FALL EDITION
October 2025

AmSECTOMORROW

SPECIAL CONSIDERATIONS IN PERFUSION: Pregnant Patients and Fetal Circulation

BY: ISABELLE TEASEL, Editor in Chief, NKU

During my first clinical rotation at Albert B. Chandler- UK Healthcare, I contributed to the care of a 15-week pregnant patient for an AVR procedure. It was great opportunity and demonstrated the importance of regularly reviewing guidelines for special patient populations.

Perfusion Management

The perfusion considerations must encompass the safety of the pregnant woman and fetus. The circulating blood volume and cardiac output have increased; therefore, the cardiac index should be held at 2.6 to 3.0 L/min/m2. Hypothermia and bypass time are significant factors that should be minimized. Blood flow should be pulsatile to preserve endothelial nitric oxide synthesis, along with decreased RAAS activation of the fetus. The suggested acid-base management measurements are hemoglobin greater than 10 g/dl, bicarbonate of 20 mmHg, pO2 from 105 to 110 mmHg, pH between 7.40 to 7.47, and pCO2 from 30 to 35 mmHg. Hematocrit should be kept between 20-25%. Bank blood should be presented in the room to correct lower hemoglobin levels. Avoid hypothermia, hypoglycemia, hypocarbia, hypercarbia, maternal alkalosis and acidosis, inadequate ventilation, and poor oxygenation saturation to prevent fetal distress. A perfusionist must be aware of causes or indications of fetal hypoxemia, such as low non-pulsatile flow, emboli, venous drainage obstruction, and hypotension. Oxygenator membranes with arterial line filters should be selected based on the oxygenation capability for the patient's parameters. Femoral cannulation is prohibited.

Medication Guidelines & Restrictions

Pregnant patients may be hypercoagulable with a larger amount of blood volume; therefore, they will require larger doses of heparin. Vasoactive and inotropic pharmaceutical agents have to be carefully selected. Alpha agonists must be avoided, since they can restrict the blood flow of the placenta. When considering pharmaceuticals, the passage across or into the placenta must be highly considered. Drugs that must be avoided are furosemide, thiazide, phenylephrine, propranolol, verapamil, and nitroprusside. TXA and warfarin should be avoided. Tocolytic drugs should be present proactively. These patients can accept hydralazine, digoxin, quinidine, atropine, dopamine, epinephrine in low doses, ephedrine, diuretics with caution, mannitol, and atenolol. Cardioplegia without or with low levels of potassium is permitted. If uterine contractions are present, the team should prepare beta-agonist, IV alcohol, or progesterone.

Pregnant Patient Considerations

The second trimester is ideal for surgery. Organogenesis occurs with the risk of teratogenesis being absent during this trimester. Anemia, hypervolemia, and hemodynamic demands are reduced compared to the 3rd trimester. Fetal risks, however, are still significant. The fetus's size is also smaller, along with lesser uterine blood flow.

Featured Articles

Innovating Safely

Back To The Stacks

Perfusion Battle

Pediactric Palooza

Goofs & Blunders

SPECIAL CONSIDERATIONS IN PERFUSION: Pregnant Patients and Fetal Circulation (CONT.)

The risks of premature labor and uterine contractions are present. It must be noted that uterine blood flow is not autoregulated, so non-pulsatile flow can decrease fetal blood supply. These are the most common causes of death within this population.

Additionally, the patient should be placed in a left uterine displacement position. The uterus can cause aortocaval compression once the gestation age is greater than 20 weeks. The risk of venous thrombosis can be reduced with extremity compression devices. Research has indicated that from the gestational period of 23 to 34 weeks, maternal corticosteroids before surgery can assist in the optimization of fetal delivery later.

Fetal Considerations & Risks

The major fetal risk factors include fetal hypoxemia and decrease in the fetal heart rate. Fetal hypoxemia can be induced by low, non-pulsatile pump flows, hypotension especially during initiation, low oxygen saturation, emboli, patient positioning, and venous obstruction due to cannulation. The low oxygen saturation can be due to uterine arteriovenous shunts, uterine arterial spasm, or simply non-pulsatile blood flow. It can be diagnosed with decelerations of fetal heart rate.

The fetal heart rate is between 120 to 160 bpm, and it should be kept within the range of 60 to 120 bpm. When the heart rate is lower than 60 bpm, it is a strong indication of fetal distress and can be induced by hypothermia. Fetal distress is associated with hypothermia, hypoglycemia, hypocarbia and hypercarbia, maternal alkalosis and acidosis, inadequate ventilation, and poor saturation of oxygenation.

