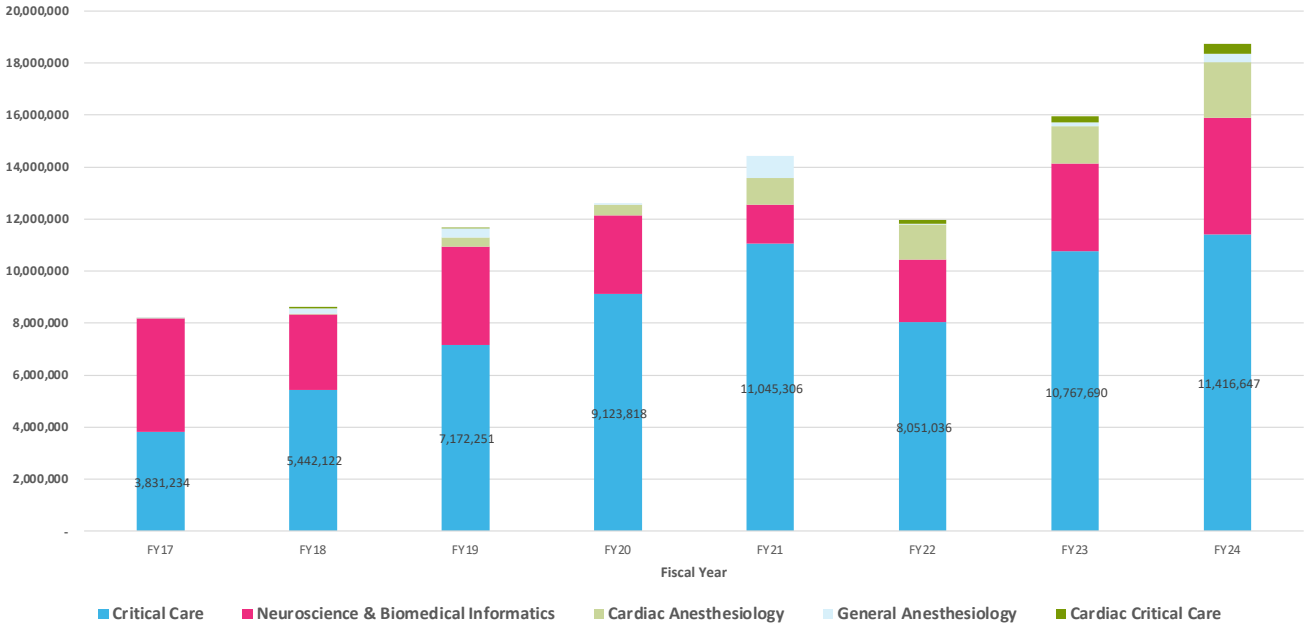
By prioritizing faculty well-being, professional development, and engagement, the Faculty Affairs Council plays an integral role in sustaining a thriving academic and clinical community. Through its initiatives, the council not only advances the department's mission but also enriches the professional lives of its members.

GRANTS

ACTIVE GRANTS BY DIVISION



YEAR OVER YEAR TOTAL GRANT SUPPORT BY DIVISION[1]



1: includes all grants, 1) PI in ACCM, 2) direct + indirect, 3) spending in listed FY

BIOMEDICAL INFORMATICS AND TSUI LAB

The Tsui Lab is dedicated to addressing serious health problems in pediatric patients and translating research into clinical decision support tools. The lab focuses on developing methods in AI, machine learning (ML), natural language processing (NLP), large language model (LLM), and signal processing (SP) applied to integrated multi-modal data: structured electronic health record (EHR) data, narrative clinical notes, and waveform data from bedside devices, e.g., ECG and EEG.

Signature research efforts include:

- Clinical deterioration prediction systems for inpatients using EHR and bedside monitor data: **F-WIN** (for general wards), **I-WIN** (for cardiac ICU), and **P-WIN** (for pediatric ICU).
- **IMPreSIv** (Infant Mortality Prediction System with Intervention Management) provides explainable predictions of risks of infant mortality paired with suggestions for interventions to improve outcomes.
- **EKP** (Expertise Knowledge Platform), an official CHOP application developed in partnership with the Innovation Ecosystem, creates discoverable person-centric summaries of skills, expertise, and research productivity among scientists at CHOP and the Perelman School of Medicine at Penn.
- **NLP** and **LLM** research focus on extracting patient information, e.g., clinical concepts and social determinants of health (SDOH), from free-text clinical notes for use in downstream ML and statistical analyses.
- **WUS** (Wake Up Safe) **Database**, sponsored by the Society for Pediatric Anesthesia, collects information about rare adverse anesthesiology events from 41 children's hospitals nationwide to perform root-cause quality improvement analysis.

The Tsui Lab partners with CHOP clinician-researchers in General Anesthesiology (Drs. Simpao, Iyers, Padiyah, Yuan) through the BioMedical Informatics Group, Cardiac Center (Drs. Asztalos, Gaynor, Goldsmith, Willett), Pediatric ICU (Drs. Nishisaki, Mehta), Child and Adolescent Psychology (Drs. Young and Barzilay), Neurology (Drs. Baker, Killbaugh, Ko, Lynch) and the Innovation Ecosystem (Dr. Winston). The Lab also collaborates with multiple institutions outside CHOP, e.g., Penn, the University of Pittsburgh, Columbia University, and Stanford University.

In 2024, the Lab was funded by 10 projects and published nine journal articles, including "Risk for Suicide Attempts Assessed Using the Patient Health Questionnaire-9 Modified for Teens" in JAMA Open.

Under the leadership of Dr. Fuchiang (Rich) Tsui, the lab has seven members: Mr. Sachin Grover, Dr. Sifei Han, Dr. Paul Kingsbury, Dr. Victor Ruiz-Herrera, Ms. Lingyun (Helen) Shi, Dr. Luiz Silva, and Dr. Eamonn Tweedy.

Rich Tsui, PhD, FAMIA,
IEEE Senior Member
Director, Tsui Lab

Helen Shi, MS
System Architect

Victor Ruiz, PhD
AI/ML
Data Scientist

Eamonn Tweedy, PhD
Mathematician /
Statistician

Sifei Han, PhD
NLP, LLM
Data Scientist

Luiz E.V. Silva, PhD
Biosignal Processing
Research Associate

Paul Kingsbury, PhD
Program Manager
NLP Scientist

Sachin Grover, MS
AI/UI/UX
Data Scientist

Ivor Asztalos, MD
Fellow, Cardiology,
Electrophysiology

Aydan Schweig, BS
LLM
NTP scholar

BASIC SCIENCE DIVISION

COHEN LABORATORY

Our basic science lab is focused on the circuit alterations and functional deficits associated with mild traumatic brain injury (mTBI), the most common type of TBI. We use lateral fluid percussion in mice to induce mTBI because the pathology caused by this preclinical model captures many of the features of human mTBI. Brain function relies on the delicate balance between excitatory and inhibitory (E/I) synaptic transmission. Our lab was the first to demonstrate that mTBI leads to regional shifts in E/I balance and that these imbalances contribute to cognitive impairments associated with mTBI. Our studies begin with behavior paradigms that engage different regions of the brain affected by injury and important in various forms of memory, e.g. spatial, working and fear memory. We then use a wide range of techniques to investigate these injury-induced changes, including in vivo recording during behavioral testing, ex vivo electrophysiology recordings (field potentials, voltage sensitive dye and single cell patch clamp recordings) as well as immunohistochemistry, and optogenetic and chemogenetic stimulation and silencing of specific neuronal populations.

We are fortunate to have lab members with a wide range expertise, and we work across all levels of the nervous system, from post-injury changes in the behavior of individual cells, to the emergent behavior of small networks of cells, up through the behavior of awake, behaving animals. We believe this broad, yet detailed approach is essential to developing and testing actionable targets for therapeutic intervention after TBI.

Significantly, we have developed the only known pharmacological therapy that mitigates the hippocampal memory impairments associated with pre-clinical mTBI. Our therapy has recently shown efficacy in humans and is becoming standard care at CHOP.

The lab is composed of senior research associates, grad students from pharmacology and neuroscience graduate groups, undergraduate as well as high school students. The lab has been funded by the NIH for the last 20 years, including a 10-year Merit Award (2015 – 2025).

BASIC SCIENCE DIVISION

THE BHATNAGAR LAB

The Bhatnagar lab efforts in 2024 were centered on three areas of research through which we seek to address our primary goal: how do variations between individuals in the way they respond to stress impact their cognitive functions, anxiety, and responses to opioids.

First, we continued our examination of the neuropeptides orexins in cognitive functions after stress across development. The results to date indicated that variations in orexin functions between males and females is present in adulthood but not in early adolescence, suggesting a regulatory change in orexin expression and function in late adolescence.

Second, we initiated studies to examine how taste receptors in thalamo-cortical circuitry control behavioral responses to opioid drugs and to chronic stress. In the brain, these receptors are thought to control glucose uptake but little is known about the function of these receptors in the brain.

Third, we continued studies of sphingolipid receptors in the brain. Studies with CRISPR/Cas9 deletion of glucocorticoid receptor binding sites near the promoter for a sphingolipid receptor have uncovered sex differences in regulation of anxiety. Furthermore, results have suggested that CRISPR/Cas9 females on a high fat diet are resistant to developing obesity indicating a novel role for sphingolipid receptors in obesity.

We highly value our collaborations with investigators within and outside the department. Within the department, we are collaborating with Drs. Akiva Cohen on orexins in traumatic brain injury, mitochondrial functions in brain and peripheral tissue in stressed animals with Dr. Meagan McManus and examining anxiety and neural outcomes in septic mice as part of the sepsis program co-led by Dr. Julie Fitzgerald.

We continue to invest in mentoring and training at all levels and our research greatly benefits from the energy and curiosity of our trainees. The trainees included Penn undergraduate, post-bacc and graduate students. As is typical for other years, the trainees that moved on from Penn this year entered MD, MD/PhD, graduate programs or other fields of science.

In 2024, our research program was funded by 3 NIH awards and we published four manuscripts in peer-reviewed journals with a fifth manuscript under review. In closing, the accomplishments of our research program could not be fully realized without the department's support of basic science and its highly collaborative faculty.

PROGRAM

RESUSCITATION SCIENCE CENTER

The Resuscitation Science Center is a multifaceted, collaborative scientific platform dedicated to understanding critical illnesses and accelerating discoveries to improve resuscitation care and outcomes for critically ill children.

