CARDIOTHORACIC ANESTHESIA ROTATION FOR CA-3 RESIDENTS

Goals and Objectives

Definition – This rotation for adult cardiothoracic anesthesiology is a one to three month rotation in the CA-3 year for cardiothoracic anesthesiology. The adult cardiac portion is based on the elements of the perioperative care of patients for all forms of cardiac surgery, including coronary revascularization, valve replacement, valve repair, arrhythmia surgery, ventricular remodeling and major vascular surgeries. Where feasible, the CA-3 resident will be assigned more advanced cases than the CA-2 resident. In addition, the rotation focuses on all elements of anesthesiology for thoracic surgery, including bronchoscopy, mediastinoscopy, and thoracotomy, and the CA-3 resident will also gain a greater understanding of advanced thoracic procedures such as lung resection, pneumonectomy, lung volume reduction and lung transplantation. The emphasis is in this CA-3 year rotation is to manage more complex cases as well as recognize and treat complications with more independence than the CA-2 resident.

Curriculum – The goal is to provide a broad exposure to all elements of anesthesia for adult cardiac surgery. The clinical experience is supplemented by a manual, a book, a subspecialty conference and a monthly journal club. In addition, the rotation provides clinical experiences with all elements of thoracic anesthesiology, including preoperative assessment, consultation, placement of arterial catheters and pulmonary artery catheters, use of hemodynamic monitoring to make bedside decisions, gaining a more advanced understanding of transesophageal echocardiography views and diagnostic capabilities, thoracic epidural analgesia, double lumen endobronchial tube placement and confirmation of the position, bronchial blocker indications and use, fiberoptic bronchoscopy, and one-lung ventilation. The emphasis in this year is to anticipate, recognize, and treat complications and difficulties of cardiothoracic anesthesia management based on clinical and laboratory data. The resident should establish an appropriate anesthesia plan to prevent and treat complications. As distinguished from the CA-2 resident, the CA-3 resident should be able to establish an appropriate anesthetic plan for complex cardiac and thoracic cases including heart and lung transplantation. In general, the emphasis will be on increasing clinical independence in proportion to the number of months of the clinical rotation, and on increasing depth of understanding of the pathophysiology of the patients' disease processes and of the clinical management of patients for complex cardiothoracic surgical procedures.

Medical Knowledge – At the conclusion of this rotation, the resident should be able to:

1. Describe the anatomy and pathophysiology of major congenital heart diseases.
2. Describe the anesthetic management of patients with congenital heart diseases.
3. Describe the anesthetic management for cardiac transplantation.
4. Describe the anesthetic management for ventricular assist device placement.
5. Describe the anesthetic management for pulmonary embolectomy.
6. Describe the management of pulmonary hypertension.
7. Describe the management of right ventricular failure
8. Describe myocardial remodeling after myocardial infarction or

with chronic cardiomyopathy and congestive heart failure.

9. Describe coronary anatomy and consequences of coronary occlusion.
10. Describe the hemodynamic changes due to valvular heart diseases and advanced anesthetic implications of valvular heart disease including an understanding of flow-volume loops.
11. Explain anesthesia implications of different heart diseases based on pathologic changes of the normal heart structures, e.g., hypertrophic obstructive cardiomyopathy, mitral valve prolapse syndrome, constrictive and restrictive cardiac diseases, and pericardial effusion.
12. Discuss and manage possible complications of cardiopulmonary bypass (CPB) and their treatment, e.g., venous drainage problems, problems with myocardial protection and decompression, difficulties with anticoagulation and reversal of anticoagulation, low systemic vascular resistance during CPB, and management of hemodilution and hemoglobin levels during CPB.
13. Describe the indications, therapeutic role, and bedside management of intra-aortic balloon pump (IABP) treatment.
14. Describe the role of extracorporeal membrane oxygenation (ECMO) and rescue ventricular assist device placement in catastrophic adult cardiac surgical cases.
15. Describe the pathophysiology and possible complications of thoracic aortic surgery, including circulatory arrest and partial left-heart bypass and other alternatives for descending thoracic aortic surgery .

    a. Describe the anesthetic management of circulatory arrest including special monitoring considerations and central nervous system protection.

    b.Describe the indications and role of partial left ventricular bypass, including anesthetic implications.
16. Describe the pharmacology of different inotropic and vasoactive agents and their role in complex heart cases on an advanced level, e.g., combinations of inotropes, vasodilators, vasoconstrictors, and inodilators.
17. Describe the role of Nitric Oxide in anesthetic management of complex cardiac cases.
18. Describe common problems and their treatment during postoperative recovery of the complicated cardiac surgery patient, e.g., excessive blood loss, cardiac tamponade, pacing and rhythm disturbances, difficulty weaning from mechanical ventilation. .
19. Describe the changes in the coagulation system during cardiopulmonary bypass and their management during and after CPB.
20. Describe the TEG and other coagulation laboratory parameters used to evaluate the coagulation system during cardiac surgery. Establish a treatment plan based on the changes of coagulation parameters.
21. Describe the role of recombinant Factor VIIa in treatment of catastrophic bleeding.
22. Describe the management of mechanical ventilation of the complicated cardiac/thoracic surgery patient.
23. Describe preoperative assessment for thoracic surgery including contraindications to pulmonary resection.

24. Use preoperative respiratory parameters to anticipate and prevent complications during anesthetic management of thoracic cases.
25. Describe indications for and risks of postoperative intubation and ventilation in patients undergoing pulmonary procedures.
26. Describe the causes and treatment of hypoxemia and hypercarbia during one-lung ventilation. Describe problems of positioning and correcting tube position problems during one lung anesthesia in depth.
27. Describe possible complications after major lung resection and pneumonectomy.
28. Describe the anesthetic management of single and double lung transplantation, including the indications for cardiopulmonary bypass.
29. Describe different techniques for analgesia during and after thoracic surgery, including epidural analgesia, paravertebral blocks, and intercostal nerve blocks.
30. Describe the postoperative recovery of the complicated thoracic surgery patient, including analgesia and possible mechanical ventilation.
31. Use the basic TEE images and TEE physical principles to evaluate pathological morphology and physiology of the diseased heart. Use TEE images to guide bedside clinical decisions at a basic to intermediate level.
32. Understand and discuss the anesthetic problems associated with off-pump coronary artery revascularization and transmyocardial laser coronary revascularization procedures.

Patient Care – At the conclusion of this rotation, the resident should be able to:

1. Insert, manage, and interpret the results of arterial catheterization, central venous catheterization and pulmonary artery catheterization with minimal staff assistance in the majority of cases.
2. Prepare the patient for cardiopulmonary bypass while considering possible complications.
3. Manage complex problems during cardiopulmonary bypass.
4. Prepare the high-risk patient for separation from cardiopulmonary bypass, considering and planning for possible difficulties.
5. Independently prepare the patient for transport to the intensive care unit (SICU) after cardiac surgery in a safe and timely manner.
6. Independently transport the patient to the SICU safely.
7. Independently give a detailed report in SICU while maintaining continuous vigilance about the patient's hemodynamic status.
8. Perform fiberoptic bronchoscopy with minimal staff assistance in the majority of cases.
9. Insert and manage double lumen endobronchial tubes with minimal faculty assistance in the majority of cases. Place and utilize bronchial blockers with faculty assistance.
10. Identify and appropriately manage patients at high risk for pulmonary and cardiac complications of pulmonary surgery.
11. Conduct one-lung ventilation and treat complications with minimal staff assistance with advanced appreciation for alternative strategies for managing ventilator difficulties and hypoxemia.

12. Recognize acute respiratory failure, establish and implement a plan to manage it.
13. Safely reintubate patients after thoracotomy when indicated independently.
14. Recognize massive intrathoracic bleeding and establish effective treatment.
15. Initiate and maintain appropriate analgesia after thoracic surgery.
16. Independently transfer thoracic (pulmonary surgery) patients to the post-anesthesia care unit (PACU) or SICU.

Communication and Interpersonal Skills – At the conclusion of this rotation, the resident should be able to:

1. Effectively communicate the relevant preoperative information needed to plan anesthesia for cardiac surgery. Effective communications will involve the patient as well as all members of the surgical team including surgeons, residents, nurses, and perfusionists.
2. Manage complications during cardiac anesthesia based on clinical and laboratory data while organizing support infrastructure such as laboratory testing, pharmacy needs, and blood transfusions and develop communication skills to facilitate these ancillary clinical services by working within the existing system.
3. Identify complications during the cardiac surgical procedure quickly by observation and interaction with the entire surgical team, including nurses, residents, attending staff, and perfusionists.
4. Identify the relevant preoperative information needed to plan anesthesia for pulmonary surgery and communicate effectively with patient, surgeon, and faculty anesthesiologist about perioperative risk factors and about modification of perioperative risk.
5 Anticipate complications during the thoracic (pulmonary) surgical procedure based on clinical and laboratory data, manage the collection of data, communicate a treatment plan with co-workers, and implement the appropriate treatment plan.
6. Identify unexpected complications during the thoracic surgical procedure quickly by observation and interact with the surgical team to resolve them.

Professionalism – At the conclusion of this rotation, the resident will be able to:

1. Prepare the patient for the cardiothoracic procedures and invasive monitoring.
2. Prepare the patient for possible complications.
3. Properly perform consultative and preoperative assessments for complex cardiac and thoracic cases.
4. Effectively work as a team member to solve complications and difficulties during the anesthetic management.
5. Effectively and professionally communicate with the surgical team in critical situations.
6. Understand the continuing educational needs of a cardiothoracic anesthesiologist.

7. Understand the differences in professional capabilities of a fellowship-trained and non-fellowship trained cardiothoracic anesthesiologist sufficiently to assist in decision-making about career practice choices.
8. Understand the requirements and options for certification in perioperative transesophageal echocardiography by the National Board of Echocardiography.

