CLINICS IN MEDICAL EDUCATION

Docendo Discimus

[By Teaching We Learn]

INSIDE

Ether Day, or The First Operation Under Ether (Robert C. Hinckley, 1882–1893) is on display at Harvard's Francis A. Countway Library of Medicine.

The 'Ether Dome' at Massachusetts General Hospital stands as a monument to medical innovation where ether anesthesia was first publicly demonstrated in 1846. This historic event transformed surgery by introducing effective pain relief. Today, the Ether Dome serves as a reminder of pioneering advancements in healthcare and continues to inspire medical professionals worldwide.
https://en.wikipedia.org/wiki/Ether_Dome

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 IMAGE: The School of Athens fresco painted by Raphael, depicts many of the ancient world's greatest minds, such as Aristotle and Plato. As it rests in the Apostolic Palace, Vatican City, it remains a symbol of art, creativity, collaboration and scholarship.
https://en.wikipedia.org/wiki/The_School_of_Athens

Table of Contents

Ruma Bose

CLINICS IN MEDICAL EDUCATION

Docendo Discimus

[By Teaching We Learn]

EDITOR'S WELCOME

We are thrilled to share our very first volume of Clinics in Medical Education! This is a breathing and interactive anesthesia education journal that will deliver a summary of new guidelines and articles and cutting-edge research updates directly to your mobile devices, iPads and computers. With expanding community and increasingly full work and home life, our journal delivers pedagogy in education to equip our faculty in education strategies, to train our residents and fellows in the best possible way.

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, CAT scans, X-rays and interpretation of invasive and non-invasive monitoring.

We hope you enjoy our first volume!

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
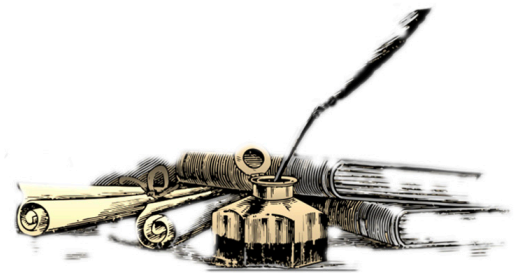
Professor of Anaesthesia, Harvard Medical School

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.
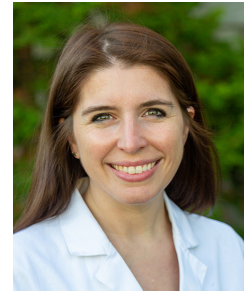
PEDAGOGY IN EDUCATION

Lessons Learnt from 'Teach the Teachers' Workshop

Sara Neves, MD

We are excited to announce that the Center for Education Research, Technology and Innovation held its first Education of Educators' program on June, 12, 2024. The mission is to increase educators' skills and equity by accelerating the development, deployment, and sustainability of educational initiatives and resources that will improve student outcomes. The program's overall goal is to have well-equipped anesthesia providers who can independently teach students and train others through capacity building and improving clinical services and perioperative outcomes.

The contents involved:

• Educators procedural teaching

• Intra-op teaching

• In situ simulation

• Feedback

The workshop was conducted by Drs. Sara Neves, Mark Robitaille, Nadav Levy, Maria Borrelli, Matthew Gao, David B. Zora and Dario Winterton.

NEWSWORTHY > >

Exciting News!

We are thrilled to announce that we will be conducting these workshops every two months.

We are starting CME accredited (1.0 AMA PRA Category 1 Credits) Train the Trainers' program from July 1st.

Achievements of the Month!

Congratulations to Dr. Feroze Mahmood, Director of Cardiac Anesthesia, who was named the 2024 recipient of the Outstanding Achievement in Perioperative Echocardiography Award by the American Society of Echocardiography. This prestigious award recognizes his achievement of significant clinical, research and education in the field of perioperative echocardiography.

Procedural Teaching with the Awake Patient "Train the Teacher" Workshop

Maria Borrelli, DO

"In the field of anesthesiology, procedural teaching often occurs on the awake patient."

A vital part of medical training is procedural teaching. How does the trainer teach his/her trainee efficiently and effectively? In the field of anesthesiology, procedural teaching often occurs on the awake patient. This can be a challenging task.

The "Teach the Teacher" Workshop held on June 12, 2024, highlighted the role of consistent and structured teaching methods involving conscious patients. Beth Israel Deaconess Medical Center OB-GYN, Dr. Huma Farid and colleagues, devised a three-part method to structure procedural teaching focusing on the conscious patient. (1) This framework was adapted for teaching procedures within the field of anesthesiology.

During the first (preprocedural) phase, emphasis was on establishing trust and rapport among the faculty, trainee, and patient, thus forming a cohesive team. This is done by clear introductions (with roles) and highlighting the patient as an important member of the team. The session also addressed how to assess learner readiness prior to start of procedure by measuring their ability to explain equipment, medications, and/or procedural steps. We also discussed establishing procedural goals by devising short-term (e.g., successfully locating midline prior to neuraxial placement) and long-term goals (e.g., troubleshooting after failed arterial line attempts).

In the second (intraprocedural) phase, we stressed the importance of maintaining effective and calm communication to learner and patient. Teachers were encouraged to clearly communicate to the patient what to expect with each step of procedure, which also guides the learner. Strategies for responding to challenging procedures highlighted the use of guided suggestions (e.g., "Can I offer a suggestion?", "Have you considered trying…?" From my viewpoint, I can see…"). These phrases may help maintain the learner's autonomy. The final (postprocedural) phase emphasized conducting debriefing sessions with both learners and patients. This can involve asking about the patients' experience (without the learner present) so the teacher may integrate valuable patient perspectives into feedback.

THREE PHASES>>

Pre-procedure	Intra-procedure	Post-procedure
• Consent	• Positioning	• Debrief trainee – "How do you think it went?"
• Trainees' readiness for autonomy	• Communication	• Patient experience?
• Goals/Expectations Anticipate Problems	• "Oops!"	• Explanation of outcome/challenges, reassurance to patient
• Procedural Rules/ Code words	• When to take over?	
	• Feedback – the good/bad	
	• Complications	

Reference:

Farid H, Rajagopalan S, Dalrymple JL. Procedural Teaching: Focusing on the Conscious Patient. *J Surg Educ*. 2023 Dec;80(12):1745-1747

Feedback

Mark Robitaille, MD & Dario Winterton, MD

During the first education workshop, we covered some key concepts and best practices in feedback exchanges.

Feedback vs. Assessment

First, we discussed the difference between feedback and assessment. Feedback ideally occurs on a daily basis, is primarily verbal and, as described above, is designed to discuss current performance and guide future performance. Feedback givers should not be worried about giving "negative" feedback for fear of undermining the learner's future career, as it is informal, generally verbal, and focused on guiding performance rather than ascribing value or character judgments. Assessments are summative retrospective evaluations designed to formally report to the trainee and education leaders. In our division, the clinical competency committee, program director and associate program directors are responsible for resident assessment.

Key factors in feedback

Feedback is fruitful in the framework of a learning contract, in which the shared goal of all stakeholders (resident, attending, education leadership) is making the trainee the best clinician they can be. A corollary to this contract is the growth mindset - the "implicit belief held by an individual that intelligence and activities are changeable", and that challenges and failures are opportunities for growth and development.

Feedback must be given in the setting of psychological safety. This encourages interpersonal risk-taking, expression of vulnerability and contribution of perspectives, without the fear of negative consequences.

Finally, it is important to underline that formative feedback is both negative and positive: learners need to have positive reinforcement of good performance and specific feedback for performances requiring improvement.

STAROS model of feedback

We presented the STAROS model of feedback, proposed in a recent NEJM Resident 360 Issue1-2, that involves the following domains.

• Specific: Trainers need to provide detailed (possibly skill-based) information on what needs improvement and what went well

• Timely: Feedback should be delivered in small doses and as close to the event as possible to avoid recall bias from either part involved

• Actionable: Feedback should include guidance on future behavior

• Realistic expectations: Requirements and expectations should be at the level of the trainee

• Observable: Feedback should be on directly observed actions

• Skill-based: Feedback should be given on activities and behaviors, not personality.

Barriers to feedback

We discussed some of the most common barriers to feedback exchanges:

• Giving negative or sensitive feedback is not easy but is vital in the growth of trainees

• There is often not enough time, or the right occasion, or the right place to give feedback

• Feedback requires presence and interaction with trainees, both to observe the action and to give the feedback

• Receivers may not recognize that they are getting feedback, hence this may need to be explicitly stated in some cases

• The receiver might not be in the previously discussed growth mindset and may thus not receive the feedback as a growing opportunity, but rather as a personal judgement.

