

GOALS AND OBJECTIVES
CT Anesthesiology Fellow(s) Goals and Objectives for UF Health Shands at UF and VA Rotations

I. ROTATION INFORMATION for VA and UF Health Shands

The Cardiothoracic (CT) Anesthesiology Fellowship includes rotations at UF Health Shands at UF and the Malcolm Randall VA Medical Center. These rotations are structured to ensure optimal patient care while providing the fellow(s) the opportunity to develop expert level skills, judgment, and competence in clinical care of cardiac anesthesiology. The subspecialist in adult cardiothoracic anesthesiology should be proficient in providing anesthesia care for patients undergoing cardiac surgery with and without extracorporeal circulation, and thoracic surgery including operations on the lung, mediastinum, esophagus, and thoracic aorta. The CT fellow(s) will develop knowledge of cardiovascular anesthesia (anesthesia for the patient with cardiovascular disease) and the skills for lifelong continuing education. The fellow(s) will also have the opportunity to be engaged in teaching medical students and anesthesiology residents in addition to exploring research. The CT anesthesiology fellow(s) will:

- Acquire experience with patients undergoing non-operative diagnostic and interventional cardiac, thoracic, and electrophysiological procedures.
- Develop skill in the preoperative patient evaluation and interpretation of cardiovascular and pulmonary diagnostic test data.
- Develop proficiency in the intraoperative interpretation of hemodynamic and respiratory monitoring.
- Acquire skills in advanced-level perioperative transesophageal echocardiography (TEE) and transthoracic echocardiography (TTE) image acquisition and interpretation.
- Develop an understanding of the major issues involved in the perioperative care of the adult with congenital heart disease.
- Review and discuss routine cardiac catheterization lab reports.
- Plan and carry out anesthetics for routine cardiothoracic procedures with minimal assistance from the attending physician.
- Perform anesthetics for complex cardiothoracic procedures with as needed assistance from the attending anesthesiologist.
- Perform all invasive monitoring techniques and interpret information obtained reliably with minimal assistance from the attending anesthesiologist.

During the Shands at UF Health rotation, the fellow(s) will:

- o Obtain their clinical experience to manage the most complex cardiac cases including ascending and descending thoracic aortic aneurysm repair with cardiopulmonary bypass and deep hypothermic circulatory arrest, type I aortic dissection, multiple valvular repair or replacement, other high risk cardiac surgical patients such as redo sternotomy, renal failure or end-stage heart failure.
- o Perform anesthetic management of at least ten adult patients undergoing surgery on the ascending or descending thoracic aorta requiring full CPB, left heart bypass and

- /or deep hypothermic circulatory arrest.
- o Gain experience with lung and heart transplantation (at least five patients each).
- o Gain experience on congenital cardiac procedures performed on adult patients.
- o Perform the anesthetic management for ventricular assist device placement and learn how to manage the patients who have a ventricular assist device.
- o Be exposed to complex and emergent cardiac cases.
- o Be exposed to less complex and fast-track cardiac cases.
- o Be expected to provide anesthetic management for patients undergoing minimally invasive cardiac surgery.
- o Gain extensive experience for anesthetic management of patients undergoing noncardiac thoracic surgery.
- o Act as the primary anesthesia provider under the direct supervision of a faculty anesthesiologist and be expected to perform most of their cardiopulmonary bypass cases (total 70 including revascularization and valvular procedures) in this setting.

In the VA hospital rotation, the fellow(s) will:

- o Gain experience dealing with patients with multiple system co-morbidities requiring coronary revascularization with and without utilizing cardiopulmonary bypass and valvular heart procedures.
 - o Gain additional experience in the anesthetic management of adult patients with cardiac pacemaker and automatic implantable cardiac defibrillator placement, surgical treatment of cardiac arrhythmias (i.e. mini maze procedure, cardiac electrophysiologic diagnostic / therapeutic procedures), and surgical procedures for congestive heart failure.
 - o Gain sufficient experience to independently manage intra-aortic balloon counterpulsation.
 - o Gain experience in managing non-cardiac thoracic surgery including operations on the lung, and mediastinum.
 - o Be encouraged to gain their experience via multidisciplinary interaction.
- Supervise residents doing the cardiovascular anesthesia cases as their proficiency and competency builds in the management of patient with complex cardiac disease.

All requirements allow the CT fellow(s) to grasp the basic knowledge and skill of cardiovascular and thoracic anesthesiology and improve their ability to care for hemodynamic unstable patients during the perioperative period. Training in these rotations will be accomplished in six four-week rotations. The fellow(s) will be selectively graded (outstanding, above average, average, below average, or unacceptable) accordingly. The fellow(s) will be required to complete assigned reading material and attend conferences. The fellow(s) will be thoroughly evaluated on the six core competencies required by the ACGME on their performance at the end of the rotation.