A transabdominal Doppler ultrasound is used to monitor the fetal heart rate through the umbilical and middle cerebral arteries via Doppler indices. A fetal cardiac monitor or bilateral probe may also be used to monitor.

Interdisciplinary Contribution

OB and NICU personnel should be on standby in the case of premature delivery during the cardiac procedure. When the gestational period is longer than 28 weeks, the risk of requiring a cesarean section is high. All members of the surgical team should be aware that pregnant patients have an increased blood volume, higher than average cardiac output, and lower hematocrit. Surgeons, surgical techs, nurses, anesthesiologists, perfusionists, OB, and NICU staff should be included in the stages of briefing and policy review. Closed-loop communication should be practiced. Medications and rewarming policy should be reviewed and followed closely to prevent uterine contractions and premature labor. AmSECT guidelines for pregnant patients can be found on the “AmSECT Perfusion Resources” webpage.

Student Spotlight Features

Abigail Dalton
Lakshana Vijayalakshmi
Giovanni Antoine
Patrick Hood
Cameron Harper

Interested in a nomination? Submit an application here!

INNOVATING SAFELY: ROBOTIC-ASSISTED REDO MITRAL VALVE REPAIR AND ENDOBALLOON MANAGEMENT
Student Case Report
BY: BAILEA RAWLINGS, EMORY

Redo mitral valve [MV] surgery after sternotomy is associated with increased surgical risk, including a mortality rate of approximately 6.6%. Minimally invasive, robotic-assisted approaches such as the Lateral Endoscopic Approach with Robotics (LEAR) offer a safe alternative with reported mortality rates under 2%. This case highlights the successful use of LEAR in a re-operative MV repair with particular attention to the use of the endoballoon and perfusion management. The patient, 70-year-old male, presented with recurrent severe mitral regurgitation following a prior MVR. Preoperative imaging confirmed preserved ventricular function and no aortic insufficiency. The patient underwent robotic-assisted MV re-repair, left atrial cryoablation, and left atrial appendage (LAA) closure.

A key component of this case was perfusion support using dual-site venous cannulation, 17 Fr right internal jugular and 25 Fr right femoral vein cannulas, along with the insertion of a 21 Fr EndoReturn cannula in the right femoral artery. This cannula provided a single arterial access point for systemic flow, antegrade cardioplegia, aortic root venting, and placement of the intra-aortic endoballoon through a side branch on the cannula. Endoballoon maintenance was critical to the success of the operation. Unlike direct aortic cross-clamping, the endoballoon requires continuous monitoring and adjustment to ensure proper occlusion and myocardial protection.

Multisite pressure monitoring was essential to this process. The perfusionist is responsible for ensuring the endoballoon is maintained at a target pressure of about 400 mmHg throughout the cross-clamp period for adequate balloon occlusion.

Bilateral radial arterial lines were used to detect migration of the endoballoon, with right arm, left arm, and aortic root pressures labeled and trended continuously. Mean arterial pressures were maintained in a tight range of 80-90 mm Hg to avoid balloon migration. Cardioplegia was delivered through the balloon's integrated lumen with an initial 1 L dose of cold blood microplegia (20 mEq/L K+) followed by maintenance doses of 300 mL every 15-20 minutes,via antegrade or retrograde. Any discrepancies during antegrade cardioplegia delivery, such as a fall in pressure, could indicate balloon migration or partial occlusion and require immediate response by the perfusionist (decreasing rate of cardioplegia delivery or increasing systemic pressure). The aortic root vent was clamped during delivery to avoid overpressurization and vented after each dose to protect myocardial integrity.

Intraoperative inspection revealed failure of the prior repair due to annular compression. The valve was re-repaired with a 36 mm band, tested with saline motorized injections, and confirmed competent. Total endoballoon time was 109 minutes, and total bypass time was 139 minutes. This patient was successfully weaned off bypass after robotic trocar removal, rhythm restoration, and deairing. This case illustrates the safety and feasibility of robotic-assisted re-operative valve surgery when supported by vigilant perfusion management. The use of the endoballoon demands precision, situational awareness, and clear communication between the surgical and perfusion teams. As robotic cardiac surgery becomes more common, advanced endoballoon and perfusion strategies will remain essential to improving outcomes in high-risk patients.

Test your knowledge

Hypoplastic left heart syndrome [HLHS] includes all of the following EXCEPT:

A. Aortic Valve Atresia
B. Hypoplastic Aorta
C. Diminutive Left Ventricle
D. Pulmonary Artery Atresia

BACK TO THE STACKS
Utilizing AI for Note-taking and Studying in Perfusion Education
BY: LANETTE CHOI, RUSH

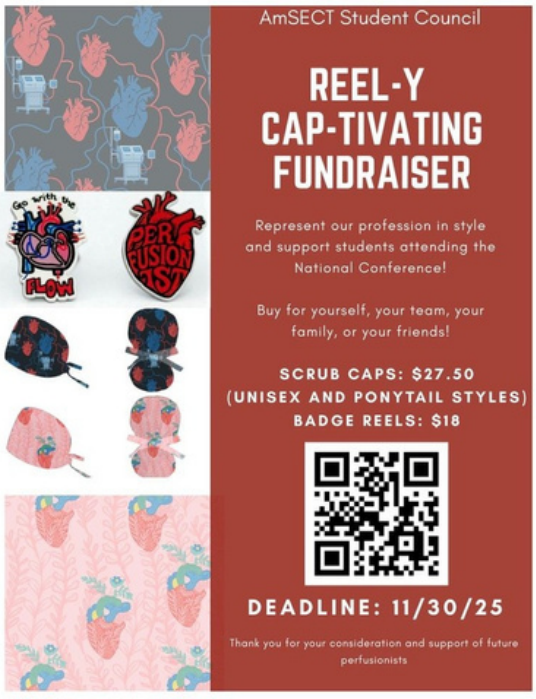
Keeping up with the volume of information in perfusion school can feel overwhelming. Whether perfusion students are coming straight from their undergraduate studies or have not been in school settings for over a decade, we are always looking for ways to make studying more efficient. Recently, artificial intelligence (AI) powered tools have become a helpful addition to the student toolkit. AI applications for notetaking, reviewing, or studying can be tailored to lecture and lab material. Below are some interesting AI-powered applications and websites that could be useful for students:

- Quizlet: can generate flashcards and quizzes automatically from uploaded notes
- Goodnotes: recognizes handwriting and lets you convert selected parts to text; notes are searchable
- Notion AI: summarizing lecture notes; generating study guides
- Evernote: can scan handwritten notes (from a notebook) and make them searchable and editable
- NoteGPT: able to generate podcasts from notes

Of course, AI is not without its limitations. AI can occasionally give inaccurate information, oversimplify concepts, or miss clinical applications. Students should always cross-check AI information with original lecture material or textbooks. The goal is not to replace traditional studying, but for perfusion students to utilize current innovations and enhance their studying by saving time and improving organization.

AI will likely play a growing role in the field of perfusion and perfusion education. For now, students can benefit by experimenting with AI for notetaking and studying by finding tools that support their learning style, while maintaining a critical eye for accurate information.

Get Your Scrub Cap & Reels Today!



Perfusion Without Borders 2025 Scholarship Recipient

"I am deeply honored to receive the Perfusion Without Borders Scholarship. This opportunity is a privilege to provide for patients in underserved communities while contributing to the expansion of lifesaving cardiovascular support where it is needed most. It allows me to pursue my passion and provides the opportunity to grow professionally by learning to deliver CPB with limited resources. I will refine my skills as a vigilant clinician to deliver the best possible care wherever my practice takes me next."

Congratulations, Kenny Casals!!

THE RESERVOIR

AmSECT Membership:
Student Memberships are free! Register now and become an official part of the perfusion community.
Go to: https://www.amsect.org/Members/Student-Corner

Have a perfusion goof & blunder? Please email Teaseli1@mymail.nku.edu to have yours featured in the next issue!

PERFUSION BATTLES: To Use NIRs or To Not Use NIRs?

Student Perspective

BY: Lauren Dudeck, SUNY

Being a second-year student on clinical rotations, it's interesting to learn the different perspectives on the various tools available to us from preceptors and how these perspectives can vary between rotation sites. One such example is the use of near infrared spectrometry (NIRs) for CPB patients. Viewpoints on the use of NIRs for cardiac surgery patients vary from absolutely necessary to completely useless, or somewhere in between, depending on the type of surgery being performed. I thought it would be interesting to examine the different rationales arguing for the use of NIRs and against their use.

NIRs use reflective light transmission that can detect hemoglobin and oxyhemoglobin. It provides a regional SO2 (rSO2) measurement of the frontal lobe of the brain; thus, it can provide insight into mostly venous oxygen saturations, but also some arterial oxygen saturations, in the frontal lobe, but lacks insight into oxygen saturations in the other lobes. Since many patients have an incomplete Circle of Willis, unknown to perfusionists, NIRs can give a false impression of adequate brain perfusion if the cerebral saturations are within normal range and remain near the patient's baseline saturations.