Method of feedback exchange

We advocate the ask-tell-ask-add model presented in the same article referenced previously.

• **Ask:** open the feedback by asking the receiver to reflect and self-assess their performance. This will help you understand how similar (or different) your assessments are and will help guide the rest of the conversation.

• **Tell:** Provide feedback on the observed activity/skill based on the expected level of the trainee (see before)

• **Ask:** encourage the trainee to identify steps for improvement and what to change

• **Add:** provide further suggestions and plan for follow-up

Conclusion

Feedback is a vital part of education and a key component of our role as trainers and educators. Within the correct framework, feedback is an opportunity for growth to make the resident the best physician they can be. This will be the first of many encounters to aid trainers navigate the intricacies, and beauty, of appropriate feedback and the way this positively impacts training.

References:

1. C. Noronha, S. Anathakrishnan – Improving Feedback Exchanges with Residents – Can You Hear Me Now? - https://resident360.nejm.org/expert-consult/improving-feedback-exchanges-with-residents

2. C. Noronha, S. Anathakrishnan – How to Receive and Deliver High-Quality Feedback - https://resident360.nejm.org/expert-consult/how-to-receive-and-deliver-high-quality-feedback

Problem-Based Learning Discussions

Matthew. Gao, MD

Three hours into an eight-hour DIEP flap, you and your resident are both silently staring at the blue drapes wondering what to talk about next. Wouldn't it be nice if there was some resource available to break up the awkward silence? Luckily there is. Problem-Based Learning Discussion, or PBLD, is a teaching method in which complex real-world problems are used as a vehicle to promote student learning of concepts and principles as opposed to direct presentations of facts. PBLDs have been shown to promote development of critical thinking skills, problem-solving abilities, and communication skills (Dutch et al, 2001).

A PBLD library is available on Docebo as well as on the ASA website (see QR codes below). Both sites are available as a mobile version and contain PBLDs for residents and trainees of all levels and subspecialties. Instructors have access to the "instructor version" with samples answers and further topics for discussion, while learners have the question stem only. These are great resources for intra-operative teaching and further discussion, especially for our incoming CA-1s. We recommend notifying the resident the night before of which PBLD topic they should be ready to discuss. Since each PBLD is broken up into several discussion points, instructors have the flexibility of pausing in between to attend to other matters.

Next time you experience awkward silence with a resident, remember to pull up one of the many PBLDs available and get to teaching!

> *"Next time you experience awkward silence with a resident, remember to pull up one of the many PBLDs available and get to teaching."*

2) You suspect an allergic reaction given her history of a penicillin allergy. What symptoms would you look for in a patient under general anesthesia?

• Anaphylaxis is a type I hypersensitivity reaction mediated by IgE immunoglobulins. Within minutes of exposure, a sensitized individual may experience severe hypotension, rash, circulatory shock, wheezing, acute respiratory distress and airway edema. Under general anesthesia, the only symptoms may be hypotension, subtle rash and perhaps wheezing. The incidence of anaphylaxis during anesthesia ranges between 1:4000- 1:20,000 anesthetics. Death and serious organ damage occur in 2-5% of cases.

Sample discussion point from the Anaphylaxis PBLD

SCAN ME: Docebo   **SCAN ME: ASA Toolbox**

If you are experiencing issues with logging in, please contact Peva Gbagornah (pgbagorn@bidmc.harvard.edu).

Left Ventricular Assist Devices

Maurizio Bottiroli, MD

An interactive workshop on anesthetic management of patients with left ventricular assist devices was conducted on September 6th, 2023.

We combined online and in person teaching to curate a hybrid environment. The online component was comprised of a pretest followed by interactive modules on anesthetic specifications in non-cardiac surgery in a patient with LVAD and impella. The participants also received informative handouts outlining anesthetic specifications and management of cardiac arrest in a patient with LVAD. An in-situ simulation-based station was set up with a mannequin and two facilitators. A group of 8 participants at a time were assigned to manage a cardiac arrest in a LVAD patient in a 10-minute simulation. Our hybrid setting combined the benefits of one-on-one teaching with the convenience and accessibility of online platforms. The in person grand rounds offered direct engagement and interactive activities with the ability to self-evaluate. The online component allowed participants to learn at their own time and pace. We plan to incorporate this curriculum in our routine didactics to train faculty and residents.

