Cardiothoracic and Vascular Anesthesia Rotation
Goals and Objectives

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Introduction

- Residents should preop their assigned in-house patients themselves a day prior to the scheduled case.
- For outpatients, residents should review the pre-anesthesia evaluation and other relevant patient information including cardiac work up.
- Residents should call the assigned attending the night prior to surgery preferably before 7 pm to discuss the case and address any issues.
- A line form should be completed and signed by the resident. The last few sets of vital signs and filling pressures before leaving the OR should be documented and handed over to the ICU nurse who will assume care of the patient on arrival in the ICU.
- On arrival to ICU, the immediate priority is to make sure that monitoring is transferred to ICU monitor. Once stability is established, a detailed report should be given to the ICU nurse and ICU resident taking care of the patient before leaving the ICU.
- No resident should close the anesthesia record without first informing the attending. Please remember to print TEE report in addition to Anesthesia record.
- Please refer to the “cheat sheet for cardiac OR” developed by previous residents to set up a cardiac OR. A copy will also be in the cardiac OR.

Expectations

All residents will have a CT ICU rotation prior to the CT rotation in the OR.

Attending CT anesthesiologists will determine when residents would be considered ready to be assigned to the CT rotation. For instance, some residents will be assigned to the CT months at the end of their CA-2 year to allow them to acquire the basic knowledge and skills needed in the CT rooms.

Residents who fail to meet the following criteria will have their CT rotation terminated. This will give these residents time to acquire the necessary knowledge and skills needed to return to the CT rooms.

- Critical errors in documentation
- Critical errors in medical judgment
- Deficiencies in basic knowledge
- Critical errors in technical skills
- Evaluation at the end of the CT rotation

Mandatory presentation of at least one keyword on Tuesdays at 06:30 am.

Residents should meet at least a 75% attendance on these keyword sessions.
Satisfactory pass will depend on the consensus of attending
Residents are encouraged to ask for daily feedback from attendings at the end of day
At the discretion of the attending, residents will be given two attempts at line placement and intubations after which the attending will decide whether to take over from the resident.

Orientation for residents starting first time CT rotation
Every effort will be made to give a 15-20 minute operating room orientation by one of the CT attendings to help understand programing pump, closed loop communication with surgeons and perfusionists, key events during cardiac case, safety during transport, etc.
Every effort shall be made to pair up a new resident with a senior resident on rotation for the first cardiac case so that more time will be spent to observe and orient.

Goals
At the end of the 2-month rotation, the resident should be able to

- Reliably perform a preoperative evaluation (including history, physical exam and understanding special investigations) for the patient undergoing cardiothoracic and major vascular surgery.
- Interpret laboratory tests and imaging studies, and relate the data to surgical and anesthesia risk.
- List medical problems, in order of priority, and formulate an anesthetic plan tailored to the needs of the individual patient.
- Counsel and educate patient and families as to the procedures, risks and benefits of anesthesia care.
- Manage co-existing medical disease pre-, intra-, and post-operatively.
- Select, apply, and consider the efficacy and accuracy of monitoring techniques.
- Execute the anesthetic plan in a well-prepared and skilled manner, including induction and maintenance of simple cardiothoracic and major vascular surgical procedures.
- Recognize and respond to significant changes in the patient’s condition.
- Perform basic procedures including: airway management, lung isolation techniques, peripheral and central lines, flotation of Pulmonary Artery catheters, arterial catheters, spinal, epidural and intercostal nerve blocks.

For the CA-3 year: In addition to the above the resident should

- Be able to manage induction and maintenance of medically complex cases undergoing complex cardiothoracic and vascular procedures
- Demonstrate independent judgment in the management of patients undergoing surgery and anesthesia.
- Perform advanced procedures

Objectives
Educational: The resident physician is expected to have a thorough understanding of the pathophysiology and current anesthetic management of patients that are about to undergo cardiac or thoracic procedures. At the end of the three-month rotation he/she will be expected to have become familiar with the following cognitive and procedural skills.

Cognitive Skills:
Cardiac:

Preoperative evaluation – ability to determine perioperative risk and anesthetic management.