II. SPECIFIC COMPETENCIES PATIENT CARE SKILLS:

At the completion of this rotation, the fellow(s) will be able to:

- ☐ Assess anesthetic risk and optimize/prepare adult patients for cardiac surgery
- ☐ Be able to apply / insert (and instruct) invasive and other monitoring and therapeutic devices including but not limited to:
 - o Arterial catheters
 - o Central venous catheters [(subclavian, internal jugular, external jugular (rarely), femoral (rarely))]
 - o Pulmonary artery catheters
 - o Lumbar spinal drains (for thoracoabdominal aneurysms)
 - o TEE probe
 - o Esophageal pacer
 - o Lumbar and thoracic epidural catheters
 - o Expired oxygenation gas monitoring
 - ☐ Interpret data obtained from these monitoring devices including:
 - o Invasive arterial blood pressure monitoring
 - o Pulmonary artery (PA) catheter monitoring
 - ☐ PA waveforms and pulmonary capillary wedge (PCW) tracings
 - ☐ Cardiac output by thermodilution and waveforms
 - ☐ Mixed venous oxygen saturation
 - o Transesophageal echocardiography
 - o Cerebral Oximetry
 - o Activated Clotting Time
 - o Thromboelastograph
- ☐ Choose and articulate appropriate anesthetic techniques for patients with different types of cardiovascular disease
- ☐ Understand the steps involved in initiating and separating/discontinuing cardiopulmonary bypass
- ☐ Work as a team member with CVT attending anesthesiologists, CVT surgeons, CVT surgical fellow(s), perfusionists, and nurses.
- ☐ Maintain good clinical judgment under stress and act quickly and accurately in diagnosis, interpretation, and treatment of intraoperative problems
- ☐ Place endotracheal tubes to facilitate one-lung ventilation as needed during thoracic surgery including:
 - o Double-lumen endotracheal tubes (right and left sided)
 - o Univent tubes
 - o Bronchial blockers
- ☐ Utilize fiberoptic bronchoscopy to precisely determine proper placement of these tubes.
- ☐ Adjust ventilatory parameters to improve oxygenation during one-lung ventilation and implement options for alternative new ventilated lung management
- ☐ Recommend / provide appropriate postoperative pain control for patients undergoing cardiothoracic surgery including:
 - o Patient controlled analgesia
 - o Thoracic epidural anesthesia / analgesia
 - o Paravertebral analgesia

MEDICAL KNOWLEDGE:

At the completion of this rotation, the fellow(s) will understand:

- ☐ Cardiovascular physiology (Frank-Starling Law)
 - o Effect of preload on cardiovascular function
 - o Effect of afterload on cardiovascular function
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- o Factors determining inotropic state
- o Cardiac cycle and the function of all four valves
- o Differences in function between the neonatal / pediatric heart and the adult heart
- ☐ Cardiovascular physiology (Frank-Starling Law)
 - o Effects of commonly used anesthetic drugs on cardiac function
- ☐ How these effects may lead to a particular choice of drug for a patient with a particular cardiac lesion (e.g. use of myocardial depressant for patient with LV outflow obstruction from SAM)
 - o Pharmacology of inotropic (catecholamine and non-catecholamine) drugs
 - o Pharmacology of vasodilators
 - o Pharmacology of calcium channel blockers
 - o Pharmacology of beta-blocking agents
 - o Pharmacology of vasopressin
- ☐ Cardiovascular anatomy (especially as relates to TEE below)
 - o Know basic normal adult cardiac anatomy
 - o Know cardiac coronary arteries distribution
 - o Know basic anatomy of congenital heart lesions for adult patient with congenital heart disease requiring cardiac surgery
- ☐ Pulmonary artery catheter
 - o Normal and pathologic waveforms
 - o Difference between wedge pressure and pulmonary artery diastolic pressure measurement
 - o Thermodilution cardiac output - principles of operation and factors causing errors
 - o Principles of operation of continuous cardiac output catheters
 - o Physiology of mixed venous oxygen saturation - factors determining changes in measured values
- ☐ Basic concepts and operational principles of transesophageal echocardiography
- ☐ Basic principles of operation of a cardiopulmonary bypass machine and pump oxygenators
- ☐ Pulmonary physiology
 - o Relationship between ventilation and perfusion (concepts of shunt and deadspace)
 - o Interpretation of arterial blood gas measurements.
- ☐ Recognition of metabolic and respiratory acidoses or alkaloses
- ☐ Knowledge of effects of changes in arterial blood gases (pH, pCO₂, pO₂) on the pulmonary circulation before and after cardiopulmonary bypass
 - o Mechanism for the effects of PEEP / CPAP, complications and side-effects associated with PEEP / CPAP
- ☐ Pulmonary pharmacology

- o Effects of anesthetic drugs and adjunctive drugs (inotropic agents, vasodilators, vasoconstrictors) on ventilation and perfusion

INTERPERSONAL AND COMMUNICATION SKILLS:

At the completion of the rotation, the fellow(s) will have demonstrated:

- ☐ Appropriate communication skills between perfusionists, cardiac surgeons, and anesthesiologists during open heart surgery.
- ☐ Effective exchange of information and collaboration with patients, their families, and other health professionals
- ☐ Ability to carry out professional responsibilities, adherence to ethical principles, and sensitivity to patients of diverse backgrounds

PROFESSIONALISM:

At the completion of the rotation, the fellow(s) will have demonstrated:

- ☐ Respect and personal integrity in their interactions with patients, perfusionists, nurses, surgeons, anesthesiologists, and other OR staff.
- ☐ The ability to maintain patient confidentiality.
- ☐ Integrity and professional conduct.
- ☐ An understanding of the ethical principles of medicine and how these impact and influence the way patients are treated.