Systems based practice

1. Understand billing and collections for cardiac and thoracic procedures including modifiers for these procedures.
2. Complete the appropriate paperwork and computer work for preoperative, intraoperative, and postoperative documentation.
3. Understand billing and collections for transesophageal echocardiography
4. Recognize strengths and limitations of current patient care systems supporting cardiothoracic surgery patients and make constructive suggestions for improvement in these systems as needed.

EVALUATION OF CA-3 ANESTHESIOLOGY RESIDENTS IN THE CARDIOTHORACIC ROTATION

Evaluator: Subject:

PROFESSIONALISM

- Respectful for patients, families and other members of the health care team.
- Properly performs consultative and preoperative assessments.
- Establishes anesthetic plan for the case and for treating possible complications based on clinical and laboratory data.
- Communicates effectively with the cardiothoracic surgery team to discuss possible complications and difficulties during patient management.
- Safely prepares the patient for invasive monitoring and pointing out possible contraindications in certain clinical scenarios.

MEDICAL KNOWLEDGE

- Exhibits knowledge that is up to date and appropriate to level of training.
- Investigates topics needed for clinical assignments.
- Considers range of potential anesthetic plans and treatment options for possible difficulties.
- Understands the abnormal anatomy and physiology of the diseased heart.
- Understands pharmacology pertinent to the cardiovascular system and the indications and contraindications of different inotropic and vasoactive agents.
- Understands and evaluate coronary artery and valvular heart diseases and their anesthesia implications.
- Understands the anesthesia implications and possible complications of cardiopulmonary bypass.
- Understands the anesthesia implications and treatment of complications in aortic surgery.
- Knows sequential steps of cardiopulmonary resuscitation in catastrophic situations.
- Manages the ventilation of the complicated cardiac/thoracic surgery patient.
- Understands the physiological responses to heart or lung transplantation.

PATIENT CARE

- Gathers appropriate pre-procedure information, orders tests and interprets the data properly to expect complications and establish treatment.

- Uses the results of arterial catheterization, central venous catheterization and pulmonary artery catheterization to evaluate difficult clinical scenarios.
- Follows the surgery and recognizes complications during cardiopulmonary bypass.
- Prepares the patient for transport after cardiopulmonary bypass in an organized and timely manner.
- Transports the patient to SICU safely with vigilance to the clinical parameters.
- Gives report in SICU with vigilance to the clinical parameters.
- Places and manage epidural catheters for patients having cardiothoracic surgery.
- Performs fiberoptic bronchoscopy with minimal staff assistance in the majority of cases to solve intraoperative difficulties.
- Insert and manage double lumen endotracheal tubes with minimal staff assistance in the majority of cases.
- Conduct one-lung ventilation and manage difficulties with minimal staff assistance.
- Transfer thoracic patients to the PACU or ICU with minimal staff assistance.
- Evaluate appropriate analgesia options after thoracic surgery.

CLINICAL/TECHNICAL SKILLS

- Appropriate and rapid room preparation and machine testing.
- Safe performance of general anesthesia with appropriate airway management skills.
- Prepare the patient for cardiopulmonary bypass.
- Identifies and treat complications during cardiopulmonary bypass.
- Timely preparation for separation from cardiopulmonary bypass.
- Active participation in the process of separation from cardiopulmonary bypass.
- Indicates inotropic and vasoactive medications based on clinical situations.
- Effective preparation of the patient for the transport to the SICU.
- Performs double lumen tube placement with high success rate.
- Changes double lumen tube to single lumen tube.
- Initiates appropriate regional anesthesia including drug and technique selection.
- Placement of invasive monitors.
- Understands different TEE modalities, finds the basic views and recognizes abnormal anatomy. Understands basic hemodynamic calculations.

INTERPERSONAL AND COMMUNICATION SKILLS

- Communicates effectively with colleagues and other health care professionals.
- Counsels and communicates effectively with patients including informed consent.
- Identifies the relevant preoperative information needed to plan anesthesia for cardiothoracic surgery and expect possible complications.
- Recognizes the stage of the surgical procedure and the complications quickly by observation and interaction with the anesthesia attending and the surgical team.
- Medical records are legible, comprehensive and timely.

PRACTICE-BASED LEARNING AND IMPROVEMENT

- Uses information technology effectively; able to perform a literature search.
- Constant self-evaluation; uses feedback from patients and other care givers.
- Demonstrates knowledge of study design and statistical methods to evaluate scientific studies.
- Facilitates the learning of students and other professionals.
- Incorporates principles of evidence-based medicine into anesthesia practice (e.g. practice guidelines).
- Knows basic articles in connection with the effect of cardiopulmonary bypass on coagulation, cardiovascular and cerebral system.
- Knows basic articles about administration of antifibrinolytic and coagulation agents.

SYSTEMS-BASED PRACTICE

- Practices cost-effective medicine that does not compromise quality of care.
- Knows the indications of administration of especially expensive medications.
- Uses resources and consults appropriately.
- Uses protocols and practice guidelines to reduce error, improve outcome.