The online materials can be viewed here.

[↗] **Teaching Session on non-cardiac surgery in LVAD patient**

[↗] **Teaching Session on anesthetic management in Impella**

Articles/Reviews/Guidelines

[↗] **Artificial Intelligence for Anesthesiology Board-Style Examination Questions: Role of Large Language Models**

New artificial intelligence tools have been developed that have implications for medical usage. Large language models (LLMs), such as ChatGPT developed by OpenAI, have not been explored in the context of anesthesiology education. Understanding the reliability of various publicly available LLMs for medical specialties could offer insight into their understanding of the physiology, pharmacology, and practical applications of anesthesiology. An exploratory prospective review was conducted using 3 commercially available LLMs--OpenAI's ChatGPT GPT-3.5 version (GPT-3.5), OpenAI's ChatGPT GPT-4 (GPT-4), and Google's Bard--on questions from a widely used anesthesia board examination review book.

[↗] **AI and Medical Education – A 21st Century Pandora Box**

To create a customized Large Language Model (LLM) for anesthesia education, it is essential to compile a comprehensive and tailored dataset. This involves sourcing information from authoritative anesthesia textbooks, up-to-date literature, peer-reviewed anesthesia journals, and relevant guidelines from related fields like cardiology. By incorporating these specialized resources, we can develop focused lectures, problem-based learning discussions, and rotation-specific teaching materials. This approach ensures that educational content is not only comprehensive but also highly relevant to the specific needs and challenges of anesthesia practice.

[↗] **2022 AHA Guidelines for Management of Heart Failure**

To address the evolving role of biomarkers and structural changes for recognition of patients who are at risk of developing HF, potential candidates for targeted treatment strategies for the prevention of HF, and to enhance the understanding and adoption of these classifications, the writing committee proposed the terminologies Stage A (at risk for HF), Stage B (Pre-HF), Stage C (Symptomatic HF) and Stage D (advanced HF).
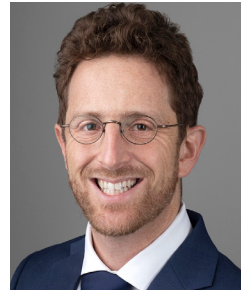
"Discovering new horizons in medical education through the lens of innovation."

Innovation in Education

Innovation in Teaching

Shiri Savir, MD,
Shirin Saeed, MD,
Nadav Levy, MD

We continue to explore innovative ways of teaching anesthesia to our faculty and trainees with several ongoing projects. Dr. Shirin Saeed is working on using Chat-Bot for education and Dr. Nadav Levy is working on advances in Simulation and using Virtual Reality for education.


Virtual Reality in Education

We have integrated virtual reality-based training which allows trainees to immerse themselves in realistic simulations in a controlled environment. It is freely accessible at any time ensuring our team can continuously refine their techniques without constraints. This commitment to leveraging virtual reality underscores our dedication to maintaining the highest standard of care.

Chat-Bot for Education

We are building a chatbot to streamline learning experiences by providing instant access to concise reviews and personalized inquiries. It will be tailored to address all queries ensuring efficiency and convenience.

**Explore our prototype chatbot here, currently under development.**
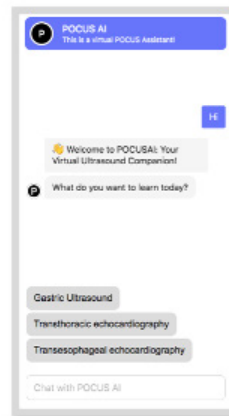
> *"Transform learning into an engaging journey, blending fun with knowledge acquisition to inspire continuous growth."*

Future Direction

We are pioneering the development of a specialized large language model tailored specifically to our specialty of Anesthesia, Critical Care and Pain Medicine. *Imagine having an attending physician in your pocket, ready to provide expert insights and guidance at any moment.*

Our goal is to create a cutting-edge resource that provides educators with instant access to accurate and up to date information sourced directly from guidelines and publications. The incorporation of a customized LLM in anesthesia education can also facilitate the development of graded complexity testing questions tailored to individual rotations in anesthesia. This allows for a more personalized and progressive learning experience, adapting to the trainee's level of expertise and specific learning needs. Additionally, by integrating core topics and procedures from related surgical fields, we can create a more comprehensive and focused training resource. This targeted approach not only enhances the educational experience for residents and fellows but also prepares them more effectively for the complexities of clinical practice in anesthesia.
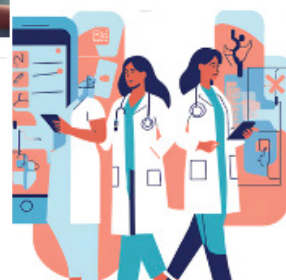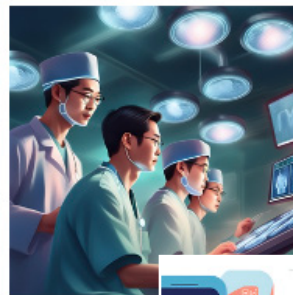
Gamification in Education

Gamification in medical education revolutionizes learning by integrating interactive simulations, quizzes, and virtual patient scenarios. It engages learners through challenges and rewards, fostering critical thinking and clinical decision-making skills. By immersing students in realistic scenarios, gamification enhances retention and application of medical knowledge, ultimately preparing them for real-world healthcare challenges with confidence and proficiency.

Explore our game-based cases here

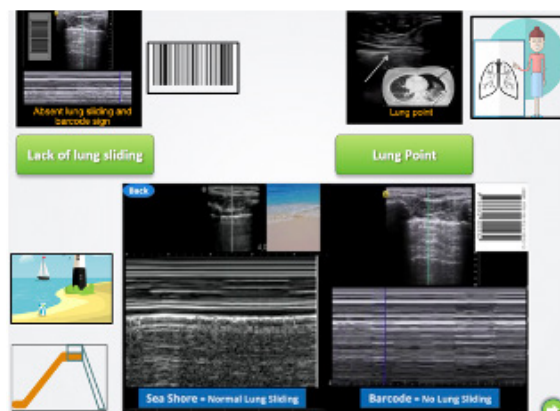This introductory glimpse showcases the interactive and engaging learning experiences we offer.

Literature Corner

Envisioning gamification in anesthesia

Game Based Learning in Medical Education

Solve the Puzzle

Spot the 5 signs to rule in our rule out pneumothorax.

Image credits: Articulate 360, Canva image generator

Case Presentation from Vascular Division

David B. Zora, MD, Matthew Gao, MD

Patient is a 73yo female with hx of HTN, DM, CKD III (Cr 1.8), pericardial effusion and MI in 2017, hx portal vein thrombosis in the setting of diverticulitis (Rx with coumadin for 6 months, NOT on anticoagulation now). Prior history of smoking 50 years. stress test negative. She's getting an open resection for infrarenal thrombi-filled AAA.
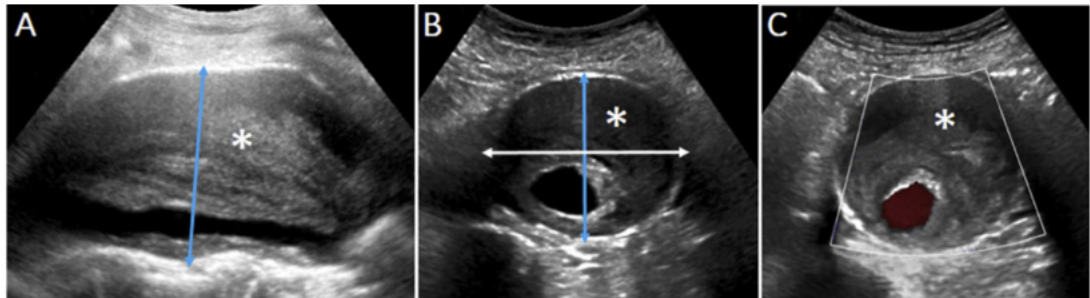
Infrarenal aortic aneurysm, maximum outer diameter 6.5mm with US, * indicate intramural thrombus.

On Physical examination: 60 inches, 50 kg weight. BP 150/78 mm of Hg, RR 14/minute, Pulse 90/minute. Important labs: BUN/Cr 30/1.8, Hct 27, BNP 300pg/l, Chest Xray normal lung and cardiac silhouette.