It focuses on six main areas of investigation:

- Pediatric Resuscitation Drug and Device Development
- Artificial Intelligence and Machine Learning Waveform Analytics
- Clinical Intervention Trials and Animal Models
- National Resuscitation Guideline Development
- Biomedical Device Development
- Computational Biology and Bioinformatics

By partnering translational and clinical science under one center, the Resuscitation Science Center is uniquely positioned to take a true bench-to-bedside approach to pediatric research. The clinical program's primary goal is to ensure that promising findings in the translational space are confirmed with high-quality clinical resuscitation investigations and subsequently put into real clinical practice so that all children can benefit. The primary goal of the translational program is to create a syndicate that accelerates novel, first-in-human clinical trials of therapeutics, diagnostics, and devices through collaborative scientific platforms.

Since 2020, the Resuscitation Science Center has grown from 7 to over 50 members, building a portfolio exceeding $40M. The Resuscitation Science Center (RSC) continues to thrive through cross-institutional collaboration, uniting researchers across disciplines. Our core functions support over 35 Principal Investigators through preclinical study design, device engineering, pathology and molecular expertise, and multi-species animal modeling.

PROGRAM

ECMO CENTER

The Children's Hospital of Philadelphia (CHOP) operates a renowned Platinum **ECMO Center**, recognized as one of the nation's premier pediatric extracorporeal life support programs. This certification designates CHOP as a center of excellence for ECMO care, reflecting exceptional outcomes, volume, and expertise. The center provides comprehensive ECMO services including both venovenous and venoarterial support for children with severe cardiac and respiratory failure. CHOP's program features a multidisciplinary team of specialists, state-of-the-art technology, robust transport capabilities, and strong outcomes data. As a Platinum center, CHOP demonstrates superior performance metrics across patient survival rates, experienced case volume, and adherence to best practice guidelines established by the Extracorporeal Life Support Organization (ELSO).

PROGRAM

AIREQUIP

MISSION

To Discover, Research and Implement innovative airway techniques,
equipment and educational programs to improve the quality and safety of pediatric airway management.

OVERARCHING GOAL OF AIREQUIP

AirEQuip's overarching goal is to make airway management safer for all children. We are a multidivisional program within the Department of Anesthesiology and Critical Care, directed by Dr. Garcia-Marcinkiewicz. **AirEQuip investigates Airway in all dimensions** – and the various components and elements that impact the safety and practices of airway management. From devices and techniques, to anesthetic depth, oxygenation, airway physiology & special populations, as well as unique airway challenges. The members of AirEQuip **collaborate** to develop evidenced based practices that guide airway management education, research and innovation. AirEQuip performs Airway research, Quality Improvement, Education, and Community Outreach. Mentored by Dr. Garcia-Marcinkiewicz, the various members of the group (18+) "subspecialize" in a specific element of Airway, for example Asif Padiyath in research and cardiac patients, Marc Parris in Airway and the Community, Amy Romer in QI and the physiologically difficult airway in the CICU, and so forth. AirEQuip is a diverse group composed of attendings, fellows, residents, CRNA's and student members.

AIREQUIP ACTIVITIES

- Airway Course Refreshers for ACCM Faculty and staff
- ASA & SPA Airway Workshop
- Pediatric Airway and Difficult Airway Didactics for residents, fellows, and trainees
- Pediatric Airway and Difficult Airway hands-on workshops for residents, fellows, and trainees
- Airway Research Publications and grants (APSF, R01, Foundation Grants)
- National & International talks and workshops
- Airway Simulation and just in time teaching
- Airway management education in the community
- "Cutting Edge Topics in Pediatric Airway Annual Symposium"

PROGRAM

POCUS

POINT OF CARE ULTRASOUND AND ASSOCIATED TECHNOLOGIES

Point of care ultrasound (POCUS) machines are ubiquitous across our Departmental practice environment and support our rapid clinical growth. Educational experts within Divisions continue to support fellow learning as well as faculty credentialing and maintenance. CHOP is an educational leader in acute care POCUS, biannually hosting the largest multidisciplinary POCUS courses in the world here in Philadelphia. CHOP's POCUS footprint now includes course partnerships with Lucile Packard Children's (Stanford), Dell Children's (Austin), Children's Hospital Colorado, and Children's Nebraska with future collaboration planned with Seattle Children's. In 2025 the team partnered with The Pediatric Society of Ghana and designed a pre-conference workshop for their annual Congress and continued partnering with University Hospital, Bern and TINEC in Lausanne, Switzerland supporting their annual courses. Courses continue to be planned around the country; where there is pediatric POCUS education, there is CHOP.

Individual leads continue to push POCUS forward locally, nationally, and internationally. Elaina Lin, MD will direct the POCUS workshop at the revived Principals of Pediatric Anesthesia and Critical Care conference, a collaborative between Boston Children's and CHOP. Christie Glau, MD, is the new Critical Care Ultrasound Fellowship Program Director, the first Non-ACGME fellowship of its kind in pediatric critical care. Steven Loscalzo, MD continues to expand and strengthen fellowship curriculum within the PICU. Adam Himebauch, MD and Garrett Keim, MD lead PICU POCUS research resulting in high impact publications related to clinical applications. In the CICU, Ben Kozyak, MD and Mahsun Yuerek, MD develop new procedural POCUS applications and sit on POCUS guideline committees relevant to their practice setting.

Though POCUS embraces technology central to our program, numerous tangential activities are explored, developed and nurtured within our group. Whether evaluating electrical impedance technology, optimizing ECMO protocols or identifying novel vascular access techniques, POCUS influences how we think about patients and approach their care. VIPER, our nursing-based PICU vascular access service-line led by Mark Weber, MSN and Eileen Nelson, RN is an important example of technology changing care paradigms with bedside PICCs expeditiously placed in critically ill children and reduced metrics of vascular access harm.

PROGRAM

NEUROCRITICAL CARE

The Pediatric Neurocritical Care Program in the Department of Anesthesiology and Critical Care Medicine is dedicated to the treatment and follow-up of infants, children, and adolescents who have acute neurological or neurosurgical conditions requiring intensive care. The team is comprised of experts from critical care medicine, neurology, neurosurgery, anesthesiology, rehabilitation medicine, and neuroradiology. Our multidisciplinary team works together to provide state-of-the-art neurocritical care, focusing on the early recognition of brain injury through bedside clinical evaluation, invasive and non-invasive brain monitoring, therapies to minimize ongoing brain injury, and optimizing recovery and long-term outcomes.

NCC LEADERSHIP

- **Alexis Topjian, MD MSCE** | Director of Neurocritical Care
- **Jimmy Huh, MD** | Co-Director of Pediatric Neurocritical Care and Director of Pediatric Neurosurgical Neurocritical Care
- **Matt Kirschen, MD, PhD** | Associate Director of Pediatric Neurocritical Care – Neuromonitoring
- **Neethi Pinto, MD, MS** | Associate Director of Pediatric Neurocritical Care – Outcomes
- **Rachel Bacon** | Project Manager

In 2022, we opened a dedicated 15-bed neurocritical care unit (NCCU) within the pediatric ICU to cohort neurologically critically ill patients (e.g. cardiac arrest, traumatic brain injury, refractory status epilepticus) and acute neurosurgical patients. In addition to PICU staffing, the NCCU is staffed by 2 NCC nurse practitioners as well as critical care nursing with supplementary NCC training. High fidelity multimodality neuromonitoring is available. Recognizing that recovery extends beyond hospitalization, we created the Recovery and Return (R2) Clinic, our NCC follow-up program, that follows survivors of cardiac arrest and traumatic brain injury after hospital discharge.

Our team is highly active in clinical research, supported by local, philanthropic, and NIH funding, and is leading a large post-cardiac arrest clinical trial, as well as observational research in traumatic brain injury, cardiac arrest, and neuromonitoring. We mentor numerous trainees and junior faculty who have received grants, and awards at local and national conferences. We are active participants in the Neurocritical Care Society, Neurotrauma and Neurosurgery Societies, and the Pediatric Neurocritical Care Research Group.

To expand NCC knowledge among the entire CHOP CCM community, we developed a core NCC nursing education series and a handbook to advance NCC clinical education for our clinicians. The physician and nursing leaders of our NCC team teach locally, nationally, and internationally on various topics in pediatric NCC.

Through the provision of high-quality pediatric NCC and pediatric NCC research and education, we continually aim to improve outcomes for all children and families navigating recovery from pediatric neurocritical illnesses.

LYNCH LAB

The Lynch Lab is focused on improving neurologic outcomes for children with critical congenital heart disease by advancing the use of noninvasive optical technologies. Using hybrid frequency-domain diffuse optical spectroscopy and diffuse correlation spectroscopy (FD-DOS/DCS), the lab performs real-time, bedside monitoring of cerebral hemodynamics and oxygen metabolism to better understand the physiologic underpinnings of neurologic injury. In 2024, the lab built on this work by continuing its core translational research investigating how intraoperative cerebral physiology relates to postoperative brain injury and neurodevelopmental outcomes. By integrating optical signals with other neuromonitoring modalities and clinical data, the lab aims to identify physiologic biomarkers that can guide neuroprotective strategies in the operating room.

The Lynch Lab also mentors trainees across disciplines, including bioengineering, medicine, and anesthesia. Nicolina Ranieri, a PhD candidate in Bioengineering, received the Best Abstract Award at the 2024 Congenital Cardiac Anesthesia Society Annual Meeting for her research on impaired cerebral autoregulation during cardiopulmonary bypass.

While the lab's primary focus remains on intraoperative monitoring, it has broadened its research to examine cerebral physiology during other phases of care. Ongoing collaborations include studies with neonatologists on resuscitation and delayed cord clamping in the delivery room and with investigators in the Division of Neurology to evaluate noninvasive optical markers of intracranial pressure in children with single ventricle physiology.

The Lynch Lab works closely with collaborators in anesthesiology, cardiology, neurology, and bioengineering, and is committed to translating advanced physiologic monitoring tools from the bench to the bedside. The lab's long-term goal is to develop real-time, actionable neuromonitoring techniques that support individualized care and improve neurodevelopmental outcomes for high-risk pediatric patients.

PROGRAM

SIMULATION GROUP

The Simulation Group is dedicated to enhancing medical education through the integration of simulation-based learning across all levels of training. A primary objective is to establish simulation as a core component of medical education, ensuring hands-on practice to reinforce clinical knowledge and technical skills. By implementing innovative techniques, the group seeks to improve learning outcomes while developing scenarios that address real-world perioperative events.