PRACTICE-BASED LEARNING AND IMPROVEMENT:

At the completion of the rotation, the fellow(s) will have demonstrated:

- ☐ Efficiency of case turnover of complex cases requiring invasive monitoring.
- ☐ Efficiency of placing invasive monitoring catheters.
- ☐ Organizational skills of the anesthesia workstation - making needed drugs available quickly without having to search for them.
- ☐ Organization of efficient transport of medically complex patients pre- and postoperatively.
- ☐ Organizational skills of monitoring wires to prevent excessive tangling
- ☐ Rationale for case sequencing
- ☐ Cost effective practice
- ☐ Implementation of evidence based medicine practices
- ☐ An understanding of the rationale for the use of IABP or ventricular assist device to rescue the high risk patients who are unable to maintain the hemodynamic stability.

SYSTEMS-BASED PRACTICE:

At the completion of the rotation, the fellow(s) will have demonstrated the ability to:

- ☐ Practice cost-effective and safe anesthesia
- ☐ Fast-track anesthesia to appropriate patients
- ☐ Use medical informatics to learn about the various cardiovascular medical conditions in patients presenting for cardiovascular surgery
- ☐ Participate in national surgical care improvement project quality initiatives and also local ones

III. EVALUATION TO DETERMINE GOAL ACHIEVEMENT

- ☐ The fellow(s) will be evaluated after each of these rotations by the CT faculty at UF Health Shands at UF and Malcolm Randall VA Medical Center.
- ☐ At the completion of the rotation, the attending cardiovascular anesthesiologists will complete a departmental CT anesthesiology fellow evaluation form using the electronic evaluation system.
- ☐ These evaluations will be reviewed by the CT Clinical Competency Committee (CCC), CT CCC Chair, and/or the CT Anesthesiology Program Director (PD).
- ☐ The CT CCC chair and/or CT PD will inform the fellow(s) of any problems identified, and serious problems or concerns will be discussed with the fellow immediately after they occur.
- ☐ The CT Anesthesiology fellow(s) will have at least two meetings/year with the PD or Associate PD to discuss their progress.
- ☐ The fellow(s) will complete a departmental rotation evaluation form for each of the rotations, which will be shared periodically with the rotation director, CT CCC Chair, and/or CT PD.

IV. TEACHING RESOURCES TO ACCOMPLISH THE OBJECTIVES

- ☐ Patients
 - o Approximately 600 adult cardiopulmonary bypass cases per year at UF Health Shands Teaching Hospital and 250 adult cases per year at the Veterans Administration Medical Center requiring the following procedures:
 - ☐ Aortic repairs > 300
 - ☐ Congenital repairs--pediatric ≥ 200/year
 - ☐ Coronary artery bypass grafting and valves--adults
 - ☐ Electrophysiology
 - ☐ Thoracic surgery
 - ☐ Transplantation--heart and lungs
- ☐ Reading Materials
 - o Texts and review articles:
 - ☐ Kaplan JA: Cardiac Anesthesia
 - ☐ Benumof J: Anesthesia for Thoracic Surgery
 - ☐ Lake C: Pediatric Cardiac Anesthesia
 - ☐ Reading files provided by the Department containing handouts and peer-reviewed articles available on the Anesthesiology Bridge and Education Hub
 - ☐ Congenital Heart Lesion Anatomy and Physiologic Descriptions (from Helen B. Taussig Children's Heart Center - Johns Hopkins Medical Institutions) for adult patients with congenital heart lesions.
- ☐ Equipment
 - o Transesophageal echocardiography machines (n = 4) dedicated to operating room use
 - o Online learning through E-echocardiography
- ☐ Faculty
 - o UF Health Shands at UF:
 - Robin Bergbauer, M.D.
 - Laurie Davies, M.D.
 - Edward McGough, M.D.

- Gregory Janelle, M.D.
 - Yong Peng, M.D.
 - Andrew Pitkin, M.D.
 - Albert Robinson, M.D
- o Malcolm Randall VA Medical Center:
- Julia Bauerfeind, M.D.
 - Chris Goldstein, M.D.
 - Dustin Hegland, M.D.
 - Felipe Urdaneta, M.D

V. ROTATION DIRECTOR

Dr. Greg Janelle is the faculty member responsible for UF Health Shands at UF rotation.

Drs. Julia Bauerfeind and Dustin Hegland are the faculty members responsible for the VA rotation.

Transesophageal Echocardiography (TEE) Rotation Curriculum

Fellow(s) Goals and Objectives for the TEE Rotation

I. CORE ROTATION INFORMATION

During the transesophageal echocardiography (TEE) rotation, the fellow(s) will be expected to learn to perform and interpret TEE images and to use TEE guidance for minimally invasive procedures such as TAVR and Mitraclip. In addition, fellows will learn to manipulate 3D TEE images of the mitral valve. The rotation will occur at UF Health and the Malcolm Randall VA Medical Center. The learning process will be facilitated by weekly echo conferences, available electronic materials, and can be further enhanced by attending a national echocardiography conference.

Advanced Transesophageal Echocardiography will have as a pre-requisite the ability to perform a basic TEE exam, including recognition of regional wall motion abnormalities and normal/abnormal valvular function.

Advanced-level perioperative transesophageal echocardiography (TEE) training will be accomplished based on training objectives from the American Society of Echocardiography and Society of Cardiovascular Anesthesiologists' "Guidelines for Training in Perioperative Echocardiography." This will include the study of 300 complete perioperative echocardiographic examinations, of which at least 150 are comprehensive intraoperative TEE examinations performed, interpreted, and reported by the fellow(s) under the supervision of TEE-certified Cardiac Anesthesiologist(s). We strongly encourage all fellow(s) to work toward passing the Perioperative Transesophageal Echocardiography test administered by the National Board of Echocardiography at the end of their fellowship training. The fellow(s) will be thoroughly evaluated on the six core competencies required by the ACGME on their performance at the end of the rotation.

II. SPECIFIC COMPETENCIES

A. PATIENT CARE SKILLS:

At the completion of this rotation, the fellow(s) will be able to:

- Properly and safely insert and manipulate a TEE probe into an anesthetized patient
- Examination Skills
 - Complete a basic TEE examination, including evaluation of left and right ventricle function, heart valves, the aorta, and regional wall motion abnormality.
 - Discuss the indications, limitations, contraindications, and complications of TEE
 - Demonstrate the primary views used for intraoperative TEE to examine the heart and great vessels.
 - Measure normal cardiac dimensions, area, and volume.
 - Measure global systolic and diastolic function and recognize abnormal systolic and diastolic function.
 - Recognize the different segments for regional wall motion analysis and the numeric scoring system.
 - Understand and identify common congenital cardiac lesions, and describe embryologic origins of such lesions.
 - Identify and quantify intracardiac shunts, both congenital and acquired.
 - Understand cardiac implications of non-cardiac diseases as they pertain to ultrasonographically identifiable abnormalities.

- Understand advanced techniques for quantifying systolic function (circumferential shortening, index of myocardial performance, dp/dt relationships, etc).
- Understand advanced techniques for quantifying diastolic function (velocity of propagation, tissue Doppler analysis, isovolumic relaxation times, etc).
- Identify and describe diseases of the pericardium, including constrictive pericarditis and various manifestations of pericardial tamponade.
- Recognize abnormal cardiac function that requires immediate therapy.
- Assess the results of pharmacologic therapy on cardiac function
- Evaluate the hemodynamically unstable patient - specifically:
 - Identify the typical 2D echocardiographic features of pericardial tamponade.
 - Identify the typical 2D echocardiographic features of severe right and left ventricular dysfunction.
 - Identify the typical 2D echocardiographic features of pulmonary embolus.
 - Identify the typical 2D echocardiographic features of hypovolemia.
 - Identify the typical 2D echocardiographic features of atrial and ventricular septal defects.
- Recognize when findings are beyond the fellow's expertise level and call for additional help.
- Evaluation of the Aortic Valve
 - Demonstrate the three primary views used for intraoperative assessment of the aortic valve.
 - Recognize the normal aortic valve leaflets morphology, velocities, area, and opening.
 - Calculate cardiac output based on aortic flow interrogation.
 - Perform a quantitative and qualitative assessment of aortic valve stenosis and regurgitant lesions.
 - Derive pressure gradients across the aortic valve based on Doppler-derived velocities.
 - Differentiate aortic and sub-aortic stenosis.
 - Calculate the aortic valve area using planimetry and the continuity equation.
 - Be comfortable with at least 3 different methods of grading the severity of aortic insufficiency utilizing color flow Doppler and continuous Doppler.
 - Calculate regurgitant volume and fractions of aortic insufficiency.
 - Provide anatomic information necessary for surgical repair or replacement.
 - Accurately estimate aortic annular size for surgical replacement.
 - Accurately assess post-valve repair/replacement function.
 - Accurately assess need for re-intervention in above patients.
- Evaluation of the Mitral Valve
 - Recognize the normal mitral valve leaflets morphology, velocities, area and dynamic opening.
 - Describe Carpentier's and Duran's nomenclature of the mitral valve apparatus.
 - Recognize the typical 2D-echocardiographic features of mitral stenosis.
 - Quantify mitral stenosis using continuity equation, proximal isovelocity surface area (PISA) method and pressure half time.
 - Differentiate between restrictive leaflet motion, normal leaflet motion, and excessive leaflet motion as variants of mitral regurgitation.
 - Critically assess mitral valve regurgitation by color flow-Doppler and PISA method.
 - Calculate mitral regurgitant volume and fraction.
 - Recognize normal and abnormal pulmonary venous flow patterns.

