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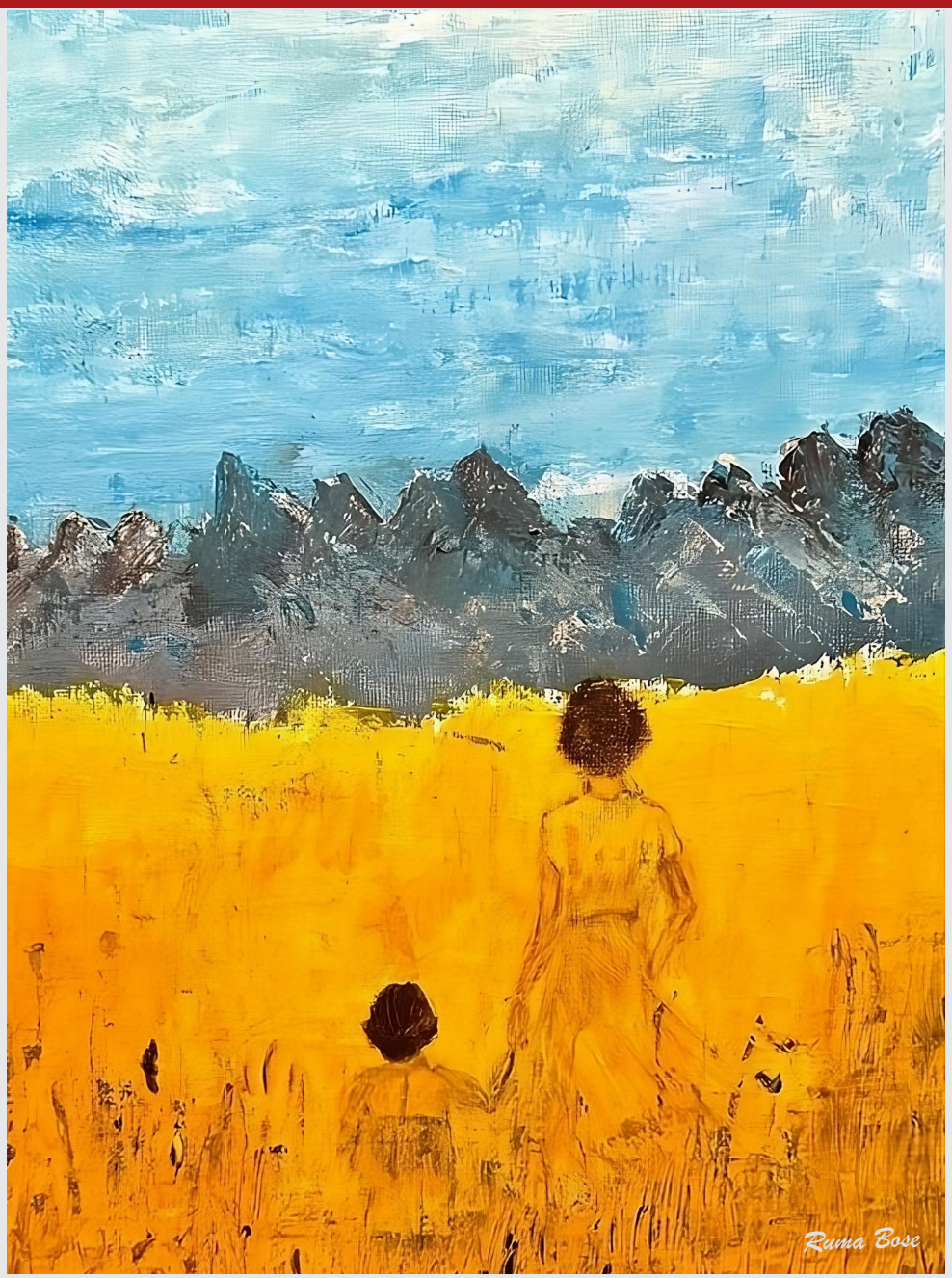
CLINICS IN MEDICAL EDUCATION

Docendo Discimus

[By Teaching We Learn]



INSIDE

Beth Israel Deaconess Medical Center

HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Department of Anesthesia, Critical Care and Pain Medicine

Center for Education Research, Technology and Innovation

Website Alert

We are excited to introduce our brand new website with this edition of the journal!

medicaleducationclinic.com offers the latest updates in research, academia, and pedagogy from the Department of Anesthesia, Critical Care and Pain Medicine at BIDMC. The site features extra content, interactive courses, quizzes, and a wide array of engaging resources. Click here to explore and enhance your learning experience!

Mentor / Mentee Collaborative Relationship: This process of reinterpretation closely mirrors the concept of mentorship. Like Van Gogh, drawing inspiration from *Millet*, a mentee learns from the experiences and knowledge of a mentor. The mentor provides the structure—the "black-and-white" foundation—and the mentee, through their own creativity, vision, and growth, adds their own colors, shaping the guidance they receive into something personal and uniquely their own.

Just as Van Gogh's paintings were not mere copies but individual works born from admiration and learning, so too is the relationship between mentor and mentee—a collaborative process where the mentor provides a framework, and the mentee develops their distinct path.

Nyansapo "Wisdom Knot": A symbol of wisdom, ingenuity, intelligence, and patience. The proverb associated with this Adinkra is "Nyansapo wosane no badwenma," to wit, "A wisdom knot is untied (only) by the wise."
https://www.adinkrasymbols.org/symbols/nyansapo/

COVER: Painting by Dr. Ruma Bose.

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CLINICS IN MEDICAL EDUCATION
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EDITOR'S WELCOME

We are thrilled to share our third issue of Clinics in Medical Education! This is an interactive anesthesia education journal that will deliver a summary of clinical and medical education directly to your mobile devices, ipads and computers. We are launching our website with this issue and look forward to hearing your suggestions and articles. Our aim is to provide unlimited educational resources to our residents and faculty.

Each month, we will present complex and unique cases to enhance your expertise featuring embedded live lectures, quizzes and rich visual aids including ultrasound images, CT scans, X-rays and interpretation of invasive and non-invasive monitoring.

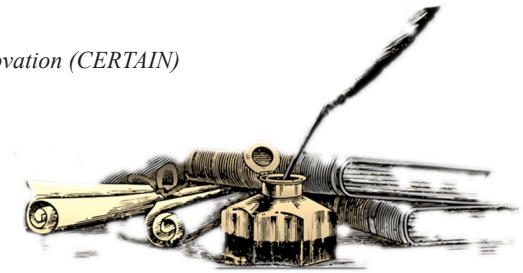
We hope you enjoy our third issue!

Robina Matyal

Robina Matyal, MD
Vice Chair, Education
Director of Center for Education Research, Technology and Innovation (CERTAIN)
Director of Vascular Anesthesia
Beth Israel Deaconess Medical Center

Leonard S. Bushnell MD, Chair in Anaesthesia
Beth Israel Deaconess Medical Center

Professor of Anaesthesia, Harvard Medical School



Feroze Mahmood, MD, FASE
Division Director Cardiac Anesthesia
Beth Israel Deaconess Medical Center

Professor of Anaesthesia, Harvard Medical School

Daniel S. Talmor, MD, MPH
Chairman, Department of Anaesthesia, Critical Care, and Pain Medicine
Beth Israel Deaconess Medical Center

Edward Lowenstein Professor of Anaesthesia, Harvard Medical School

OUR MISSION

- Empowering scholarly dialogue and advancing knowledge through rigorous research and insightful perspectives.
- Advancing medical education through effective teaching practices and ongoing mentorship.
- Fostering excellence in medical teaching through continuous innovation and professional growth.