Perioperative management: Preop: 1. Large IVs 2. A-line 3. Epidural INR 1.5 what other options for multimodal analgesia? For example, rectus sheath block, TAP block, ketamine

Intraoperative:

1. GA with maintaining hemodynamic stability

2. Central line for CVP monitoring

3. Non-invasive monitoring LIDCO for SVV, CO and SVR

4. TEE or TTE depends on the expertise

5. Nitroglycerine and phenylephrine on the pump

6. Consider renal protection strategies

Management:

1. Goal directed fluid management is the protocolized use of cardiac output and related parameters as end points for fluid and/or inotropic therapy administration.

2. Goal directed coagulation management (TEG, ACT, platelets, INR when needed)

3. Goal directed resuscitation (baseline blood gas and afterwards every hour or half an hour depending on the stage of surgery, SVV, end systolic and end diastolic diameter, PPV for fluid management.)

4. Starting from clamping the aorta, goal directed volume with blood, balanced crystalloids (plasmalyte), and albumin. Consider FFP, platelet depending on the amount and time period of blood loss.

5. Will you consider Cell Saver?

6. Anticipate hemodynamic changes with cross clamping and release of cross clamping (aggressive preload and tone support).

7. Frequent labs for acidosis and ischemia reperfusion injury evaluation.

8. Appropriate temperature management and avoid hypothermia and at the same time hyperthermia to the legs during cross clamp.

Reasons when to consider Cell Saver

1. When anticipated blood loss is >1 L or 20% of the patient's estimated blood volume (EBV).

2. In patients with a low hemoglobin concentration or who are at increased risk of bleeding.

3. In patients with multiple antibodies or rare blood types (cross-match compatible blood is unobtainable).

4. In patients who are unwilling to accept allogeneic blood (e.g. Jehovah's Witnesses).

Cell saver is the process of collecting blood from the operative field, which is then anticoagulated, centrifuged, filtered, washed and finally re-suspended in saline. Coagulation factors and platelets are entirely removed by the cell saver. Salvaged red cells can then be transfused to the patient during or after the surgery as required (within 6 h). According to a recent Cochrane review, cell saver is associated with a 38% reduction of allogeneic blood transfusion, without significant safety concerns being raised.

End of surgery: Surgery finished uneventfully, you gave 650 cc from the cell saver, 2 packed RBC, three liters of plasmalyte. Total EBL 1.8 liters. Urine output 200 cc. PPV 8, CO 4.0 l/minute, End diastolic diameter is 11cm, Blood gas Lactate is 1.5 to 5.5 soon after the infrarenal clamp. Base deficit is -2, Hct 28. **The incision site looks dry. You are asked to give protamine.** Fixed protamine dose regimen-1-1.3mg of protamine for each100IU of heparin. **For this patient 30 mg of protamine is given slowly after test dose.** Suddenly, patient became hypotensive with systolic pressure in 50/30 mm of Hg.

What is the differential diagnosis?

🔗 **Click here to view TTE imaging.**

Treatment options:

In order to improve RV function, we need to

1. Reduce RV volume and pressure
   • Normalizes Septal Position
   • Maintaining shape/gerometry
   • Improves right ventricular function

2. Increasing systemic pressure
   • Normalizes septal position
   • Improves right ventricular perfusion

3. Lower PVR improves forward flow

4. Maintain Heart Rate (80-100 bts/min)

5. Inotropic support to improve ventricular function and septal contribution
   • Epinephrine, Norepinephrine, Milrinone, Vasopressin, Nitric oxide, Iloprost.

6. Patient-Optimization
   • Avoid hypoxia
   • Avoid hypercapnia
   • Avoid Acidosis
   • Ionotropic support
   • Avoid hypotension

Patient became stable hemodynamically on epinephrine gtt and nitric oxide. Patient was transported to the ICU intubated.

References:

1. Carless PA, Henry DA, Moxey AJ, O'Connell D, Brown T, Fergusson DA. Cell salvage for minimizing perioperative allogeneic blood transfusion. *Cochrane Database Syst Rev.* 2010

2. Tamura T, Waters JH, Nishiwaki K. Heparin concentration in cell salvage during heparinization: a pilot study. Nagoya *J Med Sci.* 2020

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

Check out case one here.