- Correctly identify severe mitral insufficiency by pulmonary vein flow.
- Identify restrictive physiology by pulmonary vein flow patterns.
- Provide surgeons with relevant, detailed systemic and functional information necessary for mitral valve repair or replacement.
- Accurately assess post-valve repair/replacement function.
- Accurately assess need for re-intervention in above patients.
- Evaluation of the Tricuspid and Pulmonic Valve
 - Recognize the normal tricuspid and pulmonic valve leaflets, velocities, area and opening.
 - Recognize normal and abnormal tricuspid inflow patterns and hepatic venous patterns and the pathophysiological implications.
 - Obtain intraoperative vena caval views to document cannula placement or to monitor tumor or air-embolic loads for particular surgical cases.
 - Qualitatively and quantitatively evaluate tricuspid regurgitation.
 - Accurately and reproducibly measure right ventricular systolic pressure.
 - Qualitatively and quantitatively evaluate pulmonic stenosis and regurgitation.
 - Provide surgeons with relevant information necessary for tricuspid valve repair or replacement.
 - Provide surgeons with relevant information necessary for pulmonary valve repair or replacement.
 - Accurately assess post-valve repair/replacement function.
 - Accurately assess need for re-intervention in above patients.
- Evaluation of the Aorta
 - Learn the views used for intraoperative assessment of the ascending, arch, and descending aorta.
 - Identify the typical 2D echocardiographic features of the various aortic dissections.
 - Identify the typical 2D echocardiographic features of atheromatous plaque in the aorta, grade degree of atheromatous aortic disease.
 - Guide / identify proper IABP placement via echo assessment.

B. MEDICAL KNOWLEDGE:

At the completion of this rotation, the fellow(s) will understand:

- The basic principles of ultrasound and how it is incorporated into 2D Echo, Spectral and Color Doppler echocardiography.
- The difference and limitations between continuous and pulsed-wave Doppler ultrasound and their different applications.
- Basic cardiac anatomy and be able to recognize corresponding structures on a TEE examination.
- The indications, limitations, contraindications, and complications of TEE.
- Different artifacts that may interfere with reading an echocardiographic image, (i.e. reverberations, side lobes, shadowing, and other artificial effects)
- Basic topics covered in twice monthly TEE conferences including but not limited to:
 - Basic Principles of 2D Echo
 - Basic Principles of Spectral and Color Doppler
 - Basic cardiac anatomy & TEE
 - Global and Regional LV and RV Function
 - Basic and Advanced Evaluation of the Aortic Valve
 - Basic and Advanced Evaluation of the Mitral Valve
 - Basic and Advanced Evaluation of the Tricuspid Valve

- Basic and Advanced Evaluation of the Pulmonic Valve
- Evaluation of systolic and diastolic dysfunction
- Evaluation of the Aorta
- Evaluation of the Hemodynamically Unstable Patient
- Indications, Complications and Pitfalls of TEE

C. INTERPERSONAL AND COMMUNICATION SKILLS:

- At the completion of the rotation, the fellow(s) will have demonstrated:
- Appropriate communication skills between cardiac surgeon and anesthesiologist during open heart surgery.
- The ability to function as a consultant regarding cardiovascular function to anesthesiology and surgical colleagues during surgery.
- Professional and compassionate interactions with critically ill patients and their families.
- Learn “etiquette of the heart room”. This will include sensitivity to the high pressure environment of the heart room and the social and emotional needs of the surgical team at various times of the surgery
- Serve as a resource to the residents on the both CV and TEE rotations
 - Utilize simulation to educate the residents when there are to cardiac surgery cases
 - Teach the TEE resident how to obtain basic views
 - Review TEE images with the TEE resident

D. PROFESSIONALISM:

- At the completion of the rotation, the fellow(s) will have demonstrated:
- Respect and personal integrity in their interactions with patients, surgeons, anesthesiologists, cardiologists, perfusionists, nurses, and other OR staff.
- Maintaining patient confidentiality.
- Integrity and professional conduct.

E. PRACTICE-BASED LEARNING AND IMPROVEMENT:

- At the completion of the rotation, the fellow(s) will be able to:
- Function simultaneously as the anesthesiologist for the case and as the person responsible for TEE monitoring and interpretation.
- Rapidly assess and prepare the cardiothoracic patient requiring emergency surgery

F. SYSTEMS-BASED PRACTICE:

At the completion of the rotation, the fellow(s) will have demonstrated:

- How conventional hemodynamic monitoring techniques, such as the pulmonary artery (PA) catheter and TEE, will help appropriately determine function of CPB circuit during open heart surgery.
- Challenges faced in applying TEE to assess the appropriate insertion of IABP or ventricular assist device.
- Knowledge gained from TEE and how to use its capabilities in decision making process of critically ill patients in the perioperative period.
- Use of medical informatics to learn about the various cardiovascular medical conditions in patients presenting for vascular surgery.