"Providing strong support alongside challenging yet achievable tasks elevates mentees to new heights and strengthens their self-confidence."

Effective Mentorship: Strategies for Fostering Growth and Success in Medical Education

Robina Matyal, MD

Becoming an Effective Mentor

Establishing a successful mentor-mentee relationship requires careful planning, clear communication, and mutual commitment to both professional and personal growth. Here are key steps to creating a strong and productive mentoring relationship:

Define the Goals of the Mentorship

The goal of mentorship can range from providing feedback, bolstering communication and clinical skills, to something as simple as offering guidance on work-life balance. Ideally ,this relationship is lifelong and guides the mentee for career development.

Initial Meeting – Set Clear Expectations

In the first meeting, the foundation for the relationship should be laid out. This involves discussing the mentee's career aspirations, current challenges, and expectations from the mentoring process. It's important to define clear expectations around communication, time commitment, and areas to be covered. Key objectives of this meeting include:

- Building rapport and creating a comfortable space for open dialogue.
- Clarifying the goals and objectives of the mentoring relationship.
- Outlining mutual responsibilities and boundaries.
- Setting expectations for how feedback will be given and received.

Encourage Open and Ongoing Communication

A key component of a successful mentor-mentee relationship is open and ongoing communication. Establish preferred communication methods (in-person, virtual, email) and ensure that both parties feel comfortable initiating conversations. Regular check-ins help track progress and address any challenges or changes in goals. Open communication fosters trust and psychological safety, encouraging the mentee to seek guidance without hesitation.

Set Boundaries and Manage Expectations

Mentorship aimed at achieving personal and professional goals, such as pursuing advanced fellowships or securing job placements, requires a strategic approach. The mentor plays a critical role in guiding the mentee through this phase of their journey. The mentor should help the mentee define long-term career aspirations, including selecting fellowships and securing positions that align with their goals. This mentorship goes beyond general support, focusing on concrete steps that position the mentee for success in competitive fellowship programs and job markets.

Provide Feedback, Stimulate Growth and Foster Mutual Lerning

The mentor should provide constructive feedback—both positive and developmental—to help the mentee grow. Feedback should encourage reflection and learning. Instead of simply providing answers, mentors should guide the mentee in problem-solving and critical thinking. Schedule regular feedback sessions to ensure ongoing evaluation of progress.

Mentorship is a two-way street where both parties can learn from each other. While the mentee benefits from the mentor's experience and guidance, the mentor can gain fresh perspectives from the mentee. Encouraging a relationship of mutual respect and continuous learning helps both mentor and mentee grow.

Prepare for the Evolution of the Relationship

As the mentee progresses, the relationship will evolve. The mentee may become more independent, requiring less direct guidance but still benefiting from occasional check-ins. Discuss how the relationship may change over time and agree on a strategy for maintaining it after the mentee achieves their initial goals.

By following these steps, mentors and mentees can build a strong, productive relationship that promotes growth, learning, and mutual success. The mentor plays an instrumental role in supporting the mentee's long-term success by offering both practical guidance and professional mentorship.

Training and Development for Mentors

Mentors, particularly those new to mentoring, benefit from skills training. Participating in workshops, reviewing mentoring resources, and brainstorming ideas with other mentors can enhance their effectiveness. This investment in personal development ensures that mentors provide thoughtful, balanced, and tailored guidance to their mentees, resulting in a more meaningful and impactful mentoring experience.

Conclusion:

Effective mentorship requires a balance between support and challenge. According to Daloz (1986), mentors must not only provide guidance and encouragement but also push mentees beyond their current capabilities. Too much support without challenge can lead to stagnation, where the mentee feels comfortable but isn't making meaningful progress. Conversely, too much challenge without adequate support can overwhelm the mentee, leading to frustration and regression. The key to a productive mentor-mentee relationship is finding the middle ground, where mentors offer both encouragement and opportunities for growth. By setting positive expectations and providing constructive feedback, mentors can help mentees take on new challenges while ensuring they have the necessary resources and confidence to succeed. Providing strong support alongside challenging yet achievable tasks elevates mentees to new heights and strengthens their self-confidence.This balanced approach fosters a supportive environment that empowers mentees to develop professionally and reach their full potential.

Figure 1:The Daloz Model (1986) of support and challenge.

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"Lead the way in clinical education: where knowledge meets practice - Inspire, Guide and Empower."

PEDAGOGY IN EDUCATION

Do's and Don'ts of Intraoperative Teaching

Sara Neves, MD

In academic medicine the new year begins in the summer. New interns, residents, fellows, and faculty necessitate efficient teaching strategies. Trainees need to learn quickly, but new faculty need to be able to teach. It is a helpful time to review proven methods of effective clinical teaching and avoid bad teaching habits that undermine learning.

Here, we will briefly review key features of adult learning theory, recognize differences about teaching in the clinical environment as compared to the classroom, review effective teaching strategies and learn to avoid common pitfalls in clinical teaching.

Adult learners are typically characterized by the fact that they are largely more volitional and self-directed, in addition to having fully matured brain capacity. Effective adult learners are self-directed, have a readiness to learn and an intrinsic learning motivation. If we think about adult learning settings, they are ones in which the learner has chosen their environment—chosen to attend university, or pursue a particular career path, or train in a specific job. In contrast, child learners lack mature decision-making capacity and are in school settings which are mandatory with a prescribed curriculum that the students do not choose, impacting their motivation and readiness to learn. Additionally, adult learning tends to be driven towards problem solving and utilization of acquired knowledge, whereas child learners have not yet acquired much knowledge, so learning is more curriculum driven.

Where do our trainees fit in? Residency is a time of transition. Medical schools typically introduce adult learning techniques with problem-based teaching, flipped classrooms, and group discussions, but these opportunities are limited and constrained by a need to get many learners to acquire a significant amount of knowledge in a short period of time. As they progress through residency, we see more of the adult learner motivation. If we compare and contrast the medical school experience and residency training, we see key differences that define the goals of that educational environment.

Medical school still remains primarily curriculum driven, with many assessments (tests, Shelf Exams) and despite the incorporation of some active and adult learning techniques still follows the passive pedagogical model of education. This fits with the overall goal being the acquisition of large amounts of knowledge in four short years. In contrast, residency training is much more problem-based, with the learning bouncing around in a non-linear way, varying from learner to learner based on exposure and experience. The resident may apply principles of hemodynamic management in different ways in a pediatric case versus a cardiac case versus a neurosurgery case, yet this very much fits the goals of an adult learning environment, which is the active process of applying acquired knowledge to solve problems. Additional acquisition of knowledge is driven by the need to solve a particular problem (ie take care of the patient in front of the trainee) rather than to build a fund of knowledge in and of itself.

However, there is still a period of transition. Learners may be students on June 30th and doctors on July 1st, but they are not entirely prepared for the new learning environment or the expectations of adult learning that the training environment brings. They arrive from the high stakes high pressure environment of school where for 20 years they are exposed to the same style of education—being taught a topic, study that topic, take a test on that topic. Combining work with learning is entirely new, and the relative dearth of formal assessment (tests) leaves learners feeling unmoored and uncertain of how to proceed. Because trainees are adults, we make the mistake of expecting them to be adult learners, despite being in a more traditional education environment for much longer than other professionals their age. Instead, we should design the residency learning environment to grow trainees into adult learners. This necessitates a different approach.

The clinical teaching environment, especially in anesthesiology can prove challenging to these learning goals. The perioperative space is high stakes, with considerable production pressure and limited teaching time, prioritizing efficiency, and can be overwhelming with data and tasks. In addition, the teacher-learner relationship—the strength of which is critical to effective education—can be difficult to build when faculty change day to day and have attention split between supervising trainees in multiple operating rooms.

Challenge	Do	Don't
Limited Rapport	- Use day-before discussion	- Don't assume the worst
	- Check in with your resident	- Don't let 1, 2, 3 things ruin the day
	- Support them in front of patients, staff	- Don't forget your surroundings
High Stakes Environment	- Find the right time	- Don't use a difficult environment to avoid teaching altogether
	- Set expectations about teaching during the case	- Don't miss an opportunity for teaching the day before
	- Use a high stakes moment for teaching later	
Limited Time	- Use day-before discussion	- Don't forget that working under pressure is a teaching point too!
	- Earmark topics for later	- Don't sabotage your resident — if they are worried about being prepared, they can't pay attention
Overstimulated Environment	- Take over monitoring the patient when teaching	- Don't try to teach during high intensity moments for your resident
	- Choose a few high-yield teaching points	
	- Be aware of your learner's level	

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"Every case is a teaching moment; let's transform each challenge into a lesson learned."

PEDAGOGY IN EDUCATION

Inside the Operating Room: Expert Tips for Educators

Dario Winterton, MD
Aidan Sharkey, MD

The following is a summary of the lecture/video podcast on intraoperative teaching given as part of the Education Scholarship CME program. The lecture was inspired and based on a recent article by Thompson and Brag1. You can access the full recording of the session here: https://vimeo.com/1008133397

Introduction

Teaching in the operating room (OR) poses several unique challenges due to the high-stakes environment where patient safety is the top priority. Despite these challenges, attending anesthesiologists must find ways to ensure that residents gain essential hands-on experience. This balance is difficult but necessary, particularly during critical moments of patient care. Effective OR teaching strategies can help mitigate these difficulties while maintaining a focus on resident education and patient safety.

Challenges of OR Teaching

The OR is a fast-paced, high-pressure environment where **patient care takes precedence** over teaching. This is particularly evident during high-risk or time-sensitive procedures, where balancing education and efficiency can be difficult. Additionally, **time and production pressure** in the OR is constant, and teaching can sometimes disrupt the flow of the procedure, leading to conflicts between educational goals and efficiency.

For **less experienced residents**, the complexity of surgeries combined with the rapid influx of information can result in **cognitive overload**, making it harder to focus on both the task at hand and new learning. Furthermore, the OR is **full of distractions** - from urgent clinical needs to equipment noise - making it difficult for residents to concentrate on instruction.

Another challenge is the **wide range of experience levels among residents**, requiring instructors to tailor their teaching to individual needs while managing the complexities of the case. Additionally, **high-stress situations** frequently arise in the OR, particularly during critical phases such as airway management or hemodynamic instability, which are not ideal moments for detailed instruction but often contain valuable lessons.

Given the **limited downtime for teaching**, residents may struggle to find moments to absorb new information during long or complex procedures. Attending physicians are also required to **observe and supervise multiple tasks simultaneously**, which can limit their ability to give residents the autonomy they need to develop their skills. Finally, the OR's **team-based environment** often demands clear communication and coordination, and managing the team can sometimes overshadow teaching opportunities.

Effective Teaching Strategies in the OR

Despite these challenges, attending physicians can adopt several strategies to effectively teach in the OR:

- **Set clear learning goals and context** before the procedure. Communicating specific objectives helps residents focus on key concepts that are directly relevant to the case. For instance, in a complex procedure like an open AAA repair, a resident can focus on critical tasks such as induction and vascular access.
- **Tailor teaching to the resident's experience level** by assessing their knowledge base and adjusting the complexity of teaching accordingly. Less experienced residents should first grasp foundational concepts, while more advanced residents can be exposed to intricate aspects of the surgery.
  - **Balance autonomy with supervision** by assigning specific tasks to residents while remaining available to intervene if needed. This hands-on approach allows residents to build confidence without compromising patient safety.
- **Provide real-time feedback and encourage reflection**. Immediate, actionable feedback after a task reinforces correct actions and corrects mistakes. Asking reflective questions like "What would you have done differently?" promotes critical thinking and self-awareness.
- **Use probing questions to challenge residents' thinking.** For example, during a procedure, asking "What would you do if the blood pressure dropped after cross-clamping?" encourages residents to apply their knowledge and problem-solving skills.
- **Time teaching moments appropriately** by using natural pauses in the procedure to discuss important concepts without disrupting the surgical flow. This ensures that teaching does not compromise the efficiency of the operation.
- **Encourage self-directed learning** by suggesting post-procedure readings and encouraging reflection on the case. This fosters continuous learning and allows for deeper engagement with the material.
- **Use the "teach-back" method** by having residents explain a concept or procedure in their own words. This technique reinforces learning and highlights any knowledge gaps that can be addressed immediately.
- **Focus on a few key learning points** to avoid overwhelming residents with too much information. Concentrating on 2-3 essential points per case helps residents absorb critical concepts without cognitive overload.
- **Encourage self-assessmnt** by prompting residents to reflect on their performance with questions like "What went well?" and "What could be improved?" This self-reflection fosters responsibility for learning and encourages continuous development.
- **Demonstrate flexibility and adaptation** by being open to different approaches suggested by residents. Encouraging them to implement their ideas under supervision promotes creativity and critical thinking.

Conclusion

Teaching in the OR is a delicate balance of patient safety and resident education. By applying evidence-based strategies, attending physicians can create a learning environment that not only fosters resident growth and confidence but also maintains the highest standards of patient care. The ability to provide immediate, tailored, and reflective feedback ensures that residents can develop their skills effectively while contributing to patient safety and team-based care in the OR.

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A Bioethics and Professionalism Curriculum Framework for Anesthesiology Training Programs – PART TWO

Shahla Siddiqui, MD
Altan Marvi

Goals of ethics and professionalism curricula

Although medical ethics and professionalism teaching may be done in differing ways, there is a need for more standardization in the curriculum and in evaluation and long-term outcome assessment. It is suggested in literature that a well-designed curriculum not only enhances the learning experience but also ensures that learners acquire the necessary knowledge and skills in a structured and efficient manner.[1] Making ethical competence learning possible, as well as having emotional awareness of one's own thoughts, biases and perceptions, and upholding a patient's best interests and autonomy are important aspects when seeking to increase the understanding and management of ethical problems in everyday clinical work. It has been suggested that through rigorous ethical teaching, debate and discussion of clinical contexts in an interdisciplinary manner, the focus of such a curriculum should be expansion of 'cognitive knowledge, behavioral skills, and development of a professional character.'[1]

In a review of ethics curricula and needs assessment, there was a preponderance of ethical topics related to a patient's right to self-determination.[1]

1. In **designing a curriculum**, the initial key points to consider should be as outlined in the table below:

Key themes	Sub themes
Create conditions for learning	Making ethical competence learning possible
Design strategies for learning	
Interact with others	
Visualize attitudes and approaches	Having awareness of one's own thoughts and perceptions
Experience emotional conditions	
Manage emotions and tensions	Doing right by the patient's best interests
Manage different perspectives in a situation	

Table 1. Curriculum themes

Broad objectives

Step 1: Define clear objectives,

Step 2: Conduct a needs assessment: survey residents, fellows, nursing, patients and faculty,

Step 3: Organize content systematically, and involve other fields such as ethics, social work and nursing,

Step 4: Choose appropriate instructional methods: lectures, case discussions, role play, debate, journal club, simulation,

Step 5: Develop assessment strategies: such as OSCE or role play,

Step 6: Integrate innovation and technology, such as virtual reality, and artificial intelligence if possible.[1]

2. Secondly, the **content** included should be carefully considered and based on evidence in literature as well as local requirements, such as hospital culture, state and federal laws and cross-cultural considerations. Such an integrative systematic review by Pence et al, provides insights into ethics education for healthcare professionals, students, and educators. The results show that ethical competence learning is essential when seeking to draw attention to and deal effectively with ethical problems.

Healthcare professionals and students in clinical practice need a supportive learning environment in which they can experience a conducive climate for reflection on ethical challenges, conflicts, or

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"Ethics training: Where knowledge meets conscience to guide responsible action."

dilemmas that influence everyday healthcare work. The design and course content of ethics education meant to increase the understanding and management of ethical problems in clinical practice should be interdisciplinary and interactive. Input from supportive teams such as nursing and social work would be vital in the success of such education.[1]

Prior studies have identified certain areas to focus on but they need to be validated in the local setting. In the perioperative scenario, the topics that could commonly be experienced include, but are not limited to (Table 2):

Tip	Description
Set Clear Expectations	Define mentor-mentee roles clearly and ensure mutual understanding of responsibilities.
Be Aware of Cultural and Gender Issues	Understand the influence of gender and cultural differences, and create an inclusive environment.
Balance Support and Challenge	Provide both emotional support and constructive challenges to encourage growth.
Provide a Forum for Mentors	Allow mentors to discuss uncertainties and share solutions with peers.
Maintain Professional Boundaries	Stay mindful of boundaries, referring mentees to specialists for personal issues when necessary.
Provide Mentoring for Mentors	Senior mentors need guidance and support to continue developing their mentoring skills.
Recognize Mentors	Publicly acknowledge the contributions of mentors to the institution's success.
Reward Mentors	Offer incentives such as conference funding or promotion opportunities to mentors.
Allocate Protected Time	Ensure mentors have protected time dedicated to mentoring, without additional workload.
Support Mentors with Resources	Provide access to professionals like counselors or psychologists to assist in complex situations.
Encourage Peer Mentoring	Create a system where peers mentor each other, fostering collaboration and support.
Continuously Evaluate Mentorship	Regularly assess mentoring relationships and programs for effectiveness, and make improvements.

Among programs in medical ethics and professionalism, the Harvard Medical School program offers a holistic curriculum focused on *Equity and Anti-Racism, Professionalism, Cultural Humility and Structural Competence, Community Engagement and Learning, Advocacy and Activism, as well as Interprofessional Education.*

In addition, among the pedagogy theories is the Learning Triangle[1] which represents the 'self-organizing process that occurs when individuals bring together their theoretical knowledge and challenges with their practical knowledge and challenges to produce new learning.' This interplay of **learner, teacher and knowledge** can produce an interactive progression from *novice to expert* and with a goal to create a respectful, reciprocal, reflective dialogue on teaching and learning.

3. Tools for teaching could include the following proven interactive interprofessional education (IPE) methods: Lectures, debates, simulations, roleplay etc.

4. Tools for assessment of milestones achieved will need to adhere to current standards of ACGME and departmental requirements. Longitudinal assessment and 360-degree appraisals from teams and patients would also be counted.

Conclusion:

Further studies on ethics education are needed. Comparative research, through which different educational designs can illuminate what provides the best possible learning process for managing ethical problems, would be valuable. Intervention studies aiming to maintain and protect the autonomy of patients with impaired decision-making capabilities may also be warranted. Another interesting area for further study is about the educators and their competencies in ethics education, with a special focus on the requirements for such competence. Further research could be used to develop healthcare professionals' and students' readiness and capabilities to recognize and respond appropriately when they encounter ethically problematic situations. This would, in turn, give healthcare professionals and students a sense of self-confidence in their everyday clinical practice.

The Concept of the Physiologically Difficult Airway

In critical care settings, airway management presents unique challenges, especially when patients exhibit **physiological derangements** that exacerbate complications during intubation. The term "**physiologically difficult airway**" refers to patients whose underlying medical conditions make intubation riskier, potentially leading to life-threatening outcomes such as hypoxemia, hypotension, or cardiac arrest. Traditional guidelines for difficult airway management primarily focus on anatomical challenges, but they often overlook these significant physiological considerations.

Physiological Factors Affecting Airway Management:

1.**Hypoxemia**: Patients with poor oxygen reserves, such as those with acute respiratory distress syndrome (ARDS) or chronic lung disease, are at heightened risk of rapid oxygen desaturation during intubation. Preoxygenation techniques become crucial for extending safe apnea time, reducing the likelihood of severe oxygen depletion.

2.**Hypotension**: Intubation can precipitate hypotension, especially in patients already experiencing shock or heart failure. Peri-intubation hypotension increases the risk of mortality and organ failure, making preemptive hemodynamic management essential.

3.**Right Ventricular Dysfunction**: Positive pressure ventilation can exacerbate right ventricular failure, increasing the likelihood of hemodynamic collapse.

4.**Severe Acidosis**: Patients with severe metabolic acidosis, such as those in diabetic ketoacidosis, are highly vulnerable to respiratory collapse when ventilatory requirements exceed mechanical support capabilities.

Click here to read the article.

Strategy	Description
Preoxygenation	- Head-up, ramped, or reverse-Trendelenburg positioning to improve oxygenation and decrease aspiration risk
Apnoeic Oxygenation	- Use apnoeic oxygenation techniques and minimize apnoea time
Rapid Sequence Intubation	- Should be considered in all patients with high risk of pulmonary aspiration
Delayed Sequence Intubation	- May be considered to maximize preoxygenation in agitated patients
Drugs	- Consider etomidate or ketamine in patients with hemodynamic instability (e.g., hypotension, shock, right ventricular dysfunction)
	- If propofol is used, reduce and carefully titrate the dose in critically ill patients
	- Neuromuscular blocking agents improve first-attempt success
Type of Laryngoscopy	- Video laryngoscopy increases first-pass success and should be the device of first choice
	- Awake fiberoptic intubation with topical anesthesia should be considered for patients with a high risk of anatomically difficult airway or clinical deterioration (e.g., refractory hypoxemia, metabolic acidosis)
Hemodynamic Optimization	- Perform hemodynamic assessment with bedside ultrasound
	- Administer fluid resuscitation in hypovolemic patients
	- Use vasopressor perfusion if unresponsive to fluids or at risk of fluid overload
	- Consider diluted ephedrine, phenylephrine, or epinephrine boluses administered peripherally to counteract the decrease in vascular tone induced by anesthetic agents
	- In patients with right ventricular dysfunction, consider pulmonary vasodilators to decrease pulmonary pressures and afterload
ECMO Cannulation	- Consider ECMO cannulation in patients in shock

Check out our interactive quiz

Click here.

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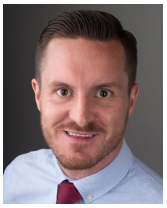
Cardiovascular Physiology Workshop for Harvard Medical Students

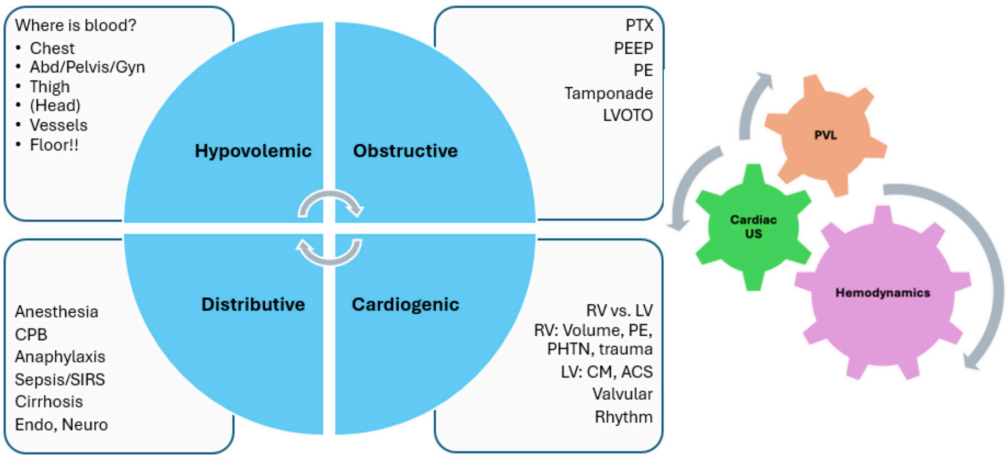

Mona Hedayat, MD,
Aidan Sharkey, MD
Maria Borelli, MD

"Integrated and dynamic teaching of cardiovascular physiology using cardiac ultrasound and AI-based tools"

A systemic framework for teaching cardiovascular physiology and pathophysiology is most powerful when integrating inextricably linked cardiovascular anatomy and physiology with hemodynamics. The gap in teaching cardiovascular physiology to medical students often lies in (1) integrating theoretical knowledge with its clinical application in clinical settings; (2) incorporating the latest technological advancements, such as cardiac ultrasound and simulation models, into the curriculum; (3) developing practical skills, such as performing cardiac ultrasound and interpreting data obtained from invasive hemodynamic monitoring; and (4) providing varied teaching methods to accommodate the diverse learning styles of medical students, such as incorporating hands-on experiences, visual aids, and interactive technologies, amongst others.

We hold quarterly three-part cardiovascular physiology workshops for second and third-year medical students rotating in their surgical clerkships. The main goal of these workshops is to help medical students develop the pattern recognition skills necessary to formulate the diagnosis, suggest therapeutic interventions, and monitor the patient's response more confidently. During these three-part workshops, we have integrated three modalities (Harvi, Cardiac US, invasive hemodynamic monitoring

Hypotension / Shock Differential Diagnosis

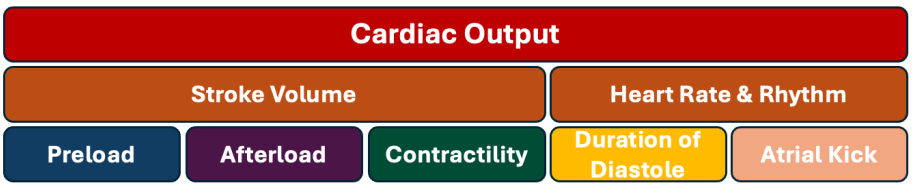


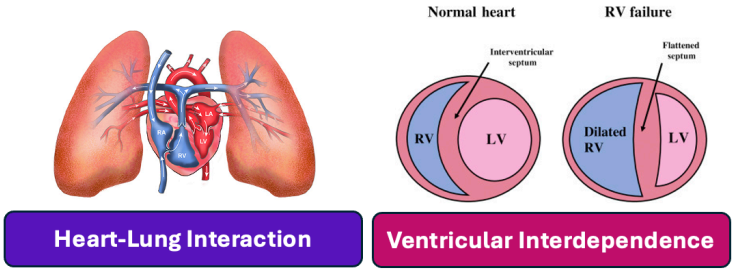
systems) to review normal cardiovascular physiology and high-yield cardiovascular pathologies in a case-based learning approach. The complex cardiovascular physiology concepts are reviewed using Harvi (an interactive, dynamic, simulation-based platform) to help trainees conceptualize the connection between the changes in the various fundamental parameters (preload, afterload, and contractility) and the effect on measurable clinical parameters (including pressures, flow, and end-organ perfusion) through the window of the ventricular-pressure volume diagrams. The students are introduced to a step-wise approach to goal-directed cardiac ultrasound to evaluate anatomical structures and hemodynamics, including machine preparation, patient preparation, and recommended sequences. Additionally, the trainees become familiarized with commonly used invasive hemodynamic monitoring systems, including pulmonary artery catheters, addressing the knowledge gap in understanding the fundamental principles of hemodynamic data acquisition and quantitative and qualitative analyses of hemodynamic waveforms in normal individuals and various cardiovascular disorders.

Hands-on simulations were a central feature of the day, allowing participants to engage with temporary pacemakers in real-time scenarios. This practical experience was complemented by **interactive digital quizzes** to test the fellows' knowledge in real-time, ensuring that core concepts were understood. One such quiz focused specifically on the **management of temporary pacemakers**, providing immediate feedback and learning opportunities.

The focus on real-time assessments, with interactive tools such as **quizzes, tutorials, and practical simulations**, created a dynamic and immersive learning environment. The faculty members fostered not only technical skill development but also **critical thinking**, encouraging attendees to reflect on the complex challenges they face in the operating room when managing patients with advanced cardiac devices. This Grand Rounds workshop offered a valuable learning experience, building confidence in the **perioperative management of patients with temporary pacemakers**, ensuring that BIDMC anesthesia fellows are well-prepared to handle these complex cases in their clinical practice. This workshop was a vital part of the Grand Rounds program, ensuring the ongoing professional development of physicians who handle the complexities of **cardiac device management** in high-stakes surgical settings.

Determinants of Cardiac Output





CO = SV x HR
CI = CO/BSA

Since its launch in March 2024, our educational initiative has been a resounding success. We have completed three sets of workshops (totaling nine sessions) for approximately 30 medical students, all of whom have benefited from our unique approach to teaching cardiovascular physiology.

Anesthesia Grand Rounds Spotlight: "Intraoperative Management of Patients with Cardiac Devices"




Maurizio Bottiroli, MD
Sankalp Sehgal, MD
Jamel Ortoleva, MD
Nadav Levy, MD

We are excited to announce that the Center for Education Research, Technology and Innovation held its second 'Education of Educators' program on September 18, 2024. This workshop on "**Intraoperative Management of the Patients with Cardiac Devices**" was aimed at enhancing the practical knowledge of anaesthesiologists and medical staff in the **perioperative management of cardiac devices** such as **temporary pacemakers.**

Click each to view learning materials

1. Introduction to Workshop
2. Temporary Pacemakers
3. Management of Temporary Pacemakers
4. Temporary Pacemakers: An Interactive Quiz

Drs. Maurizio Bottiroli, Sankalp Sehgal, Jamel Ortoleva, and **Nadav Levy** conducted the hands-on workshop with stations designed to simulate real-world challenges to give participants the opportunity to manage complex cardiac devices in a controlled environment.