Additionally, the group focuses on the professional growth of educators by facilitating attendance at a three-day facilitator course within six months, encouraging participation in conferences and networking events, and promoting research publication to share best practices. To train future simulation educators, mentorship and support are provided to refine teaching methods, along with dedicated workshops and feedback sessions.

Innovation is a key component of the group's mission, as it explores new technologies such as virtual reality to enhance simulation effectiveness and uses simulation-based interventions to identify training gaps.

Current members include Lenard Babus, Lauren Bice, Dean Bruins, Jason Butchko, Anushree Doshi, Harshad Gurnaney, Nicholas Julian, Kim Laliberte, Elizabeth O'Brien, Bryan Perez, Allie Trakimas, Allie Ulrich, and Devika Singh.

The group has made significant progress in simulation training for fellows, residents, faculty, perioperative staff, and medical students. Several key initiatives have been implemented, including Fellow Boot Camp, four annual Fellow Simulation Sessions, Resident Boot Camp, CRNA Boot Camp, and Resident Simulation Sessions held twice per rotation. Additionally, formalized sedation training occurs three times annually, and the group has expanded OSCE and board preparation simulations, developed oncology simulations with three annual crisis management sessions, and increased medical student engagement through hands-on learning opportunities. Critical care scenario recordings are being developed for the SPA website and internal use, and the MOCA Simulation Course, an ASA-endorsed anesthesia crisis training program, has been established. These initiatives aim to sustain and expand simulation-based education, ensuring high-quality training for all learners while continuously identifying opportunities for growth and improvement in medical education. Through these efforts, the Simulation Group is shaping the future of medical training, fostering excellence in clinical practice, and advancing patient safety through innovative educational strategies.

PROGRAM

Pedi-INQUIRE

Pedi-INQUIRE (INformatics, QUality Improvement, and REsearch) is a collaborative team of physicians and scientists dedicated to improving the perioperative care of children through informatics, quality improvement, and research methodologies. By fostering a multidisciplinary approach, the program seeks to enhance perioperative management for pediatric patients and improve clinical outcomes.

The program's mission is to evaluate and advance pediatric perioperative care using scientific research and quality improvement strategies. To achieve this, Pedi-INQUIRE provides a structured forum for idea generation, project planning, and collaboration. Regular meetings enable members to share hypotheses, refine research proposals, and establish well-defined project plans. Ongoing projects undergo periodic review to ensure progress, while strategic discussions help shape research priorities, foster internal collaborations, and identify external partnership opportunities.

A fundamental principle of the group is synergism, where experts from diverse backgrounds come together to address critical questions in pediatric perioperative medicine. The program also values fulfillment, fostering both professional growth and an engaging research culture. Academic development is another key focus, with an emphasis on producing scholarly work that supports career progression. The program's success is measured by its impact on education, research productivity, and the professional advancement of its members, all while striving to improve the perioperative care of children.

MEMBERS:

- Paul Stricker, MD, MHCM
- Allan Simpao, MD, MBI
- Ty Muhly, MD
- Elizabeth O'Brien, MD
- Rich Tsui, PhD
- Annery Garcia-Marcinkiewicz, MD, MSCE
- Scott Cook-Sather, MD
- Tori Sutherland, MD, MPH
- Olivia Nelson, MD
- Ian Yuan, MD
- Febina Padiyath, MD
- Julia Hickey, MD
- Asif Padiyath, MBBS
- Jennifer Lynch, MD, PhD

PROGRAM

Pedi-INQUIRE

Selected Recent Publications from Our Members

- Cord blood for autologous transfusion in infants with congenital anomalies: Volumes, sterility, and stability during storage. Transfusion (2025). PMID: 39810392
- Surgical neonates: A retrospective review of procedures and postoperative outcomes at a quaternary children's hospital. Paediatr Anaesth (2024). PMID: 38146211
- Predicting pediatric emergence delirium using machine learning applied to EHR datasets. JAMIA Open (2023). PMID: 38098478
- Perioperative Management and Outcomes in Patients with Autism Spectrum Disorder: A retrospective cohort study. Anesth Analg (2024). PMID: 37010953
- Perioperative management and outcomes for posterior spinal fusion in Friedreich ataxia: A single-center, retrospective study. Paediatr Anaesth (2024). PMID: 38655751
- Preoperative vs Postoperative Opioid Prescriptions and Prolonged Opioid Refills Among US Youths. JAMA Netw Open (2024). PMID: 38967924
- Potential for a Propofol Volume and Dosing Decision Support Tool in EHRs: Anticipating propofol volumes and reducing waste. J Med Syst (2024). PMID: 39271596
- The Child Opportunity Index: Addressing perioperative disparities in anesthesiology. Anesthesiology (2024). PMID: 39254538

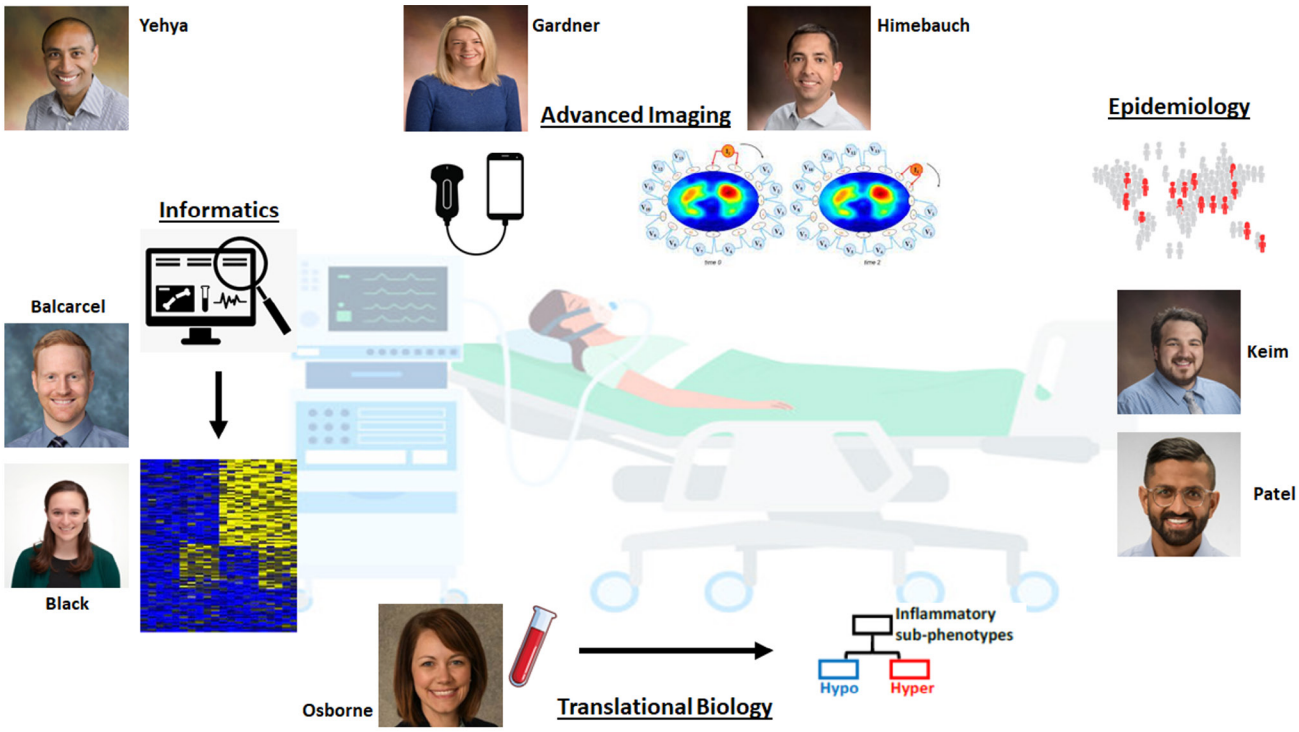
PROGRAM

LUNG INJURY

Lung iNjury Group (LUNG) at CHOP

The LUNG research program is composed of a group of multidisciplinary researchers investigating the translational biology and clinical epidemiology of pediatric lung injury and respiratory failure. LUNG is based out of the Division of Critical Care Medicine and led by Dr. Nadir Yehya, who holds the Endowed Chair in Pediatric Lung Injury. Our group is supported by this Endowed Chair and by multiple investigator-initiated NIH funds. LUNG at CHOP has published > 25% of all publications in pediatric acute respiratory failure epidemiology since 2012, and our work forms the basis for modern definitions of pediatric acute respiratory distress syndrome (ARDS). Our work spans epidemiology, translational biology using biomarkers, novel imaging modalities, informatics, and clinical trials.

We have substantial expertise in epidemiology, and are responsible for developing and implementing novel causal inference and clinical trial methodologies in pediatric critical illness. More recently, we have leveraged our expertise in protein biomarkers to identify subtypes of critical illness for the purposes of clinical trial enrichment, and have provided the first comprehensive proteomic characterization of pediatric ARDS. We continue to investigate novel high-dimensional omics technologies (including genomics, transcriptomics, metabolomics, and DNA methylomics) to further characterize pediatric critical illness. We have used cutting-edge imaging techniques, including strain echocardiography and electrical impedance tomography (EIT), to characterize pediatric ARDS. Our group has expanded into bioinformatics by using the electronic health record to identify subtypes of critical illness, which may prove more operational than biomarkers. Finally, we are also initiating clinical trials of mechanically ventilated children at CHOP, with a focus on determinants of why parents consent or decline research studies in order to ensure equitable enrollment at CHOP.