The main driver for the use of NIRs is the addition of a data point confirming protection of the brain to prevent neurological injury post-op in already high-risk patients. Cerebral hypoperfusion and embolic load to the brain during the bypass period are major causes of neurological injury during cardiac surgery. Using NIRs data, perfusionists can ensure they are adequately perfusing the frontal lobe of the brain. However, as mentioned previously, perfusionists still lack insight into the perfusion of other regions of the brain. Some teams do not see the value in investing in NIRs equipment and disposable sensors when the data they gain is only an estimate. Taking these points into consideration, some cardiac surgery teams reserve the use of NIRs for cases with a higher risk of brain hypoperfusion, such as DHCA cases. However, despite the researched benefits, more recent studies have revealed that patients who had NIRs had equivalent incidences of neurological injury compared to patients who did not have NIRs. As the typical cardiac surgery patient continues getting older, minimizing the risk of neurological injury on CPB and ensuring adequate brain perfusion becomes more important than ever. NIRs is just one tool that can aid in assessing adequate brain perfusion. Other neuroprotective strategies can be used alone or in conjunction with NIRs, which include running an elevated MAP, elevated pCO2, and administering mannitol.

As the conversation surrounding the usefulness of NIRs continues, it's important to consider what data can be gained from using NIRs and what is missing. It is important to assess all the patient's hemodynamics and medical history before making a clinical decision.

PEDIATRIC PALOOZA: Transformations and Innovations
BY: BRYCE ORE, RUSH

Pediatric perfusion, though complex, is driving innovations that continue to offer better results for children undergoing cardiac surgery. To transform care for this patient population, many new practices are being researched to eventually integrate into the plan of care. Gene therapy, regenerative medicine, and artificial intelligence are a few examples of these transformations. Ex situ heart perfusion, or “heart in a box,” is a popular method for preservation of hearts before transplantation. The addition of gene therapy to this preservation method can reduce the risk of rejection and correct predisposed gene mutations. Further research into genomics led to the discovery of a gene by the name of PRDM6, when activated, is a critical regulator in heart development in experimental models.

In addition to gene therapy, there is growing evidence that stem cell therapy has the potential to aid in congenital heart disease physiology, even hypoplastic left heart syndrome (HLHS). Advancement in these areas shows promise to be able to reverse structural heart defects in those with complex pediatric anatomy. These therapies can delay heart failure in these complex heart conditions. Perfusionists can benefit from their practice by expanding their knowledge of gene therapy or even regenerative medicine, requiring knowledge beyond traditional circuitry. Furthermore, the use of AI has offered various benefits from the use of modeling tools or ultrasound. Modeling tools driven by AI have been able to produce 3D representations of complex congenital anatomy. These 3D models that are created give the ability to further understand disease presentation or improve surgical techniques and surgical planning. Ultrasound technology enhanced by AI is a different method offered, which helps to improve early congenital heart disease detection. These ultrasound techniques can potentially provide early intervention and better outcomes. Many of the recent scientific innovations encourage the field of perfusion to keep expanding conversations surrounding these topics. All of this in hopes of providing the best quality and most precise multidisciplinary care available to the pediatric congenital heart disease population.

Goofs & Blunders
We’ve all been there!

“Walking to the other side of the OR with an unclamped cell saver transfusion bag. Safe to say I was not happy cleaning up that trail after a 13 hour surgery!”

“We took the XC off and I confidently said “that’s 20 minutes on pleg” and the surgeon was already in a mood and started yelling how the XC was off”

SUBMISSIONS FROM AMSECT STUDENTS

Before You Go!

The AmSECT Student Council exists to promote student involvement within AmSECT. While our current members hail from over 19 different programs, our goal is to have every perfusion program in the country represented on the council. Our major projects include an annual fundraising event, the perfusion bowl, and this very newsletter, with multiple opportunities for student leadership!

Our current officer team consists of a president/chief student liaison, vice president, fundraising project lead, communications coordinator, and newsletter editor, pre-perfusion coordinator, events, and perfusion bowl coordinator. The Student Council meets monthly via Zoom for one hour, so the time commitment is designed to be manageable! Don't forget to sign up to come to the annual AmSECT Conference in the spring! It’s a great way to network and see the student council in action.

INTERESTED IN JOINING THE STUDENT COUNCIL?

PLEASE EMAIL AMSECTSTUDENTHQ@GMAIL.COM AND BE SURE TO INCLUDE YOUR CONTACT INFORMATION. SHARE YOUR VOICE, DEVELOP YOUR NETWORKING AND LEADERSHIP SKILLS, AND BECOME INVESTED IN THE PROFESSIONAL DEVELOPMENT OF OUR FIELD! WE LOOK FORWARD TO SEEING YOU JOIN OUR TEAM.