The interactive workshop began with an **introductory session** led by **Dr. Maurizio Bottiroli**, followed by a series of highly engaging and informative teaching sessions.
Hands-on simulations were a central feature of the day, allowing participants to engage with temporary pacemakers in real-time scenarios. This practical experience was complemented by **interactive digital quizzes** to test the fellows' knowledge in real-time, ensuring that core concepts were understood. One such quiz focused specifically on the **management of temporary pacemakers**, providing immediate feedback and learning opportunities.

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ARTICLES | REVIEWS | GUIDELINES

In Situ Simulation for Less Common but Critical Conditions.

Featured: Autonomic Dysreflexia (AD)

Nadav Levy, MD
Lior Levy, MD
Adil Al-Karim Manji, MD
Peva Gbagornah, MD
Dario Winterton, MD
Shireen Saeed, MD

One of our recent Thursday in situ simulation scenarios focused on a critical but preventable complication of spinal cord injury (SCI) — autonomic dysreflexia (AD), also known as autonomic hyperreflexia. The patient in the scenario is a young, otherwise healthy male with a T4 SCI resulting from a car accident a few years ago. He has a neurogenic bladder with clots and is scheduled for a cystoscopy with continuous irrigation. Due to his lack of sensation below T4, the attending anesthesiologist opted for MAC (Monitored Anesthesia Care) sedation. The case was then handed over to a resident, and the urologist began the procedure.

Suddenly, the patient's blood pressure surged to **220/110**, and his heart rate dropped into the **40s**—classic signs of an AD crisis. This is a perfect example of a preventable AD episode. Our residents promptly instructed the surgeon to stop the stimulus, administered **nicardipine** (0.2-0.5 mg IV bolus, followed by an infusion of 2.5-15 mg/hr if needed), and halted the sedation to assess neurological function. The team then proceeded with general anesthesia using an endotracheal tube (ETT), taking care to avoid **succinylcholine**, which is contraindicated in SCI patients after 48 hours post-injury.

Autonomic dysreflexia occurs in up to **85% of patients** with SCI above the T6 level. It is characterized by an exaggerated sympathetic response to stimuli below the injury site, most commonly a distended viscus (e.g., bladder, intestines, or cervix). Sensory input travels through intact peripheral nerves and triggers a massive sympathetic surge, causing vasoconstriction—especially in the splanchnic vasculature—leading to severe hypertension. Baroreceptors in the neck signal the brain, but due to the SCI, parasympathetic inhibitory impulses cannot travel below the injury. The result is a mismatch: **parasympathetic overflow above the lesion** (reactive bradycardia, flushing, headache, sweating) and **unopposed sympathetic tone below the lesion** (hypertension, dysrhythmia, goosebumps, cold, pale skin). Severe cases of AD can lead to life-threatening conditions such as myocardial ischemia, sinus arrest, intracranial hemorrhage, and seizures.

Key Management Steps for Autonomic Dysreflexia:

- **Stop the stimulus immediately**.
- **Position the patient with the head elevated**.
- **Treat hypertension** with vasodilators like nicardipine, nitroglycerin, or nitroprusside for severe cases.
- **Deepen anesthesia** to prevent further episodes.

Preventing AD is key. Although SCI patients may not feel pain, sensory input from the viscera must be suppressed to avoid AD crises. Neuraxial anesthesia is often the preferred option for urologic procedures. If this is not possible, a deep general anesthetic is required—MAC sedation is insufficient.

During our post-simulation debrief, we discussed another high-risk patient population: **pregnant women with SCI**. AD can occur due to distention of a hollow viscus, including the uterus. AD is

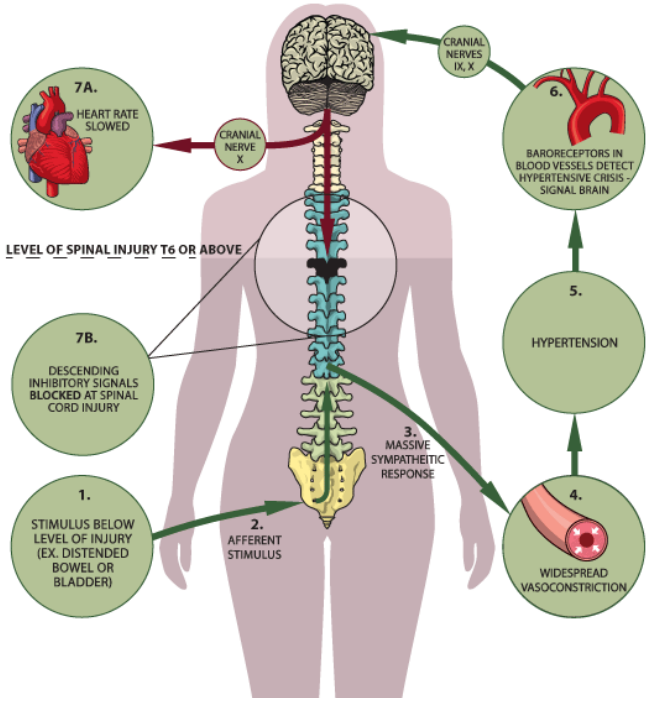


Figure 1 showing features of AD, adapted from *Spinal Cord Injury Zone*

most likely to arise during labor, particularly during cervical exams, the use of constrictive clothing or devices, fundal massages, and uterine contractions. In addition to severe maternal hypertension and cardiac arrhythmias, uteroplacental vasoconstriction can result in **fetal hypoxia** and bradycardia. It is critical to distinguish AD-induced hypertension from preeclampsia. While AD-associated hypertension typically improves between contractions, proteinuria is not expected in AD but may be present in preeclampsia. However, a new headache combined with severe hypertension may point towards preeclampsia.

For pregnant SCI patients, an **early anesthesia consultation** is recommended, along with the involvement of a **multidisciplinary team**. Even though these patients may not feel pain below the T6 level, neuraxial anesthesia can prevent AD and be lifesaving for both mother and baby. Early epidural administration by an experienced provider is recommended, despite potential technical difficulties due to the SCI. Neuraxial anesthesia can also be used postpartum. While vaginal delivery with forceps or vacuum assistance is possible if AD is well-controlled, **cesarean delivery** is the preferred option for around **68-69%** of these patients. When appropriate, **spinal anesthesia** is better at controlling AD compared to epidurals, which may not provide adequate sacral coverage or may be patchy due to spinal deformities.

In cases of severe hypertension in labor, treatment options include **sublingual or IV nitroglycerin,** or **nicardipine**. However, caution is advised as these drugs can reduce uterine tone, increasing the risk of hemorrhage. **Nitroprusside** should only be used as a last resort due to the risk of fetal cyanide toxicity. For less acute hypertension, **hydralazine, labetalol, or oral nifedipine** are appropriate options.

In conclusion, AD is a life-threatening condition that anesthesiologists must understand, prevent, and treat—especially in SCI patients. By recognizing the signs, stopping the stimulus, and providing appropriate anesthesia, we can significantly reduce the risk of this dangerous complication.

Further reading:

1. Allen KJ, Leslie SW. Autonomic Dysreflexia. [Updated 2023 May 30]. In: *StatPearls* [Internet].
2. Balik V, Šulla I. Autonomic Dysreflexia following Spinal Cord Injury. *Asian J Neurosurg.* PMID: 36120615
3. Soh SH, Lee G, Joo MC. Autonomic dysreflexia during pregnancy in a woman with spinal cord injury: a case report. PMID: 31187679

DIVISION CORNER

A case of elective aortic aneurysm repair with post-operative complications

Matthew H. Gao, DO
Jacopo Colombo, MD

Background:

A 76-year-old male with a history of hypertension, hyperlipidemia, diabetes mellitus, and heart failure with reduced ejection fraction (HFrEF) underwent an elective open abdominal aortic aneurysm (AAA) repair. The procedure was managed under general anesthesia with thoracic epidural anesthesia and continuous invasive monitoring, including an arterial line and central venous lines. A suprarenal aortic clamp was applied for 30 minutes, and there was significant blood loss of 3.5 liters. The patient received 4 liters of Plasma-Lyte, 4 units of RBCs, 2 units of FFP, and 300 cc from a cell saver, with 350 cc of urine output recorded. Postoperatively, he was extubated without complications, had satisfactory pain control, and was monitored in the PACU overnight with 1200 cc of lactated Ringer's solution and periodic phenylephrine infusions.

Complication:

The following day, he complained of shortness of breath, and his oxygen requirements escalated. To evaluate the cause of his hypoxia and hypotension, a chest X-ray and ultrasound were performed.

Diagnosis:

Click here to view interactive case.

1.Cardiogenic Pulmonary Edema:

This type is caused by increased pressure in the pulmonary capillaries due to elevated cardiac filling pressures, usually resulting from left ventricular dysfunction (e.g., heart failure, mitral valve disease, or acute myocardial infarction). The heart's inability to pump blood effectively leads to fluid backing up into the lungs, causing fluid accumulation in the alveolar spaces.

Radiographic Feature	Cardiogenic Edema	Noncardiogenic Edema
Heart size	Normal or greater than normal	Usually normal
Width of the vascular pedicle	Normal or greater than normal	Usually normal or less than normal
Vascular distribution	Balanced or inverted	Normal or balanced
Distribution of edema	Even or central	Patchy or peripheral
Pleural effusions	Present	Not usually present
Peribronchial cuffing	Present	Not usually present
Septal lines	Present	Not usually present
Air bronchograms	Not usually present	Usually present
Overall pattern of B-lines	Symmetrical, bilateral, gravity dependent (i.e. worse at the dependent areas)	Asymmetrical (patchy)
Spared areas of normal lung?	If mild or improving with treatment, the apices may be spared	Spared areas of normal lung alternate with diseased areas
Lung sliding	Often enhanced (pleural transudate decreases friction)	Often reduced or absent ('sticky' pleural exudate increases friction)
Pleural line	Smooth	Often irregular (due to microconsolidations)
Areas of consolidation	Absent (unless coexistent disease)	Present

2. Non-Cardiogenic Pulmonary Edema:

- In this type, fluid leaks into the lungs due to increased permeability of the alveolar-capillary barrier, often without elevated cardiac pressures. Common causes include acute respiratory distress syndrome (ARDS), sepsis, trauma, inhalation injury, or severe infections. Unlike cardiogenic pulmonary edema, the heart is usually not the primary culprit in this form of edema. Each type requires different management approaches based on the underlying etiology. The table highlights radiographic differences between cardiogenic and noncardiogenic pulmonary edema.

Treatment in this case would be:

1. **Positioning**
   Sit the patient up to reduce pulmonary congestion and facilitate breathing.
2. **Oxygen Therapy:**
   Administer high-concentration oxygen (e.g., 60%) to improve oxygenation and alleviate hypoxemia.
3. **Monitoring:**
   Implement continuous monitoring of cardiac rhythm, blood pressure (BP), and oxygen saturation to assess patient status and detect any deterioration. Perform serial cardiac and lung ultrasounds to assess prognosis.
4. **Nitrate Therapy:**
   Administer intravenous (IV) infusion of nitroglycerin.
5. **Diuretic Therapy:**
   Administer a loop diuretic such as furosemide 50–100 mg IV to reduce fluid overload and relieve pulmonary congestion.
6. **Noninvasive Ventilation:**
   Initiate continuous positive airway pressure (CPAP) if respiratory distress persists.
7. **Inotropic Agents:**
   Consider using inotropic agents, especially in patients with hypotension, to improve cardiac output and tissue perfusion.

Mechanical Ventilation:

- Initiate mechanical ventilation if noninvasive ventilation fails, or the patient shows signs of respiratory failure.

Intra-Aortic Balloon Pump (IABP):

- Consider the insertion of an intra-aortic balloon pump, particularly if myocardial ischemia is a contributing factor to the pulmonary edema.

References:

Ralston, S. H., Penman, I. D., Strachan, M. W. J., & Hobson, R. (Eds.). (2018). *Davidson's principles and practice of medicine* (23rd ed.).

DIVISION CORNER

Case Scenario: Use of the SALVATION algorithm to manage perioperative hypoxia and hypotension



Robina Matyal, MD
Feroze Mahmood, MD
Shirin Saeed, MD

Background:

A 54-year-old male with a medical history of chronic obstructive pulmonary disease (COPD) and coronary artery disease (CAD) underwent tracheomalacia repair surgery. Prior to surgery, a stent was placed. Anesthesia was maintained with propofol and remifentanil. Postoperatively, the patient was transferred to the post-anesthesia care unit (PACU), where Sugammadex was administered for neuromuscular reversal

Complication:

Approximately 30 minutes after arriving in the PACU, the patient experienced sudden desaturation from 98% to 88% and a drop in blood pressure to 80/50 mmHg. The anesthesia team responded using the SALVATION algorithm, a stepwise approach to managing perioperative hemodynamic instability.
SALVATION (Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension Algorithm) Application:

Step 1: Contractility and Afterload Evaluation

The team begins by evaluating cardiac function using a focused transthoracic echocardiogram (TTE). The examination reveals a hyperdynamic left ventricle (LV), with no signs of major cardiac abnormalities, ruling out a primary cardiac cause for the hypotension.
No pericardial effusion or tamponade is noted, and the ventricular contractility appears stable. However, increased afterload in the right ventricle (RV) is observed, pointing toward a possible pulmonary issue contributing to the patient's instability.

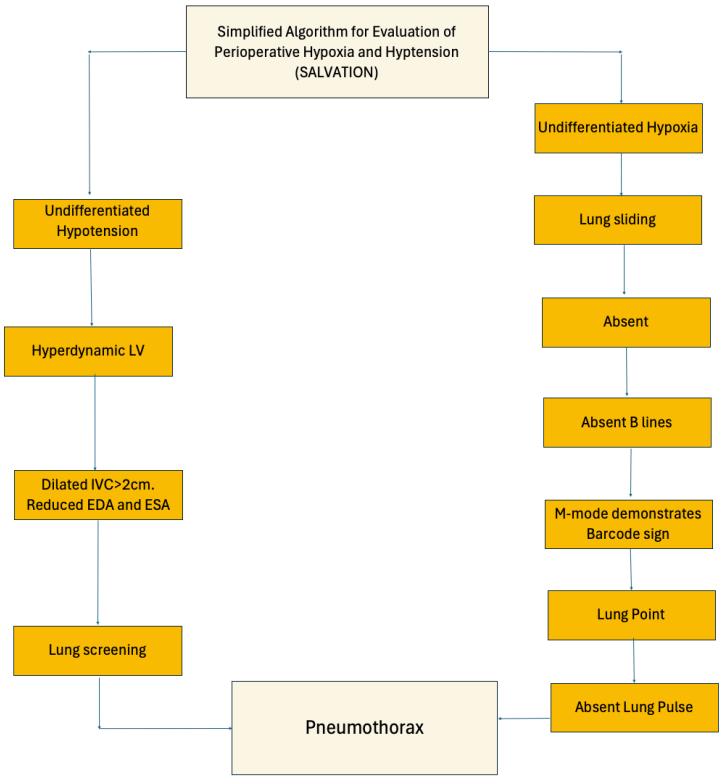
Step 2: Preload Evaluation

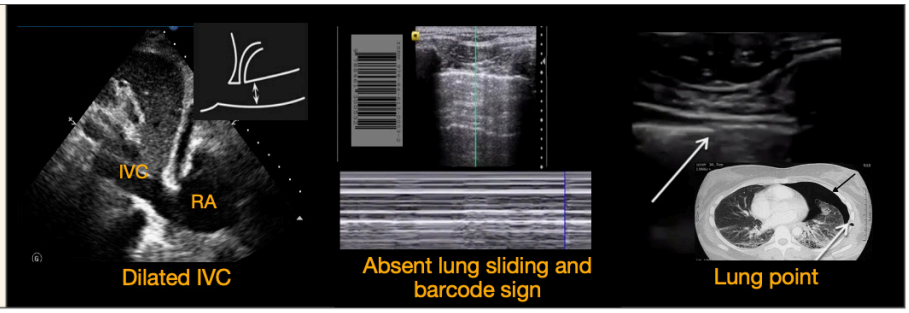
Next, the team assesses the patient's preload by performing an ultrasound evaluation of the inferior vena cava (IVC). The IVC is found to be distended with minimal respiratory variation, suggesting the patient is not hypovolemic. There is no evidence of fluid overload, and pericardial effusion is excluded as a potential cause of the hypotension.

Step 3: Hypoxia Evaluation

With preload and cardiac contractility deemed stable, the team turns its focus to the cause of hypoxia. A lung ultrasound is performed, showing absent lung sliding on the right side, along with prominent A-lines and absent B-lines. These findings, along with the identification of a lung point (the junction between normal lung sliding and absent sliding), confirm the diagnosis of a right-sided pneumothorax.

Click here to view ultrasound.



Tension pneumothorax	• Fixed, dilated IVC
	• Hyperdynamic RV
	• Lung ultrasound:
	  • Absent lung sliding
	  • Absent B-lines
	  • Prominent A-lines
	  • Lung point
	  • Absent lung pulse (left)
		

D - Intervention:

The anesthesia team acts swiftly to treat the confirmed pneumothorax. They perform a needle decompression on the right side, followed by the placement of a chest tube to allow for continuous drainage. Following this intervention

•The patient's oxygen saturation quickly improves, rising from 88% back to 98%.

•Blood pressure stabilizes, increasing from 80/50 mmHg to 110/70 mmHg.

•Peak airway pressures, which had been elevated, return to normal limits, indicating relief of the pulmonary pressure from the pneumothorax.

The patient is transferred to the ICU for postoperative monitoring, with continued chest tube drainage. Special attention is given to the patient's respiratory status due to his underlying COPD and the recent pneumothorax. He remains in the ICU for close observation to ensure stable breathing and to monitor for any recurrence of pneumothorax or other complications.

Conclusion:

This case highlights the effectiveness of using the SALVATION algorithm to systematically evaluate postoperative complications. In this instance, early identification and intervention of a right-sided pneumothorax using the SALVATION approach helped prevent further deterioration in a patient with pre-existing COPD and coronary artery disease.

References

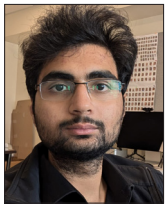
1. Fatima H, Amador Y, Walsh DP, Qureshi NQ, Chaudhary O, Mufarrih SH, Bose RR, Mahmood F, Matyal R. Simplified Algorithm for Evaluation of Perioperative Hypoxia and Hypotension (SALVATION): A Practical Echo-guided Approach Proposal. *J Cardiothorac Vasc Anesth.* PMID: 34006466

E-LEARNING CORNER

“Reaching new heights”: E Journal Club Initiative

Feroze Mahmood, MD
Adil Al-Karim Manji, MD
Usman Ahmed, MD





We are excited to introduce a new initiative—an e-journal club—Drs. Feroze Mahmood, Usman Ahmed and Adil Al-Karim Manji have developed, utilizing the Reach 360 platform. This innovative program is tailored specifically for the cardiac division of the Anesthesia Faculty at BIDMC. The primary goal of the e-journal club is to foster an engaging, collaborative, and intellectually stimulating environment that promotes continuous education and professional growth within our faculty.

Each week, a carefully selected, peer-reviewed article will be presented to the group, focusing on the latest advancements, research, and clinical insights relevant to cardiac anesthesia. Following the presentation, interactive quizzes will be integrated into the session, encouraging active participation and providing an immediate assessment of comprehension. These quizzes are designed not only to test knowledge but also to facilitate deeper discussions, allowing participants to explore complex topics and share perspectives.

The Reach 360 platform will serve as the backbone of our club, offering a seamless and interactive interface for discussions, real-time feedback, and shared learning. This initiative aims to bridge the gap between theory and practice, ensuring that our faculty stays up-to-date with emerging trends, techniques, and evidence-based practices in cardiac anesthesia.

NEWSWORTHY > >

Website Alert

We are excited to introduce our brand new website with this edition of the journal!

medicaleducationclinic.com offers the latest updates in research, academia, and pedagogy from the Department of Anesthesia, Critical Care and Pain Medicine at BIDMC. The site features extra content, interactive courses, quizzes, and a wide array of engaging resources. Click here to explore and enhance your learning experience!

Alumni Achievement

Congratulations to **Dr. Mario Montealegre Gallegos** on his appointment to Assistant Program Director of the Cardiac Anesthesia Fellowship Program at Yale!

Quiz Yourself

Audio & Visual Lesson

We have compiled cases for quick review of ***ECG and rhythm interpretations*** for efficient learning and skill enhancement.

Check out case here.

Congratulations!

The **Matyal Lab**'s Abstract on **Chest Wall Fascial Plane Blocks for Cardiac Surgery** has been accepted for Oral Presentation at Society of Thoracic Surgeons (STS) 2025 Annual Meeting.

CME-Accredited courses

We are pleased to announce that **two CME-accredited courses**, a lecture and a podcast, were conducted this month by **Drs. Dario Winterton, Aidan Sharkey,** and **Sarah Neves** as part of the Education Scholarly Program. These courses, designed to advance knowledge in anesthesia, are now available for CME credits through the anesthesia education portal.

IARS & SOCCA Meetings

Drs. Robina Matyal, Shiri Savir, John Mitchell and **Sarah Neves** have been invited as speakers at the 2025 Annual Meeting of the International Anesthesia Research Society (IARS) and the Society of Critical Care Anesthesiologists (SOCCA), to be held in Honolulu, Hawaii.

Panel topics include **"Faculty Development in POCUS Training: Integrating Quality Assurance into Teaching"** and **"Stepping Into the Future: Implementing Virtual Reality in Invasive Procedural Training Curriculums."**

This prestigious event will feature experts from around the world, highlighting advancements and innovations in anesthesia and critical care.

Exciting News!

This edition of our journal will be shared with esteemed faculty at Boston's top medical institutions, including MGH and Brigham and Women's Hospital. This marks a significant step in expanding our reach and fostering collaboration with leading professionals in cardiac anesthesia and beyond.