PROGRAM

IMPLEMENTATION SCIENCE

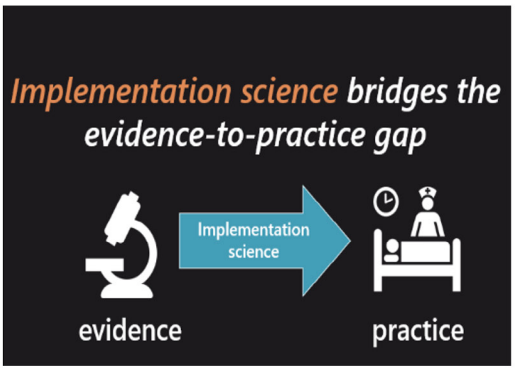
ECLIPSE

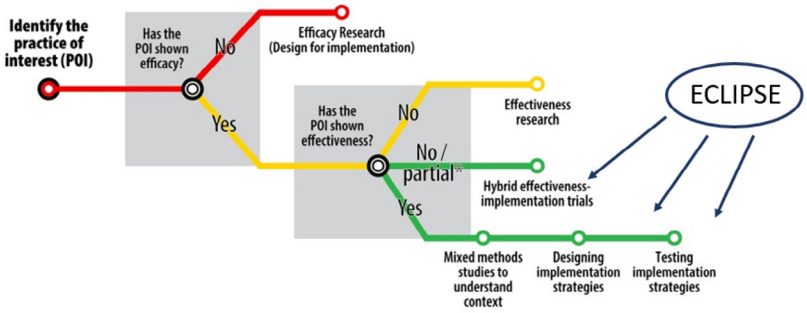
ECLIPSE (Excellence in Pediatric Implementation Science) is the first ever, and still the only, national collaborative research network dedicated to the use of implementation science in the pediatric critical care setting. It is a subgroup of the larger PALISI (Pediatric Acute Lung Injury and Sepsis Investigators) network. ECLIPSE was established by Dr. Charlotte Woods-Hill MD MSHP and Dr. Heather Wolfe MD MSHP in 2021. We now have over 60 members from more than 20 institutions across the United States. It is currently led by Dr. Woods-Hill and Dr. Malone PhD from Washington University in St. Louis.

Our mission statement is: To use principles and methods of implementation science (IS) to shorten the research-to-implementation gap for evidence-based or consensus-based practices in pediatric critical care and improve the care and outcomes of critically ill children.

Our specific objectives are to: 1) advance the field of IS within pediatric critical care, producing much-needed data on how context, implementation strategies, and implementation outcomes drive the success or failure of optimal clinical practices; 2) directly impact patient outcomes via implementation of evidence-based or consensus-based practices in PICUs (with specific focus on those coming from PALISI investigators) and to 3) support the academic growth of IS investigators via education, collaboration, and publication.

ECLIPSE is designed to be a home for collaborative implementation science research for pediatric intensivists. Since our formation, our members, with ECLIPSE support, have published multiple manuscripts, abstracts, and have received or applied for five federal grants to date! We meet twice a year during the larger PALISI network meetings, and also regularly host educational sessions, journal clubs, and have experts in IS give invited talks to our members. We provide letters of support for investigators submitting grant proposals and provide consultation/guidance for IS projects of all types and sizes. We aim to continue our collaborative projects and educational efforts to advance the field of implementation science within the pediatric critical care environment, believing strongly that IS can and should be applied to all kinds of problems in our field to effectively, efficiently, sustainably, and equitably improve care and outcomes for our most fragile patients.





PROGRAM

SEPSIS

The Pediatric Sepsis Program (PSP) at CHOP was established in 2017 through a CHOP Department of Pediatric Chair's Initiative. The PSP is committed to the prevention, early recognition, treatment and follow-up for infants, children and adolescents with sepsis, a life-threatening response to an infection that causes organ failure. Our mission is to lead the international medical and scientific communities in the search for what causes sepsis, the best methods for early detection and resuscitation, effective therapies to reverse the effects of sepsis, and most appropriate long-term follow-up after sepsis in infants, children, and adolescents. We have established a multidisciplinary team to achieve this mission through innovative clinical programs, scientific research, clinical decision support, education, public awareness, and quality improvement.

The PSP co-directors are Julie Fitzgerald from CCM and Fran Balamuth from the Division of Emergency Medicine (EM). PSP members include faculty from CCM, EM, Neonatology, Infectious Diseases, and Hematology, as well as nursing leaders from the PICU and Emergency Department. CCM faculty members are Julie Fitzgerald, Katie Chiotos, R. Brad Lindell, Hannah Stinson, Alicia Alcamo, Charley Woods-Hill, Neethi Pinto, Nadir Yehya, and Garrett Keim.

Our main clinical program is a Sepsis Survivorship follow-up program, coordinated by our sepsis nurse coordinator, Nancy Kelly RN. Through this program, we perform a comprehensive health assessment of PICU sepsis survivors 2-3 months after hospital discharge. In this assessment, we identify new healthcare needs and morbidities experienced by the patient and offer assistance to patients and families in accessing appropriate resources to address these needs. We also connect families with with private foundations who provide financial assistance to those who have needed ICU-level care for sepsis. PSP faculty also coordinate clinical use of blood purification devices for patients with sepsis.

PSP faculty members are involved with basic science, translational, and clinical research. We have collaborated with faculty in the Basic Science Division to develop a mouse model of sepsis in which we can perform behavioral testing and neuro-imaging to help elucidate the cognitive and behavioral impacts of sepsis. We have also developed an enterprise-wide electronic health record registry of sepsis cases and a biorepository as resources for clinical and translational research projects.

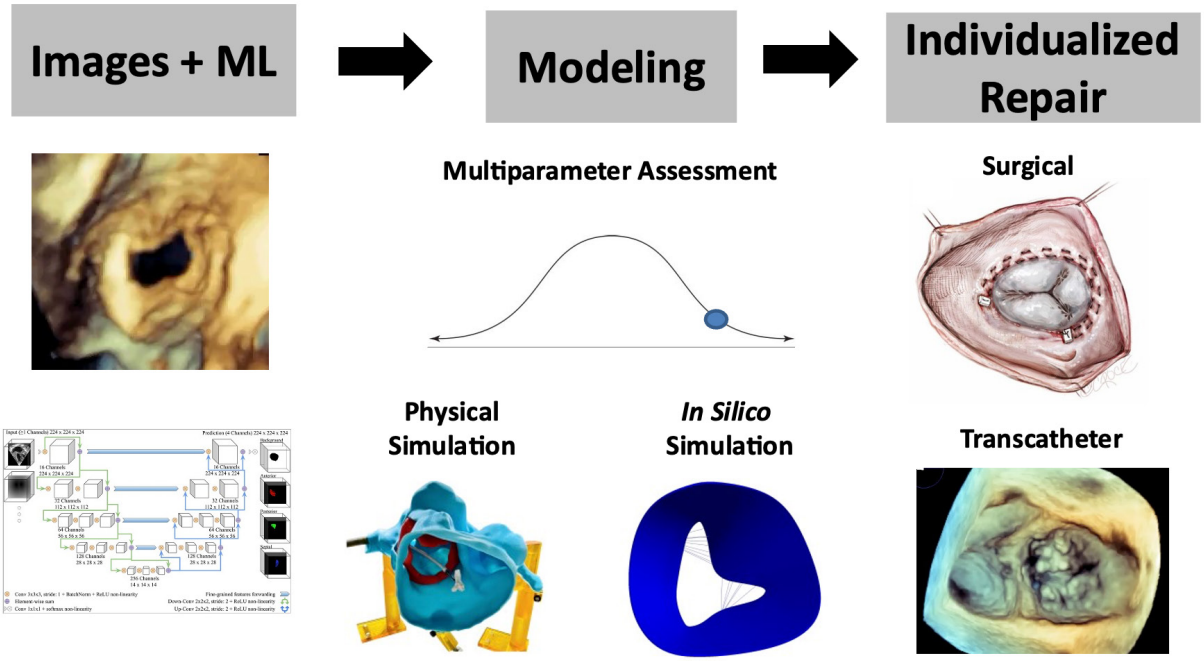
Our future vision involves transitioning the PSP into the Precision Sepsis Care Initiative (PSCI). Through the PSCI, we will develop clinically available testing to identify sepsis subphenotypes and actional inborn errors of immunity that would allow for precision sepsis care and trial stratification in real time for our patients, positioning us as leaders in the era of precision medicine in pediatric sepsis.

JOLLEY LAB

The Jolley Lab is an academic laboratory in the Roberts Center for Pediatric Research focused on the visualization, quantification, and computational modeling of congenitally abnormal heart structures using multi-modality 3D imaging. Notably, children with congenital heart disease (CHD) have a broad range of anatomy, and there are few flexible tools to facilitate patient specific planning of interventions (image-derived precision medicine). As such, the Jolley Lab develops and applies custom tools built upon open-source platforms to help answer critical questions in this unique population. The group leverages medical image processing, machine learning, multi-physics simulations, computer-aided design, virtual reality, and 3D printing to achieve these goals.

Our long-term goal is to improve the outcomes of children with CHD by using patient-specific image-derived modeling to inform the design of the optimal intervention for an individual patient. As such we have recently translated our scientific efforts into a service-based model (core lab) for 3D image derived cardiac modeling to inform the design and application of the optimal intervention for an individual child. This clinical program entails both targeted software development and the evolution of image-to-model workflows which we expect to catalyze application and potentiate programmatic expansion to meet the diverse needs of "technologically orphaned" pediatric populations.

The lab continues to integrate surgeons, cardiac imagers, and interventional cardiologists with the driving goal of delivering personalized structural modeling to inform optimal interventions in individual patients. Further, the laboratory is a growing interdisciplinary nidus for the integrated training of the next generation of translational scientists as well as for diverse local, national, and international collaborations.



PROGRAM

PROMISE

Pediatric Health Outcome Optimization through Implementation Science, Policy, and Human Factors Engineering

MISSION

To use principles and methods of implementation science (IS) and human factors engineering (HFE) to shorten the research-to-implementation gap for evidence- or consensus-based practices in pediatric anesthesia/critical care. PROMISE aims to optimize human-human and human-device interactions and improve perioperative/critical care outcomes through a human-centered, simulation-enhanced approach.

VISION

PROMISE is designed to be the leading pediatric program integrating IS, policy, and HFE to shape safe, effective, and sustainable improvements in clinical care. It offers a home for innovation, collaboration, and education in these critical areas.

AIMS

Advance the field of IS within pediatric anesthesiology and critical care, producing much-needed data on how context, implementation strategies, and implementation outcomes drive the success or failure of optimal clinical practices

Leverage IS methods in the service of health policy investigations, focusing on identifying efficient, sustainable, and equitable solutions to policy issues facing children

Redesign thoughtful HFE-centric approach for bedside workflow and human-human and human-device interaction with the concept of "easy to do the right thing and difficult to do the wrong thing" that results in a positive work environment, reducing clinicians' work-burden, and positive patient outcomes

Directly impact patient outcomes and reduce clinician's burnouts by implementing HFE-rooted, evidence-based best practice to the bedside.

COLLABORATIONS & MENTORSHIP

PROMISE supports a growing group of ACCM faculty and trainees involved in IS and policy work, mentoring fellows and junior faculty. The program promotes cross-disciplinary collaboration across CHOP and Penn.

ACHIEVEMENTS & LEADERSHIP

- 12+ grants (active or under review)
- >20 manuscripts
- 10+ invited talks
- Multiple national leadership roles

SPECIAL DELIVERY UNIT

ANESTHESIA SERVICES

Patients are referred to the **Robert D. Wood, Jr. Center for Fetal Diagnosis and Treatment** when their fetus is prenatally diagnosed with a birth defect or another condition that requires fetal or early life intervention. After patients are evaluated, they may be recommended to undergo a fetal intervention or deliver on the **Garbose Family Special Delivery Unit (SDU)**, a labor and delivery unit dedicated to the care of such infants. The anesthesiologists in the SDU are uniquely integrated into maternal and infant care. The anesthesiologists counsel patients prenatally, provide maternal and fetal anesthesia during fetal surgery or during the process of birth, and may care for the newborn immediately after delivery.

The SDU anesthesiology team provides pain relief to pregnant patients during labor, and anesthesia to those undergoing cesarean delivery or minimally invasive mid-gestation procedures such as fetoscopic laser photocoagulation and intrauterine transfusion. The anesthesiologists discuss anesthesia options for analgesia and anesthesia with maternal patients and evaluate their suitability to deliver on the SDU since our children's hospital does not have access to adult specialists. Maternal patients anticipated to require specialized adult medical care at the time of delivery are referred to the Hospital of the University of Pennsylvania (HUP); however, their infants still receive care at CHOP.

The fetal team is a subset of anesthesiologists on the SDU anesthesia team who provide anesthesia to the mother and fetus or newborn. These types of fetal surgeries include mid-gestation open fetal surgery for conditions such as myelomeningocele repair, Ex Utero Intrapartum Treatment procedures (EXIT) for airway management or resection of severe congenital lung lesions, IMmediate Postpartum Access to Cardiac Therapy (IMPACT) for infants whose cardiac lesion is likely to require immediate intervention, and Fetoscopic Endoluminal Tracheal Occlusion (FETO) balloon removal for severe congenital diaphragmatic hernia. The fetal team anesthesiologists provide neonatal anesthesia to infants who require surgery immediately after delivery (e.g. congenital lung lesions and sacrococcygeal teratoma resections). They also work with neonatology and otolaryngologists to provide neonatal resuscitation and anesthesia for infants who require airway management at the time of delivery (known as a PRESTO; Procedure Requiring a Second Team in the Operating Room). If airway intervention at birth is anticipated but the maternal patient needs to deliver at HUP, our team provides care there.

ACUTE PAIN SERVICE

CHRONIC PAIN MANAGEMENT CLINIC

ACUTE PAIN SERVICE

The Acute Pain Service (APS) at CHOP focuses on improving patient outcomes through consultative services, cutting-edge research, patient education, and multidisciplinary care. The APS team includes 9 pediatric pain management physicians, 5 advanced nurse practitioners, and a dedicated pain psychologist, ensuring comprehensive care for the child and family.

The service primarily operates at CHOP Main, with additional telehealth consultations at King of Prussia Hospital. APS provides pain management across various settings, from the Neonatal ICU to complex post-surgical patients. Treatment modalities include rapid recovery protocols for major surgeries, opioid mitigation strategies, patient-controlled analgesia, regional anesthesia (including epidurals and peripheral nerve catheters), and postoperative peripheral nerve block catheters for major orthopedic and reconstructive surgeries.

CHRONIC PAIN MANAGEMENT CLINIC

The Chronic Pain Management Clinic offers specialized care for children with persistent pain. Treatment options include medication management, cognitive behavioral therapy, physical and occupational therapy, and complementary therapies such as acupuncture and massage. The clinic is led by F. Wickham Kraemer, MD, and Jessica Collins, PsyD, and collaborates with other CHOP specialized clinics for conditions like Amplified Musculoskeletal Pain Syndrome and Pediatric Headache.

In 2024, the Chronic Pain Clinic evaluated 40 patients across 28 clinic days, and the team also provided care in the Epidermolysis Bullosa (EB) Multidisciplinary Clinic. The EB clinic, addressing a rare skin condition with multi-organ involvement, treated 33 patients in 9 clinic days, collaborating with specialists in dermatology, gastroenterology, wound care, and more.

Both services are committed to advancing pain management for pediatric patients, ensuring individualized, comprehensive care.

HOSPITAL LEADERSHIP POSITIONS

Our talented faculty hold key leadership roles not only within our department but also throughout the hospital. Below is a sample of additional appointments and positions held by our faculty.

Don Boyer, MD – GME Office, Associate Designated Institutional Official for CHOP

Akira Nishisaki, MD – Program Director, Simulation

Ari Weintraub, MD – EPIC Clinical Champion

Daniela Davis, MD – Office of General Counsel, Medical Advisor

David Cohen, MD – Medical Director, Periop

David Hehir, MD – Deputy Patient Safety Office, Cardiac Center

Elizabeth Drum, MD – Program Director, Sedation

Geoffrey Bird, MD – Medical Director, CICU

Lucy Li, MD – Epic Clinical Champion

Hannah Stinson, MD – Deputy Patient Safety Officer, Critical Care Medicine

Heather Wolfe, MD – Medical Director, PICU Pathways

Jessica Fowler, MD – GME Office, Associate Designated Institutional Official for CHOP; Associate Medical Director, PICU

Kathleen Chiotos, MD – Medical Director, PICU Infectious Disease Pathway

Kelly Marin, MD – EPIC Clinical Champion, Critical Care Medicine

Kha Tran, MD – Medical Director, Bucks ASC

Laura Petrini, MD - GME Office, Associate Designated Institutional Official for CHOP; Associate Designated Institutional Officer, Wellness

Margaret Priestly-Hill, MD – Senior Medical Director, Critical Care Medicine

Matthew Pearsall, MD – Medical Director, Voorhees ASC

Michael Goldsmith, MD - Technology & Information Systems Officer, Cardiac Center

Nadir Yehya, MD – Program Director, Respiratory Care

Richard Lin, MD – Medical Director, PCU; EPIC Clinical Champion

Ryan Morgan, MD – Outreach Team, Critical Care

Scott Cook-Sather, MD- Medical Director, KOPH

Sherri Jones-Oguh, MD – Deputy Patient Safety Officer

Venkat Shankar, MD – Medical Director, CICU

Ty Muhly, MD – Medical Director, Brandywine, ASC; Periop Quality and Safety

Wynne Morrison, MD – Program Director, Palliative Care

Paul Stricker, MD – Chair, CHOP Sedation Committee

AWARDS, ROLES AND RECOGNITION

CHOP ECMO Fellowship
Co-Director: Marissa Brunetti

CICU Bootcamp Founders / Directors
Course Directors: Felina Mille & Amy Romer

Congenital Cardiac Anesthesia Society-CHiP Network-CCAS Article Review editor-2023 to 2025
Asif Padiyath

Congenital Cardiac Anesthesia Society-Echo Tutorials Editor-2023 to 2025
Asif Padiyath

Director of the Education in Pediatric Intensive Care (E.P.I.C.) research collaborative
Don Boyer

Pediatric Critical Care Medicine Categorical Fellowship: Associate Program Director
Amy Romer

Savannah Aepli

- First-place recipient of the American Academy of Pediatrics John J. Downes Resident Research Award at SPA 2024 for my presentation on the Association of Primary Language and Neighborhood Opportunity with Pediatric Day-of-Surgery Cancellations

Alicia Alcamo

- Star Research Award, Society of Critical Care Medicine Annual Meeting – February 2025
- Pediatric Critical Care Medicine Editorial Board

Pilar Anton-Martin

- Member of National and International Scientific Research & Educational Committees at: Sociedad Española de Cuidados Intensivos Pediátricos (SECIP) ECMO-VAD Subcommittee – Spain; Extracorporeal Life Support Organization (ELSO) – United States; Pediatric Cardiac Intensive Care Society (PCICS) – United States; Worldwide Exploration of Renal Replacement Outcomes Collaborative in Kidney Disease (We-ROCK) – United States

Bob Berg

- Editorial Board, Resuscitation
- Keynote speaker at Austrian Society of Emergency Medicine: Personalized Pediatric Resuscitation, April 2024
- Invited Professor for the Second Annual Ron Gottesman Pediatrics Grand Rounds on "Caring for the Critically Ill Child: Past, Present, and Future," Montreal Children's Hospital, April 2024
- Organized and led the evening panel on "Mentorship" at the American Heart Association Resuscitation Science Symposium Young Investigator Networking Meeting, November 2024

Sherell Bernard, MSN, CRNA

- 2024 Behind Every Graduate Clinical Preceptor Award

Molly Deacutis

- CHOP Hospital Ethics Committee and CCAS Communications Committee

Aaron Donoghue

- Chair of the Education Writing Group for the American Heart Association ECC 2025 CPR Guidelines
- Education Implementation and Teams Task Force for ILCOR (International Liaison Committee on Resuscitation)

AWARDS, ROLES AND RECOGNITION

Liz Drum

- Chair, American Society of Anesthesiologists (ASA) Committee on Global Health
- Member, ASA Charitable Foundation Board
- Member, Editorial Board, ASA Monitor
- Member, Society for Pediatric Anesthesia (SPA) Global Committee
- Advisor, SPA Women's Empowerment and Leadership Initiative (WELI)
- Council Member and US Representative, World Federation of Societies of Anaesthesiologists (WFSA)
- Member, WFSA Constitution Committee
- Member, WFSA Credentials Committee
- Member, Executive Committee of Section on Anesthesiology and Pain Medicine (SOA) of American Academy of Pediatrics (AAP)
- Member, Anesthesiology Council, Pan-African Academy of Christian Surgeons (PAACS)

Matt Kirschen

- chair of the Ethics, Law & Humanities Committee, A Joint Committee of the American Academy of Neurology, American Neurological Association, and Child Neurology Society
- Co-chair, Scientific Review Committee for the Pediatric Neurocritical Care Research Group
- Member, Board of Directors, Organ Donation and Transplant Alliance

Dean Kurth

- Section editor "quality and safety" in journal pediatric anesthesia
- Co-editor for themed issue in journal pediatric anesthesia entitled "Global Pediatric Anesthesia"
- Leader for "Pediatric Anesthesia Learning Network" in USA and Canada
- member of Masimo Co. Scientific Advisory Board

Justin Lockman

- Education editor for Pediatric Anesthesia
- Executive Council for the Pediatric Anesthesia Article of the Day