- Monitoring the cardiothoracic surgical patient, including but not limited to; ECG, blood pressure (invasive and noninvasive), central venous pressure, pulmonary artery pressure, cardiac output, mixed venous oxygen saturation, pulse oxymetry, ABG analysis, capnography, temperature and basic TEE monitoring.
- Pharmacology of cardiovascular drugs: Inotropes, vasodilators, vasopressors (β agonist, vasopresing agonist), antiarrhythmias (B Blockers, CA channel blockers, Amiodarone, etc.), diuretics.
- Anesthetic management: including induction of anesthesia and management of the pre-cardiopulmonary bypass, cardiopulmonary bypass and post-cardiopulmonary bypass periods.
- Postoperative care of the cardiac surgical patient: including but not limited to ventilatory management, pain and sedation control, hemodynamic and coagulation management.

The resident will be expected to have a clear understanding of the pathophysiology of cardiopulmonary bypass, circulatory assist devices (IABP) and intraoperative myocardial and brain protection.

Thoracic

- Preoperative assessment: including risk stratification based on lung and cardiac functions.
- Monitoring with emphasis on ABG analysis and ventilatory mechanics.
- Lung separation techniques, physiology of one lung ventilation.
- Positioning
- Fiberoptic bronchoscopy and anesthetic techniques.
- Treatment of hypoxemia during one lung ventilation.
- Pain and postoperative ventilatory management

Procedural Skills

- Insertion of invasive hemodynamic monitoring lines
  - Pulmonary artery catheters
  - Central venous lines
  - Arterial catheters
- Endotracheal intubation and ventilatory management
  - Double lumen endotracheal tubes (DLT)
  - Bronchial blockers (BB)
  - Tube exchangers
- Modes of mechanical ventilation: VC, PC, HFJO
- Fiberoptic bronchoscopy (awake fiberoptic intubations, fiberoptic confirmation of proper placement of DLTs and BBs)
- Basic transesophageal echocardiography (insertion of TEE probe, indications and contraindications for perioperative TEE, understanding basic TEE views)
- Pain management (thoracic epidural, intercostal blocks, PCA)

Communications

The resident physician will be evaluated on his ability to communicate and interact with his/her peers, including:
- Patients and families
- Physicians, including anesthesiologists, residents, surgeons and other consultants
- Nurses, OR and anesthesia technicians, perfusionists, respiratory therapists, and other support staff

**Professional Behavior**
- Compassionate care of patients
- Respect for coworkers
- Desire to learn (attendance to didactic sessions, case reviews, in-services, etc.)
- Willingness to work (arrives on time, desire to help member of the CT team, etc.)

Continuity of care - Willingness to provide continuous care intra- and postoperatively.

**CA-2 Duration 2 months**
Residents may request additional months in their CA-3 year for more exposure

**Education Objectives**

1. **Medical Knowledge:**
The resident physician is expected to have a thorough understanding of the pathophysiology and current anesthetic management of patients that are about to undergo cardiac, thoracic and major vascular procedures. At the end of the two-month rotation he/she will be expected to have become familiar with the following cognitive and procedural skills.

**Cognitive Skills:**

- **Cardiac:**
  - Preoperative evaluation – ability to determine perioperative risk and formulate a plan for the anesthetic management.
  - Monitoring the cardiac surgical patient, including but not limited to; ECG, blood pressure (invasive and noninvasive), central venous pressure, pulmonary artery pressure, cardiac output, mixed venous oxygen saturation, pulse oxymetry, ABG analysis, capnography, temperature and basic TEE monitoring.
  - Cardiovascular drugs: Understanding the pharmacology of inotropes, vasodilators, vasopressors, antiarrhythmics, and diuretics.
  - The resident will be expected to have a clear understanding of the pathophysiology of cardiopulmonary bypass, circulatory assist devices (IABP) and intraoperative myocardial and brain protection.
  - Anesthetic management: including induction of anesthesia and management of the pre-cardiopulmonary bypass, cardiopulmonary bypass and post-cardiopulmonary bypass periods.
  - Post-operative care of the cardiac surgical patient: including but not limited to ventilatory management, pain and sedation control, hemodynamic and coagulation management.
  - Understand the principles of blood transfusion practices and perioperative blood conservation

- **Thoracic:**
  - Pre-operative assessment: including risk stratification based on lung and cardiac functions
  - Monitoring with emphasis on ABG analysis and ventilatory mechanics
  - Lung separation techniques, physiology of one-lung ventilation
• Positioning
• Fiberoptic bronchoscopy.
• Treatment of hypoxemia during one lung ventilation.
• Post-operative pain and ventilator management