III. EVALUATION TO DETERMINE GOAL ACHIEVEMENT

- The fellow(s) will be evaluated after this rotation by the TEE rotation director and the attending anesthesiologists involved with cardiovascular anesthesiology.
- The fellow(s), in addition, may receive additional/supplemental evaluations:

- Daily (if possible) discussions based on cases of the day and the reading assessments.
- Daily discussions based upon completion of assigned duties.
- Faculty assigned to the cardiovascular ORs will complete an electronic group evaluation form if they had significant contact with fellow during the rotation.
- The fellow(s) will complete a departmental rotation evaluation form, which will be shared periodically with the rotation director, Clinical Competency Chair, and/or Fellowship Program Director (PD).

IV. TEACHING RESOURCES TO ACCOMPLISH THE OBJECTIVES

- Patients
 - TEE: up to 80 patients per month undergoing cardiovascular, vascular, thoracic, and other procedures
 - Hands-on intraoperative TEE examination
- Reading Materials
 - Texts and review articles:
 - Mathew: Clinical Manual and Review of Transesophageal Echocardiography
 - Perrino and Reeves: A Practical Approach to Transesophageal Echocardiography
 - Sidebotham Malcolm Legget: Practical Perioperative Transoesophageal Echocardiography
 - Sako: Transesophageal Echocardiography
 - De Bruijn and Clemens: Perioperative Transesophageal Echocardiography
 - Reading file provided by the Department containing handouts and peer-reviewed articles located on the Bridge and the Education Hub online
- TEE Reading sessions with the CT faculty
- Interactive hands-on review with the CT Anesthesiology Faculty
- E-echocardiography.com
- Faculty
 - Julia Bauerfeind, M.D.
 - Dustin Hegland, M.D.
 - Daniel Hernandez, M.D.
 - Chris Goldstein, M.D.
 - Gregory Janelle, M.D.
 - Ed McGough, M.D.
 - Yong Peng, M.D.
 - Andrew Pitkin, M.D.
 - Albert Robinson, M.D.
 - Bruce Spiess, M.D.
 - Felipe Urdaneta, M.D.
 - Daryl Reust, M.D.
 - Michael Franklin, D.O.

V. ROTATION DIRECTOR

Dr. Edward McGough is the faculty member responsible for this rotation.

Cardiac ICU Rotation Curriculum

CT Anesthesiology Fellow(s) Goals and Objectives for the Cardiac ICU and Critical Care Medicine Rotation

I. CORE ROTATION INFORMATION

The CT Anesthesiology Fellow(s) will be evaluated on the six core competencies required by the ACGME (described below), as pertains to the care of the Cardiothoracic ICU (CICU) patient. It is understood that the breadth of knowledge and experience gained will be proportional to the amount of time spent rotating in the CICU as well as the effort of the fellow(s) on rounds and in reviewing appropriate reading materials, including textbooks, the peer-reviewed literature, and web-based educational materials.

Training in the CICU is accomplished in one to two consecutive months managing critical care patients in the CICU setting and should include but is not limited to adult cardiothoracic surgical patients. The fellow(s) will be expected to accomplish the full spectrum of the goals and objectives listed below by the time rotation is completed. In addition, graduated levels of responsibility will be given during each CICU rotation. Fellow(s) will be asked to work closely with cardiac surgeons, intensivists, and physician assistants who are scheduled to work in the CICU full time.

Fellow(s) will work closely with CICU attendings and will be expected to be very proactive in developing both initial patient care plans and plans in response to changes in a patient's condition, discuss the plans with the other subspecialty attending, implement the plans, and closely follow the results. They will be expected to be aware of and practice well-established preventive / proactive medicine relevant to common critical care problems. The general area of training for CT anesthesia fellow(s) should primarily focus on but is not limited to:

- Diagnosis and management of post cardiac surgery low output state.
- Diagnosis and management of post cardiac surgery arrhythmia.
- Prevention, diagnosis and management of ventilator associated pneumonia.
- Indications for and maintenance / trouble-shooting IABP.
- Understand fundamental principle and operation of single and bi- ventricular assist Device.
- Post cardiac surgery coagulopathy assessment and management work up.
- Post cardiac surgery renal failure work up and management.

The CT Anesthesiology Fellow(s) will understand the spectrum of critical surgical illness following cardiac, vascular, thoracic, or pulmonary procedures. In the course of following postoperative critically ill patient, the fellow(s) should:

- Learn from observations of the postoperative course of critically ill CICU patients how to better care for critically ill patients intraoperatively.
- Assimilate, organize, and prioritize large amounts of information on critically ill patients.
- Develop competence in the placement and use of invasive hemodynamic monitoring tools.
- Be able to discriminate the critically ill patient who needs intensive postoperative care from the patient who does not require such care, concentrating on:
 - Physiologic instability

- ❖ Hemodynamic (including left atrial pressure)
- ❖ Respiratory
- ❖ Neurologic
- Need for Close Monitoring
- ❖ Neurologic status
- ❖ High risk of continuing bleeding or postoperative bleeding
- ❖ Pulmonary function competence
- The patient with poor physiologic reserve
- ❖ Neurologic
- ❖ Respiratory
- ❖ Cardiovascular (Hemodynamic)

II. SPECIFIC COMPETENCIES

PATIENT CARE SKILLS:

At the completion of this rotation, the fellow(s) will be able to:

- Efficiently obtain historical information from the patient and/or the chart relevant to acute cardiac intensive care management.
- Elicit physical examination findings relevant to acute cardiac intensive care management.
- Demonstrate patient care skills and medical knowledge adequate to appropriately deal with the following general situations commonly seen in a cardiac CICU:
 - the post-cardiac surgical patient with oliguria
 - the post-cardiac surgical patient with hypotension
 - the post-cardiac surgical patient with low cardiac count for cardiac tamponade
 - the febrile post-cardiac surgical patient and the post-cardiac surgical patient with septic shock - includes appropriate use of antibiotics
 - the post-cardiac surgical patient requiring ventilatory support for either acute or chronic respiratory failure - including choice of ventilatory modes and weaning from mechanical ventilation
 - the post-cardiac surgical patient requiring acute airway management - who also has a difficult airway
 - the post-cardiac surgical patient with myocardial ischemia
 - the post-cardiac surgical patient with a coagulopathy
 - the post-cardiac surgical patient requiring either parenteral or enteral nutrition
 - the patient requiring resuscitation (demonstrating a working knowledge of ACLS)
- Synthesize an appropriate management plan from available history, physical findings, and laboratory information - specifically for the following system related problems:
 - Cardiovascular system - fluids
 - ❖ Fluid maintenance requirements
 - ❖ Replacement of blood loss and coagulation deficiencies
 - ❖ Assessment and replacement of 3rd space losses
 - ❖ Differential diagnosis and appropriate treatment of:
 - Hypotension
 - Hypertension
 - Arrhythmias
 - Cardiac arrest (ACLS)
 - Shock states

- Pulmonary embolism
- Neurologic system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Postoperative confusion / agitation
 - Seizures
 - Stroke
- Respiratory system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Hypoxemia
 - Hypercapnia
 - Acute Lung Injury / ARDS
 - Airway compromise - understand different methods for managing and securing the airway
 - Endotracheal intubation with and without drugs (via direct laryngoscopy)
 - Independent lung ventilation
 - Awake fiberoptic intubation
 - Laryngeal mask airway
 - Indications (not performance) for surgical airway
 - cricothyrotomy
 - formal surgical tracheostomy
 - Know available ventilatory support modes and be able to appropriately recognize when each mode is most effectively used
- Renal system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Oliguria
 - Azotemia
 - Common electrolyte abnormalities including but not limited to:
 - hyper / hyponatremia
 - hyper / hypokalemia
 - hyper / hypocalcemia
 - hyper / hypophosphatemia
 - hypomagnesemia
 - acid-base disorders
 - Renal replacement therapy
- Hepatic system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Jaundice
 - Coagulopathy
 - Shock liver
- Hematologic system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Anemia
 - Thrombocytopenia
 - Coagulopathy
- Endocrine system
 - ❖ Differential diagnosis and appropriate treatment of:
 - Adrenal insufficiency
 - Diabetes mellitus and glycemic control

- SIADH
- Reproductive system
- ❖ Be aware of the diagnosis and critical care implications of:
 - Pulmonary and amniotic fluid embolism
 - Peripartum cardiomyopathy
- Be aware of and competently manage Immune System / Infectious Disease issues, specifically:
 - Evaluation and workup of postoperative fever
 - Appropriate selection of antibiotics
 - ❖ Initial choice
 - ❖ Narrowing antibiotic focus based upon culture sensitivities
 - ❖ Drug level monitoring
 - ❖ Duration of therapy
 - Prevention, evaluation, and treatment of common infections in the cardiac surgical patient
 - ❖ Ventilator associated pneumonia (VAP)
 - ❖ Catheter-related bloodstream infection
 - ❖ Urinary tract infections
 - ❖ Wound infections
 - ❖ Peritonitis / intraabdominal abscess
 - ❖ Meningitis
 - ❖ Sepsis / septic shock
 - Surgical antibiotic prophylaxis (choice, timing, discontinuation)
- Be aware of and competently manage nutrition related issues, specifically:
 - Evaluation of nutritional status and assessment of need for:
 - ❖ Enteral nutrition
 - ❖ Parenteral nutrition
- Be aware of the indications for and appropriately utilize blood component therapy including:
 - Packed red blood cells
 - Platelets
 - Fresh frozen plasma
 - Cryoprecipitate
 - Recombinant Factor VIIa
- Refine indications and techniques for use / placement as well as appropriate interpretative skills (as applicable) for the following:
 - Capnography
 - Arterial catheterization
 - Central venous catheterization
 - Pulmonary artery catheterization
 - Cardiac output / function assessment:
 - ❖ Thermodilution
 - ❖ Noninvasive monitors
 - ❖ Echocardiography
 - Transvenous cardiac pacemaker
 - External (Zoll) cardiac pacemaker
 - Chest tube insertion
 - Diagnostic and therapeutic bronchoscopy
- Be aware of and practice well-established preventive / proactive medicine relevant to common critical care problems including:

- DVT prophylaxis
- Stress ulcer prophylaxis
- Pulmonary toilet / bronchodilators / VAP prophylaxis
- Perioperative heart rate and blood pressure control
- Renal protection prior to use of dyes for diagnostic procedures
- Appropriately provide sedation and analgesia to postoperative CTICU patients
- Appropriately utilize and monitor neuromuscular blockade as necessary in the ventilated postoperative patient
- Anticipate problems associated with transport of critically ill patients

MEDICAL KNOWLEDGE:

At the completion of this rotation, the fellow(s) will understand:

- Pathophysiology of patients' preexisting and current surgical and medical illnesses, and the critical care implications of these illnesses.
- Basic science knowledge (physiology, pharmacology, anatomy) as related to patients.
- Pharmacology of drugs commonly used in the critical care setting, especially vasopressors, vasodilators, pain management drugs, sedative drugs, and antimicrobial therapy.
- Principles of mechanical ventilation; understands function of modern ventilators and ventilation strategy options and implementation thereof
- Acid-base physiology

INTERPERSONAL AND COMMUNICATION SKILLS:

At the completion of the rotation, the fellow(s) will have demonstrated:

- Optimum medical care assisted by professionals and effective relationships and communication with attending physicians, surgical colleagues, medical and other consultants.
- Effective and appropriate relationships and communication with nursing and ancillary staff.
- Compassionate relationships and communication with patients and their families during the difficult intensive care stay and appropriately deal with issues surrounding death and the dying process both with patients and their families.

PROFESSIONALISM:

At the completion of the rotation, the fellow(s) will have demonstrated:

- Understanding ethical principles of medicine and how these impact and influence the way patients are treated.
- Participating in rounds on time and promptly when called, responding to care requests promptly and courteously, and providing dictations and timely charting.

PRACTICE-BASED LEARNING AND IMPROVEMENT:

At the completion of the rotation, the fellow(s) will be able to show:

- Use of evidence-based medicine to improve patient care.
- Proficiency at using the electronic medical record and the use of the Internet to look up medical information.
- Assimilation of concepts learned from medical rounds and daily conferences into the developing critical care practice skills.

SYSTEMS-BASED PRACTICE:

At the completion of the rotation, the fellow(s) will have demonstrated:

- How to work with an interdisciplinary team in the care of the CTICU patient including

arranging care from consultative teams

- How to approach patient care problems from a systems-based approach rather than the individual "band-aid" approach.
- Cost-effective medicine without compromising patient care.
- Appropriate utilization of health care resources available to critically ill patients – both during their stay in the CTICU and for planning for discharge from the CTICU and hospital.

III. EVALUATION TO DETERMINE GOAL ACHIEVEMENT

- The CVT anesthesiology fellow(s) will be evaluated at the end of this rotation by the rotation directors.
- The fellow(s), in addition, may receive additional/supplemental evaluations:
 - Area: Daily rounds; Means: Attending and fellow(s) assigned to the CICU for that week
 - Area: Clinical care; Means: Attending and fellow(s) assigned to the CICU during that rotation
 - Area: Presentation of case at clinical conference during the rotation; Means: CICU faculty and fellow(s)
 - Area: Chart notes; Means: Daily review by the attending assigned to the CICU that day
 - Area: Discussions related to daily care of patients; Means: All attendings involved
 - Area: Rotation debriefing session; Means: Rotation Director(s)
 - Area: Overall evaluations at the end of the rotation: CICU faculty who worked with the fellow(s) will complete a monthly online fellow evaluation form. These forms are reviewed by the rotation director, CVT Anesthesiology Fellowship Clinical Competency Chair, and/or CVT Anesthesiology Program Director (PD). The fellowship director will promptly share with fellow(s) any problems identified and assist them with correction.
- The fellow(s) will complete a departmental rotation evaluation form, which will be shared periodically with the rotation director, CVT Anesthesiology Fellowship Clinical Competency Chair, and/or CVT Anesthesiology Fellowship Program Director (PD).

IV. TEACHING RESOURCES TO ACCOMPLISH THE OBJECTIVES

- Patients
 - Approximately 800 patients per year requiring perioperative cardiac intensive care at Shands at UF.
- Reading Materials
 - Reading lists from critical care texts, which are constantly updated.
- Reading file provided by the Department containing handouts and peer-reviewed articles (Anesthesiology Online Bridge and Education Hub)
- Daily CICU conferences at scheduled times.
- Video teaching resources
- Faculty
 - Sean Kiley, MD
 - Ed McGough, MD
 - Sash Grek, MD
 - Amanda Frantz, MD
 - Arturo Torres, MD
 - Dan Demos, MD
 - Matthew Hernandez, MD

V. ROTATION DIRECTOR

Edward McGough, MD, is the faculty member responsible for this rotation.