Andreas Loepke

- Editorial Board for Pediatric Anesthesia

Annery Garcia Marcinkiewicz

- Teacher of the year award- CHOP Pediatric Anesthesia Fellowship
- President of Women in Anesthesiology
- Editor, Pediatric Anesthesia
- Reviewer for Anesthesia & Analgesia, Journal of Clinical Anesthesia, and British Journal of Anesthesia
- Anesthesia Patient Safety Foundation: Airway Management Task Force Member
- Society for Pediatric Anesthesia DEI Research Chair

Michelle Mayeda

- SCCM STAR Research award in 2024

Vanessa Mazandi

- Early Career Faculty Honor Roll for 2024

Sanjiv Mehta

- Recognized and participated in the National Academy of Medicine Scholars in Diagnostic Excellence

Wynne Morrison

- Editorial board for Pediatric Critical Care Medicine
- Pushcart Prize Nominee (national literary award) by Tar River Poetry

AWARDS, ROLES AND RECOGNITION

Susan Nicolson

- John J. Downes Master Clinician Award
- Editorial Board -Pediatric Anesthesia Article of the Day
  - Editorial Board and Reviewer - World Journal of Pediatric and Congenital Heart Surgery
  - Reviewer - Journal of Cardiothoracic and Vascular Anesthesia, Catheterization and CV Interventions, Pediatric Anesthesia, Anesthesia and Analgesia

Akira Nishisaki

- AHRQ R01, SMART PICU (Smart checklist implementation for pediatric tracheal intubations in the ICU- multicenter study: SMART PICU)
- Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Chair
- International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE) Scientific Review Committee, Fellowship Committee member
- Editorial Board, Journal of Intensive Care

Elizabeth O'Brien

- Young Investigator Awards at the Society for Pediatric Anesthesia meeting in Orlando, FL, this past month for a study entitled, "Gastric Emptying in Pediatric Patients on GLP1-Receptor Agonists: A Prospective Ultrasound Study."

Carol Pasquariello

- The Patrick S. Pasquariello Jr. Service Award
- NCCS "Physician partnering award"

Madiha Raees

- First Prize for WFPICCS24 Early Investigator Award (World Federation of Pediatric Intensive & Critical Care Societies) in June 2024
- Director of communications for PALISI (Pediatric Acute Lung Injury and Sepsis Investigators) Global Health

Allan Simpao

- Key Note Speaker: Nov, 2024 - "The Role of AI in Paediatric Anaesthesia: Current State and Future Potential", Keynote Speaker at 23rd Barts and The London Paediatric Anaesthesia Education Day, London, England
- Editorial positions: Associate Editor, ANESTHESIOLOGY: Journal of the American Society of Anesthesiologists; Social Media Co-Editor, ANESTHESIOLOGY: Journal of the American Society of Anesthesiologists; Deputy Editor-in-Chief, Journal of Medical Systems (-> EIC on January 1, 2025); Associate Editor, Pediatric Anesthesia; Associate Editor, Acta Informatica Pragensia

Alexis Topjain

- Associate Editor, Resuscitation

Audra Webber

- Chair of the ASA Committee on Ambulatory Surgical Care
- Co-Chair of the SAMBA (Society for Ambulatory Anesthesia) Pediatric Committee

Charlie Woods-Hill

- "Penn Emerging Scholars Exchange Program" award in 2024, from the Leonard
- Editorial board of the journal JAC-AMR (Journal of Antimicrobial Chemotherapy-Antimicrobial Resistance) and co-chair the ECLIPSE implementation science subgroup for PALISI

WORK-LIFE INTEGRATION

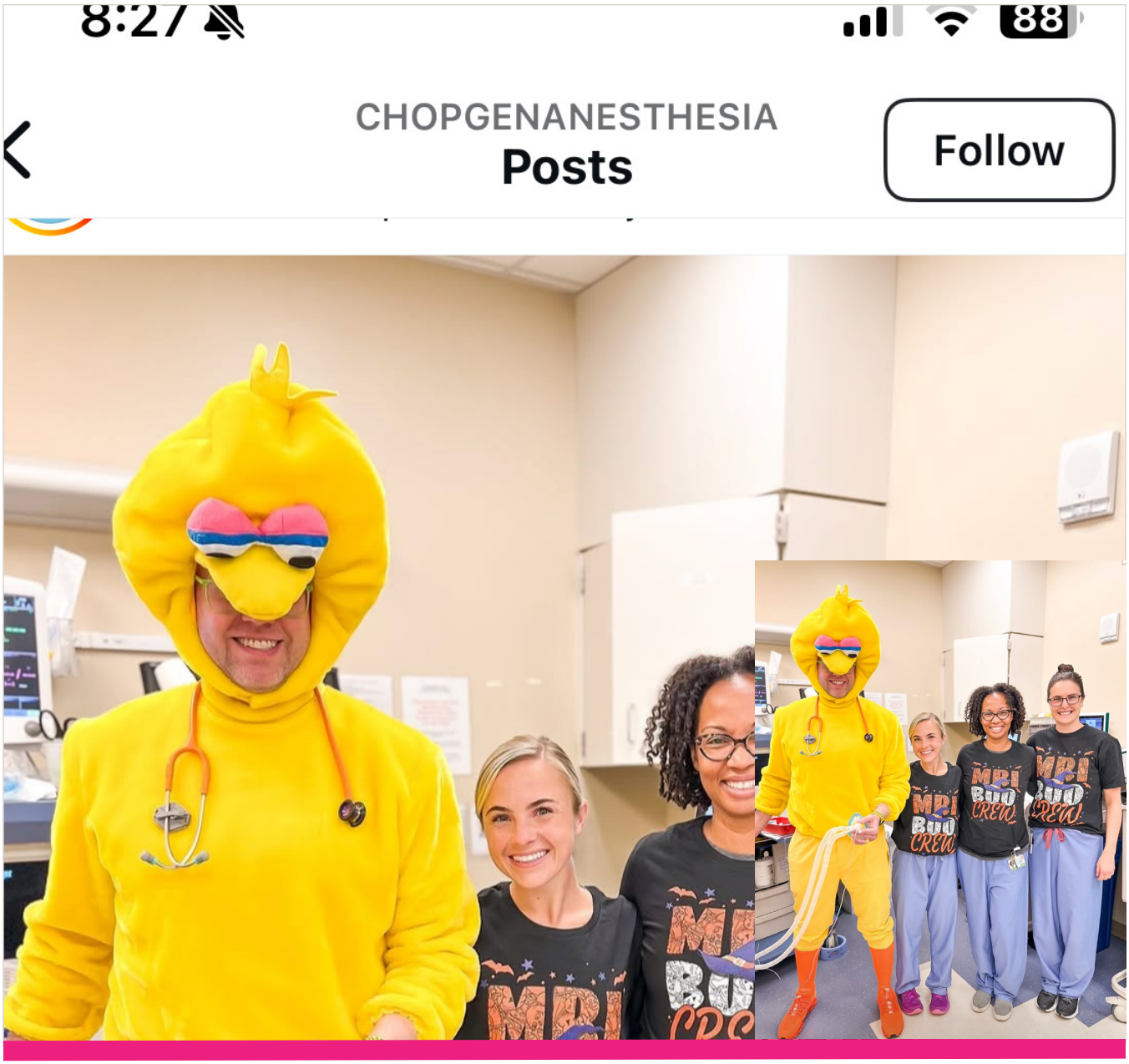
COMMUNITY

The Department of Anesthesiology and Critical Care Medicine is an amazing, dedicated, and hard-working team. While we take pride in our work every day, we also understand the importance of maintaining a healthy work-life balance. By supporting one another both professionally and personally, we work to foster a positive, well-rounded culture. Our commitment to balance ensures long-term productivity and well-being, making our team not only successful but also fulfilled. Spending time together outside of the clinical care setting strengthens our relationships, increases collaborative efforts, and helps us build a supportive and positive department culture.

SOCIAL MEDIA PRESENCE

Cardiac Anesthesia: @chopcardiacanesthesia
General Anesthesia: @chopgenanesthesia

General Anesthesia: @chop_genanesth




HARVARD
PPACC
Principles of Pediatric Anesthesia & Critical Care
May 1-4, 2025
Joseph B. Martin Conference Center
Boston, Massachusetts
COURSE DIRECTORS:
WORKSHOP DIRECTORS:
KEYNOTE SPEAKER:


Phillies

RESEARCH

GENERAL ANESTHESIA

The Division of General Anesthesiology continued its success in perioperative research and innovation. Annery Garcia-Marcinkiewicz completed enrollment on the NasoVISI trial and co-leads PeDI 3.0 and the Optimise 2 trial. Chris Massa launched a study exploring electrical impedance tomography (EIT) in anesthetized children. Elaina Lin was co-course director at the Boston Children's-CHOP "Principles and Pediatric Anesthesia and Critical Care meeting" and mentored Elizabeth O'Brien on multiple studies including one on GLP-1 and gastric ultrasound for which Elizabeth won a SPA Young Investigator Award. Febina Padiyath led a PeDI Registry analysis comparing cardiac arrest and non-arrest intubations and presented this at CHOP's Airway Symposium. Olivia Nelson launched the multicenter PICNIC registry and completed a Foerderer- and McCabe-funded umbilical cord blood study. Tori Sutherland is site PI for an NIH-funded APEX study on adolescent pain and opioid use and earned the FAER-MSARF Mentor Award. Ian Yuan continued his internationally recognized work on pediatric perioperative EEG including leading global authorship of the EEG chapter in Gregory's Pediatric Anesthesia. GA faculty were invited lecturers in Italy, England, Germany, Brazil, Taiwan, Switzerland, Scotland, and across the U.S.A. GA researchers published in many journals including ANESTHESIOLOGY, Anaesthesia, Anesthesia & Analgesia, JAMA Network Open, Transfusion, Pediatric Anesthesia, and more.

CARDIAC CRITICAL CARE MEDICINE

In 2024 the Division of Cardiac Critical Care Medicine showed continued growth in research with awards, grants, publications and presentations at national and international meetings. Faculty from the division are actively involved in collaborative research with other divisions within the institution and with multisite collaborative research with the Pediatric Cardiac Critical Care Consortium (PC4), Pediatric Cardiac Intensive Care Society, Extracorporeal Life Support Organization (ELSO), NEPHRON, and the Worldwide Exploration of Renal Replacement Outcomes Collaborate In Kidney Disease. Faculty from the Division also serve on the scientific review committees of PC4, ELSO and the Cardiac Arrest Registry to Enhance Survival. Faculty within the division serve as primary research mentors for Cardiology and Critical Care Fellows.

Noteworthy accomplishments within the division:

1. Dr. Monique Gardner's NIH funded K23-Mentor Patient-Oriented Research Career Development Award "Assessment of Myocardial Dysfunction and Inflammation after Pediatric Cardiac Arrest" and Cardiac Center Innovation Award "ACT ICU Biobank"
2. Dr. Elizabeth Herrup's Finalist for Outstanding Investigator at the 28th Annual Update on Pediatric and Congenital Cardiovascular Disease "Impact of Parental Stress in Early Childhood on Emotional Health of Young Adults with Congenital Heart Disease"
3. Dr. Benjamin Kozyak's NIH-NINDS-U01 Site PI "IND-Enabling Studies of Non-Immunogenic Gene Therapy for Duchene Muscular Dystrophy", CHOP site PI for the Dept of Defense Funded "Trial of Indication-Based Transfusion of Red Blood Cells in ECMO".
4. Dr. Marissa Brunettu was awarded one of the Top 10 PICU articles of 2024 by Pub Med/NLM/NCBI: Brunetti MA, Gaynor JW, Zhang W, Bush LR, Banerjee M, Pasquali SK, Gaies M. "Hospital variation in post-operative cardiac ECMO use and relationship to post-operative mortality." Cardiology of the Young Oct 2024.

RESEARCH

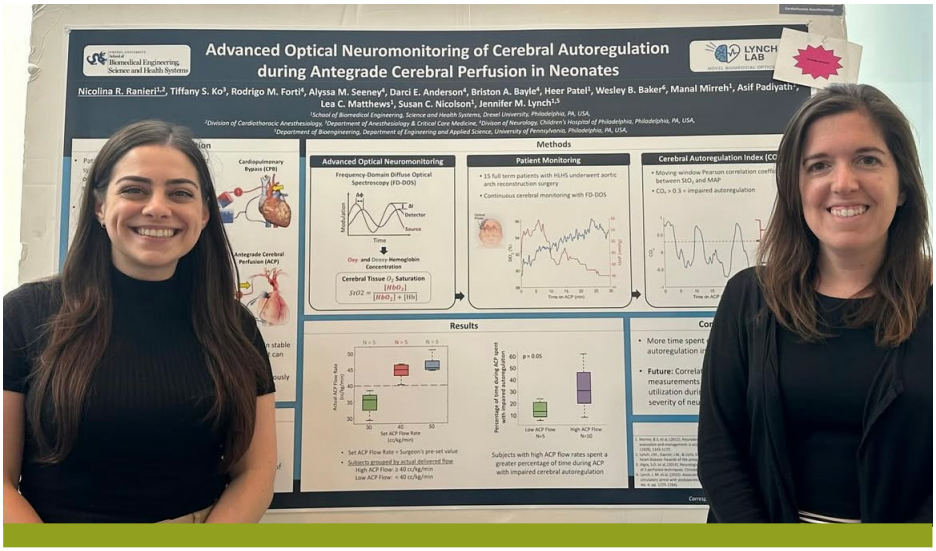
CRITICAL CARE MEDICINE

The Division of Critical Care Medicine (CCM) had a tremendous year, with > 180 publications to date (> 150 peer-reviewed primary research). The Division welcomed multiple new R01 awards for Dr. Robert Sutton and Dr. Todd Kilbaugh, and a new first-time R01 to Dr. Ryan Morgan. Additional mid-level and senior faculty with established government and foundation funding continue leading work on the core pillars of CCM research of sepsis, kidney injury, lung injury, resuscitation, brain injury, simulation and education, implementation, post-discharge outcomes, and airway management. Junior faculty are building exciting new pillars of research, including health equity (Dr. Paula Magee and Dr. Anireddy Reddy), firearm injury (Dr. Anireddy Reddy), global health (Dr. Madiha Raees), and informatics (Dr. Celeste Dixon and Dr. Sanjiv Mehta). CCM faculty and fellow trainees have received multiple awards at the Society for Critical Care Medicine, Pediatric Academic Society, American Heart Association, and American Thoracic Society annual meetings. The Division also supported 3 fellow mentees on T32s, demonstrating a commitment to training the next generation of physician-scientists.

CARDIOTHORACIC ANESTHESIOLOGY

The Division of Cardiothoracic Anesthesiology had a highly productive 2024, advancing pediatric cardiac anesthesiology through translational and clinical research. Susan Nicolson served as CHOP's site PI for several multi-center trials. Asif Padiyath launched a collaboration with Vanderbilt researchers on non-invasive venous waveform analysis. Nick Pratap received the prestigious Cardiac Center Innovation Award for the CHD Panorama project, which aims to streamline cardiac care by integrating multi-source data into a single application. The Jolley Laboratory continued groundbreaking work in 3D imaging and computational modeling of congenital heart defects. Matthew Jolley also earned a Cardiac Center Innovation Award to lead a CHOP-Penn interdisciplinary team studying biomechanical reasons behind systemic semilunar valve repair failures. Additionally, Jennifer Lynch secured a renewal of her Innovation Award to advance optical neuromonitoring technologies for neonatal cardiac surgery, and graduate student Nicolina Ranieri won Best Poster at CCAS for this project.

CA faculty were featured speakers at major conferences including CCAS, CHOP Cardiology, AHA, and Optica Biophotonics. Trainees from the Jolley and Lynch Labs also presented widely, reflecting our division's broad impact across cardiac anesthesia, pediatric cardiology, and bioengineering.



PUBLICATION LIST

"2023 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations: Summary From the Basic Life Support; Advanced Life Support; Pediatric Life Support; Neonatal Life Support; Education, Implementation, and Teams; and First Aid Task Forces." *Resuscitation*. Nadkarni VM, Topjian AA.

"2024 American Heart Association and American Academy of Pediatrics Focused Update on Special Circumstances: Resuscitation Following Drowning: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.." *Circulation*. AA Topjian.

"2024 Clinical Practice Guideline Update by the Infectious Diseases Society of America on the Management of COVID-19: Anti-SARS-CoV-2 Neutralizing Antibody Pemivibart for Pre-exposure Prophylaxis.." *Clin Infect Dis*. Kathleen Chiotos.

"3D Echocardiogram Visualization: A New Method Based on "Focus + Context".." *Proc SPIE Int Soc Opt Eng*. Jolley MA.

"A Breath of Fresh Air: The Role of Airway Anomalies on Outcomes in Congenital Heart Disease.." *Pediatric Critical Care Medicine*. MY Naim.

"A call to action: the SHEA research agenda to combat healthcare-associated infections.." *Infect Control Hosp Epidemiol*. Kathleen Chiotos.

"A coddling of the sagittal suture: inequality in spring-assisted expansion.." *Childs Nerv Syst*. DJ. Romeo.

"A Comparison of Ketamine and Midazolam as First-Line Anesthetic Infusions for Pediatric Status Epilepticus.." *Neurocrit Care*. Topjian AA.

"A critical assessment of time-to-antibiotics recommendations in pediatric sepsis.." *J Pediatric Infect Dis Soc*. Chiotos K, Fitzgerald JC.

"A genetic association study of circulating coagulation factor VIII and von Willebrand factor levels.." *Blood*. Ryan KA.

"A Master Protocol Template for Pediatric ARDS Studies." *Respir Care*. Yehya N.

"A multi-state analysis on the effect of deprivation and race on PICU admission and mortality in children receiving Medicaid in United States (2007-2014).." *BMC Pediatr*. Yehya N.

"A novel intracorporeal right ventricular assist device implantation technique in a young patient.." *JTCVS Tech*. Berger JH.

"A novel translational bioinformatics framework for facilitating multimodal data analyses in preclinical models of neurological injury.." *Sci Rep*. RW Morgan, TJ Kilbaugh.

"A Prospective Observational Study of EHR-Based Versus Virtual Desktop-Based Access to Pediatric Anesthesia Emergency Algorithms.." *Student Health Technol Inform*. Weintraub AY, Nelson O, Tran KM, Simpao AF.

"A research definition and framework for acute paediatric critical illness across resource-variable settings: a modified Delphi consensus." *Lancet Glob Health*. Nadkarni VM.

"A retrospective observational cohort study of the anesthetic management and outcomes of pediatric patients with Alexander disease undergoing lumbar puncture or magnetic resonance imaging.." *Paediatr Anaesth*. Berger JA, Simpao AF, Dubow SR, Drum ET.

"A Survey of PICU Clinician Practices and Perceptions regarding Respiratory Cultures in the Evaluation of Ventilator-Associated Infections in the BrighT STAR Collaborative." *Pediatr Crit Care Med*. Woods-Hill CZ.

"A syndromic neurodevelopmental disorder caused by rare variants in PPFIA3.." *Am J Hum Genet*. Cohen A.

"A systems engineering approach to alarm management on pediatric medical-surgical units.." *J Hosp Med*. Hannah Stinson.

"A Window into the Developing Brain: Toward a Deeper Understanding of Pediatric Anesthesia.." *Anesthesiology*. Simpao AF, Yuan I.

"Accounting for "Hidden Costs": Provider Workload as a Balancing Metric in Evaluating Procedural Innovations.." *Pediatr Crit Care Med*. Don Boyer.

"ACR Appropriateness CriteriaÆ Urinary Tract Infection-Child: 2023 Update.." *J AM Coll Radiol*. Iyer RS.

"Admission Functional Status is Associated With Intensivists Perception of Extracorporeal Membrane Oxygenation Candidacy for Pediatric Acute Respiratory Failure." *Pediatr Crit Care Med*. Morrison WE, Morgan RW, Himebauch AS.

"Advances in Point-of-Care Ultrasound in Pediatric Acute Care Medicine.." *Indian J Pediatr*. Kirschen MP, Conlon TW, Glau CL.

"Advancing pediatric perioperative care in India: A contemporary overview.." *Paediatr Anaesth*. Iyer RS.

"Adverse Tracheal Intubation Events in Critically Ill Underweight and Obese Children: Retrospective Study of the National Emergency Airway for Children Registry (2013-2020)." *Pediatr Crit Care Med*. Nadkarni VM, Nishisaki A.

"Airway management in the paediatric difficult intubation registry: a propensity score matched analysis of outcomes over time.." *EClinicalMedicine*. Garcia-Marcinkiewicz AG, Fiadjoe JE.

"Amplitude spectrum area is dependent on the electrocardiogram magnitude: evaluation of different normalization approaches.." *Physiol Meas*. RW Morgan, TJ Kilbaugh.

"Anaerobic Lactate Production Is Associated With Decreased Microcirculatory Blood Flow and Decreased Mitochondrial Respiration Following Cardiovascular Surgery With Cardiopulmonary Bypass." *Crit Care Med*. Kilbaugh TJ.

PUBLICATION LIST

"Anesthesiologists Supporting Lactation: The Easy Thing To Do.." *J Womens Health (Larchmt)*. Garcia-Marcinkiewicz AG.

"Anesthetic challenges in patients with multicompartmental lymphatic failure after Fontan palliation undergoing transcatheter thoracic duct decompression.." *Paediatr Anaesth*. Nicolson SC.

"Anesthetic management of children with medically refractory pulmonary hypertension undergoing surgical Potts shunt.." *Paediatr Anaesth*. Murray-Torres RM.

"Anthropometric-Targeted Cardiopulmonary Resuscitation: As Good as It Can Get?." *Pediatr Crit Care Med*. Nishisaki A.

"Antibiotics for Pediatric Acute Bacterial Sinusitis.." *JAMA*. K. Chiotos.

"Are chest compression quality metrics different in children with and without congenital heart disease? A report from the pediatric resuscitation quality collaborative.." *Resusc Plus*. V. Nadkarni.

"Arid1b haploinsufficiency in pyramidal neurons causes cellular and circuit changes in neocortex but is not sufficient to produce behavioral or seizure phenotypes.." *bioRxiv*. Fitzgerald J.

"Assessing left atrial size and pump function in ischemic stroke patients: Is cardiac MRI superior to transthoracic echocardiography?." *J Stroke Cerebrovasc Dis*. Kumar SA.

"Assessing Physician Climate Change Competency via Medical Licensing and Board Examinations: Lessons From Integrating Ultrasound Topics in Emergency Medicine.." *J Grad Med Educ*. EF Avakame.

"Assessing Social Determinants of Health During Critical Illness: Implications and Methodologies.." *Crit Care Clin*. Paula Magee.

"Association between Age and Mortality in Pediatric and Adult Acute Respiratory Distress Syndrome." *Am J Respir Crit Care Med*. Patel BM, Yehya N.

"Association between ASL MRI-derived cerebral blood flow and outcomes after pediatric cardiac arrest." *Resuscitation*. Kirschen MP, Berg RA, Topjian A.

"Association Between Chest Compression Pause Duration and Survival After Pediatric In-Hospital Cardiac Arrest." *Circulation*. Morgan RW, Berg RA, Sutton RM, Nadkarni VM.

"Association Between Persistent Hypothermia After Cardiopulmonary Bypass in Neonates and Odds of Serious Complications.." *Crit Care Explor*. Herrup E.

"Association between survival and number of shocks for pulseless ventricular arrhythmias during pediatric in-hospital cardiac arrest in a national registry." *Resuscitation*. Berg RA, Nadkarni V.

"Association between video laryngoscopy characteristics and successful neonatal tracheal intubation: a prospective study.." *Arch Dis Child Fetal Neonatal Ed*. E. Laverriere.

"Association of continuous kidney replacement therapy timing and mortality in critically ill children." *Pediatr Neprhol*. Keim G, Yehya N, Lindell RB, Fitzgerald JC._x000D_.

"Association of continuous kidney replacement therapy timing and mortality in critically ill children.." *Pediatr Nephrol*. Keim G, Yehya N, Lindell RB, Fitzgerald JC.

"Association of cumulative oxygen and carbon dioxide levels with neurologic outcome after pediatric cardiac arrest resuscitation: A multicenter cohort study.." *Resusc Plus*. VM Nadkarni.

"Association of EEG Background With Diffusion-Weighted Magnetic Resonance Neuroimaging and Short-Term Outcomes After Pediatric Cardiac Arrest." *Neurology*. Kirschen MP, Huh JW, Topjian AA.

"Association of EEG characteristics with outcomes following pediatric ICU cardiac arrest: A secondary analysis of the ICU-RESUScitation trial.." *Resuscitation*. Topjian AA, Sutton RM, Morgan RW, Berg RA, Nadkarni VM, Wolfe HA, Naim MY.

"Association of Pediatric Postcardiac Arrest Ventilation and Oxygenation with Survival Outcomes." *Ann Am Thorac Soc*. Topjian AA, Morgan RW, Nadkarni VM, Wolfe HA, Sutton RM, Berg RA.

"Association of Pediatric Postcardiac Arrest Ventilation and Oxygenation with Survival Outcomes.." *Semin Pediatr Surg*. Chen J.

"Association of Postarrest Hypotension Burden With Unfavorable Neurologic Outcome After Pediatric Cardiac Arrest.." *Crit Care Medicine*. Sutton RM, Nadkarni VM, Berg RA, Morgan RW, Topjian AA, Kirschen MP.

"Association of Postnatal Opioid Exposure and 2-Year Neurodevelopmental Outcomes in Infants Undergoing Cardiac Surgery.." *J Am Coll Cardiol*. Sutherland TN.

"Associations Between End-Tidal Carbon Dioxide During Pediatric Cardiopulmonary Resuscitation, Cardiopulmonary Resuscitation Quality, and Survival." *Circulation*. Morgan RW, Nadkarni VM, Wolfe HA, Berg RA, Sutton RM.

"Author Correction: Trans-ancestral genome-wide association study of longitudinal pubertal height growth and shared heritability with adult health outcomes.." *Genome Biol*. Ulrich A.

"Author Response: Pediatric and Adult Brain Death/Death by Neurologic Criteria Consensus Guideline: Report of the AAN Guidelines Subcommittee, AAP, CNS, and SCCM." *Neurology*. Kirschen MP.

"Awake Supraglottic Airway Placement in Pediatric Patients for Airway Obstruction or Difficult Intubation: Insights From an International Airway Registry (PeDI).." *Anesth Analg*. Annery Garcia-Marcinkiewicz.

"Barriers and facilitators when seeking healthcare for septic children in Ghana: a single-centre qualitative study of patient caregivers and emergency department clinicians.." *BMJ Paediar Open*. Nadkarni VM, Woods-Hill CZ, Wolfe HA.

PUBLICATION LIST

"Beyond the Final Heartbeat: Neurological Perspectives on Normothermic Regional Perfusion for Organ Donation after Circulatory Death." *Ann Neurol*. Kirschen MP.

"Biomarker-Based Risk Stratification Tool in Pediatric Acute Respiratory Distress Syndrome: Single-Center, Longitudinal Validation in a 2014-2019 Cohort." *Pediatr Crit Care Med*. Yehya N.

"Brief report: incidence and outcomes of pediatric tracheal intubation-associated cardiac arrests in the ICU-RESUS clinical trial.." *Crit Care*. Nishisaki A McGovern EL, Morgan RW, Nadkarni VM, Wolfe HA, Sutton RM, Berg RA.

"Calculating Relative Lung Perfusion Using Fluoroscopic Sequences and Image Analysis: The Fluoroscopic Flow Calculator.." *Circ Cardiovasc Interv*. Jolley MA.

"Carbon monoxide as a cellular protective agent in a swine model of cardiac arrest protocol.." *PLoS One*. Morgan RW, Kilbaugh TJ.

"Cardiac Critical Care Fellowship Training in the United States and Canada: Pediatric Cardiac Intensive Care Society-Endorsed Subcompetencies to the 2022 Entrustable Professional Activities.." *Pediatr Crit Care Med*. Chen JA.

"Cardiac point-of-care ultrasound: Practical integration in the pediatric and neonatal intensive care settings." *Eur J Pediatr*. Conlon TW.

"Cardiomyopathy, an uncommon phenotype of congenital disorders of glycosylation: Recommendations for baseline screening and follow-up evaluation.." *Mol Genet Metab*. Berger JH.

"Cardiopulmonary resuscitation employing only abdominal compressions in infants after cardiac surgery: A secondary sub-analysis of the ICU-RESUS study.." *Resusc Plus*. Berg RA, Morgan RW, Nadkarni VM, Wolfe HA, Sutton RM.

"Cardiopulmonary Resuscitation: Push Hard, Push Fast, But Where to Push?." *Pediatr Crit Care Med*. Lindsay Shepard, Akira Nishisaki.

"Cardiovascular Toxicity of Energy Drinks in Youth: A Call for Regulation.." *J Pediatr*. MY. Naim.

"Case 3: Shock after Gluteal Abscess Incision and Drainage in a 15-month-old Girl.." *Pediatr Rev*. Steven Loscalzo.

"Cerebral Autoregulation: A Target for Improving Neurological Outcomes in Extracorporeal Life Support.." *Neurocrit Care*. Kilbaugh T.

"Cerebral Oximetry During Pediatric In-Hospital Cardiac Arrest: A Multicenter Study of Survival and Neurologic Outcome." *Crit Care Med*. Kirschen MP, Topjian AA.

"Characteristics and Clinical Outcomes of Vaccine-Eligible US Children Under-5 Years Hospitalized for Acute COVID-19 in a National Network." *Pediatr Infect Dis J*. Chiotos K.

"Characteristics and outcomes of children determined to be noncandidates for heart transplant.." JHLT Open. Berger JH.
"Characteristics of Pediatric In-Hospital Cardiac Arrests and Resuscitation Duration.." *JAMA Netw Open*. O'Halloran A, Morgan RW, Berg RA, Gathers CA, Naim MY, Nadkarni V, Topjian A, Wolfe H, Sutton RM.

"Charting a course for precision therapy trials in sepsis." *Lancet Respir Med*. Lindell RB.

"Chassis-based fiber-coupled optical probe design for reproducible quantitative diffuse optical spectroscopy measurements.." *PLoS One*. Kilbaugh TJ.

"Chest Compression Depth Targets in Critically Ill Infants and Children Measured With a Laser Distance Meter: Single-Center Retrospective Study From Japan, 2019-2022.." *Pediatr Crit Care Med*. Nadkarni VM.

"Chest compressions for pediatric organized rhythms: A hemodynamic and outcomes analysis." *Resuscitation*. Morgan RW, Nadkarni VM, Wolfe HA, Berg RA, Sutton RM.

"Child Opportunity Index and Pediatric Intensive Care Outcomes: A Multicenter Retrospective Study in the United States." *Pediatr Crit Care Med*. Pinto NP.

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