Major Vascular:
• Preoperative assessment: including risk stratification
• Understanding the pathophysiology of major vascular cases such as abdominal aortic aneurysm repair and carotid endarterectomies
• Understanding the physiology of aortic cross clamping
• Understanding the complications of cross clamping
• Understanding the various monitoring modalities for major vascular as well as carotid endarterectomies
• Postoperative care of the major vascular patient

Procedural skills:
Insertion of invasive hemodynamic monitoring lines
• Pulmonary artery catheters
• Central venous lines
• Arterial catheters
• Pacemakers
• Cardioversion

Endotracheal intubation and ventilatory management
• Double lumen endotracheal tubes
• Bronchial blockers
• Tube exchangers

Modes of mechanical ventilation: VC, PC, PS.
Fiberoptic bronchoscopy (awake fiberoptic intubations, fiberoptic confirmation of proper placement DLTs and BBs)
Basic TEE (insertion of TEE probe, obtaining basic TEE views)
Pain management (thoracic and lumbar epidural placement and management, Intraspinal narcotics, Intercostal blocks, PCA)

Methods of Evaluation
• Global evaluation
• 360 evaluations by nurses, peers, surgeons and medical students
• Daily feedback from attendings

2. Patient Care:
Cardiac:
• Residents will learn the principles of caring for the cardiac patient to include
• Induction of anesthesia
• Management of anesthesia during the prebypass period
• Management of anesthesia during the bypass period
• Weaning from cardiopulmonary bypass
• Management during the post bypass period
• Management of patients undergoing off pump CABG
• Transfer of patient to the ICU

Thoracic:
• Induction of anesthesia
• Management of thoracic epidural during case
• Positioning
• Lung isolation techniques
• Fiberoptic laryngotraceobronchoscopy
• Trouble shoot hypoxemia during one lung ventilation
• Emergence of anesthesia
• Transport of patient

Major vascular:
• Induction of anesthesia
• Maintenance of anesthesia
• Management of lumbar epidural
• Management of the pathophysiology of cross clamping
• Interpreting filling pressures and hemodynamic profiles
• Emergence
• Transport of patient

Methods of Evaluation
• Global evaluation
• Daily evaluations filled by each attending

Interpersonal and Communication skills
• Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange with patients and their families as well as professional associates.
• Residents are expected to
• Explain the process of cardiac thoracic and major vascular anesthesia
• Discuss the risks of general and regional anesthesia
• Communicate with OR nurses, perfusionist, OR techs and other support staff concerning the care of the patient
• Communicate with surgeons about the anesthetic plan as well as the intraoperative management of the patient
• Communicate with faculty and develop a plan for the anesthetic management of the patient
• Communicate with the ICU care team and give report concerning the intraoperative course of the patient as well as post operative management.
• Work effectively with other members of the health care team

Methods of Evaluation:
• Global evaluation
• Daily evaluations filled by each attending
• 360 evaluations by nurses, peers, surgeons and medical students
4. Professionalism:
Residents must demonstrate

- A commitment to carry out professional responsibilities, i.e., willingness to work (arrives on time, desire to help members of the CT team, etc.)
- Adherence to ethical principles
- Sensitivity and responsiveness to a patient’s culture age gender and disabilities.
- Desire to learn (attendance to didactic sessions, case reviews, in-services, etc.)
- Continuity of care: Willingness to provide continuous care intra and postoperatively.

Methods of Evaluation

- Global evaluation
- 360° evaluations by nurses, peers, surgeons and medical students

5. Practice Based Learning:
Residents are expected to

- Locate appraise and assimilate evidence from scientific studies related to their patients health
- Able to access on line medical information to manage patients as well as support their own education
- Able to use hospital based computerized record system as well as efficiently use the computerize record.
- Analyze practice experience and perform practice based improvement activities using a systematic methodology
- facilitate the learning of students and other health care providers
- Recognize limitations and ask for help when appropriate
- Learn from experience

Methods of Evaluation

- Global evaluation
- CT/CTICU Key word presentation during the rotation
- 65% attendance for Key word presentation required

6. Systems Based Practice
 Residents are expected to

- Practice cost effective health care and resource allocation that do not compromise the health of the patient
- Advocate for quality patient care
- Partner with health care managers and health care providers to assess coordinate and improve health of their patients

Suggested Reading

- Kaplan’s Cardiac Anesthesia
- A Practical Approach to Cardiac Anesthesia (Hensley)
- Cardiothoracic journals (e.g., Cardiothoracic and Vascular Anesthesia)
- The guidelines on how to perform basic TEE exam (intranet)
- Cheat sheet for OR room set up

Author: