

Curriculum

Cardiothoracic Fellowship Training Program

Department of Anesthesiology

Virginia Commonwealth University Health System

Cardiothoracic Fellowship Rotatioin Schedule

Adult cardiac anesthesia	5 months
Primary caregiver role (2 months)	
Supervisory role with CA-2 & CA-3 residents (3 months)	
Adult thoracic anesthesia	1 month
Pediatric cardiothoracic anesthesia	2 months
Transthoracic/transesophageal echocardiography	2 months
Adult critical care (post-cardiac surgery)	1 month
Cardiac catheterization and interventional lab	2 weeks
Extracorporeal perfusion	2 weeks
Advanced Cardiac Life Support (ACLS) certification	
Pediatric Advanced Life Support (PALS) certification	

The majority of the rotations will be performed at VCU Medical Center.

I. Introduction

A. Definition and Scope of the Fellowship

Cardiothoracic Anesthesia is the subspecialty of anesthesiology devoted to the preoperative, intraoperative, and postoperative care of adult patients undergoing cardiothoracic surgery and related invasive procedures.

B. Duration and Scope of Education

Subspecialty training in adult Cardiothoracic Anesthesia will be a minimum of twelve months in duration, beginning after satisfactory completion of Accreditation Council for Graduate Medical Education (ACGME) accredited residency program in anesthesiology -- as required for entrance into the examination system of the American Board of Anesthesiology. Because Cardiothoracic Anesthesia education requires an intensive continuum of training, it should not be interrupted by frequent and/or prolonged periods of absence. The majority of the training in Cardiothoracic Anesthesia will be spent in caring for patients in the operating room, other anesthetizing locations, and intensive care units. The training will include experience in providing anesthesia for cardiac, non-cardiac thoracic, and vascular surgical procedures. It may also include anesthesia for non-operative diagnostic and interventional cardiac and thoracic procedures outside the operating room. Preanesthesia preparation and postanesthesia care, pain management, and advanced cardiac life support will be included, also.

C. Goals and Objectives

The subspecialty program in Cardiothoracic Anesthesia will be structured to ensure optimal patient care while providing fellows the opportunity to develop skills in clinical care and judgement, teaching, and research. The subspecialist in Cardiothoracic Anesthesia will be proficient in providing anesthesia care for patients with cardiac or thoracic diseases undergoing cardiac surgery with and without extra corporeal circulation, surgery on the thoracic aorta, pulmonary and mediastinal surgery, nonoperative diagnostic and interventional cardiac and thoracic procedures, and electrophysiological procedures. In addition, the subspecialist in

Cardiothoracic Anesthesia will develop skills in the conduct of preoperative patient evaluation and interpretation of cardiovascular and pulmonary diagnostic test data, hemodynamic and respiratory monitoring, advanced level perioperative transesophageal echocardiography (TEE), management of cardiopulmonary bypass (CPB), pharmacological and mechanical hemodynamic support, and perioperative critical care including ventilatory support and perioperative pain management. To meet these goals, the program will provide exposure to the wide variety of clinical problems in cardiothoracic patients as outlined below in Section V.B. below.

Specific objectives are summarized below.

1. To acquire the knowledge, judgment, and skills requisite with recognition as a consultant anesthesiologist with subspecialty expertise in Cardiothoracic Anesthesia
2. To develop specialized expertise in the performance and interpretation of perioperative transesophageal echocardiography with the specific goal of attaining the American Board of Echocardiography's certification in Perioperative TEE at completion of fellowship training
3. To participate actively in clinical and/or basic research with the goal of acquiring skills needed to identify important clinical questions, to critically evaluate published literature, and to design studies to answer questions according to the scientific method

II. Institutional Organization

A. Relationship to the Core Residency Program

The fellowship program in Cardiothoracic Anesthesia will be integrally coordinated with the ACGME accredited core residency program in anesthesiology. The Director of the core anesthesiology residency program is responsible for the appointment of the director of the cardiothoracic anesthesiology subspecialty program and determines the activities of the appointee and the duration of the appointment. There will be close cooperation between the core program and the subspecialty training program. The division of responsibilities between the residents in the core program and fellows in the subspecialty program will be

clearly delineated. **The presence of a Cardiothoracic Anesthesia fellowship program will not compromise the clinical experience and/or number of cases available to residents in the core program in anesthesiology.**

B. Institutional Policy

There should be an institutional policy governing the educational resources committed to the Cardiothoracic Anesthesia fellowship program.

III. Faculty Qualifications and Responsibilities

A. Program Director

1. Qualifications of the Program Director

The Program Director in Cardiothoracic Anesthesia will be an anesthesiologist who is certified by the American Board of Anesthesiology or who has equivalent qualifications. The Program Director also will be licensed to practice medicine in the state of Virginia and have an appointment in good standing to the medical staff of VCUHS. The Program Director will have training and/or experience in providing anesthesia care for cardiothoracic surgical patients beyond the requirement for completion of a core anesthesiology residency. The Program Director will have training and experience that would generally meet or exceed that associated with the completion of a one-year Cardiothoracic Anesthesia fellowship. The Program Director in Cardiothoracic Anesthesia has responsibility for the fellowship training program subject to the approval of the program director of the core residency training program in anesthesiology. She/he will devote sufficient time to provide substantial leadership to the program and supervision for the fellows. The clinical director of the Cardiothoracic Anesthesia service may be someone other than the Program Director.

2. Responsibilities of the Program Director

- a. Preparation, periodic review and, if necessary, revision of a written outline of the educational goals of the program with respect to the knowledge, skills, and other attributes of fellows in Cardiothoracic Anesthesia. A copy of this curriculum will be submitted to Graduate Medical Education Office with a copy maintained in the

Education Division of the Anesthesiology residency training program office,
in the Department of Anesthesiology

- b. Selection of fellows for appointment to the program in accordance with institutional and departmental policies and procedures
- c. Selection and supervision of the teaching staff and other program personnel
- d. Supervision of fellows through explicit written descriptions of supervisory lines of responsibility for the care of patients and communication of guidelines to all members of the program staff
- e. Implementation of fair procedures, as established by VCUHS regarding academic discipline and fellow initiated complaints or grievances

B. Faculty

Although the number of faculty members involved in teaching fellows in Cardiothoracic Anesthesia will vary; it is recommended that at least three faculty members be involved and that these be equal to or greater than two full-time equivalents, including the Program Director. A ratio of no less than one full-time equivalent faculty member to one subspecialty fellow will be maintained. The faculty will have training and experience that would generally meet or exceed that associated with the completion of a one-year Cardiothoracic Anesthesia fellowship. The faculty will possess expertise in the care of cardiothoracic surgical patients and will have a continuous and meaningful role in the subspecialty training program. The faculty will include at least one individual who has successfully completed advanced perioperative echocardiography education according to echocardiography training guidelines of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists' "Guidelines for Training in Perioperative Echocardiography." The program will include teaching in multidisciplinary conferences by faculty in cardiology, cardiothoracic surgery, and intensive care medicine. The cardiothoracic fellowship Program Director and faculty

responsible for teaching subspecialty fellows in Cardiothoracic Anesthesia will maintain an active role in scholarly pursuits pertaining to Cardiothoracic Anesthesia, as evidenced by participation in continuing medical education as well as by involvement in research as it pertains to the care of cardiothoracic patients. Faculty currently participating in the fellowship training program are listed below:

Cardiothoracic Fellowship Program Faculty

Director, Cardiothoracic Fellowship Program

Catherine L. Cooper, M.D.

Octavio A. Falcucci, M.D.

Jeffrey A. Green, M.D.

*Amira B. Safwat, M.D.

Jay H. Shapiro, M.D., Director, Education Division, Residency Training Program

Bruce D. Spiess, M.D.

*Diplomat, National Board of Echocardiography Advanced Certification
in Perioperative Transesophageal Echocardiography

IV. Clinical and Educational Facilities and Resources

The following resources and facilities are available to the program

- A. Intensive care units for cardiothoracic surgical patients
- B. An emergency department in which cardiothoracic patients are effectively managed 24 hours a day
- C. Operating rooms designed and equipped for the management of cardiothoracic patients
- D. A postanesthesia care area designed and equipped for the management of cardiothoracic patients located near the operating room suite
- E. Cardiothoracic patients will be available in sufficient volume and variety to provide a broad educational experience for the program. Physicians with special training and/or experience in cardiovascular disease, intensive care, clinical cardiac electrophysiology, cardiac and non-cardiac thoracic surgery, general vascular surgery, and pulmonary diseases are available readily.

- F. Monitoring and advanced life support equipment representative of current technology
 - G. Allied health staff and other support personnel
 - H. Facilities are readily available at all times to provide prompt laboratory measurement pertinent to the care of cardiothoracic patients – including, but not limited to, measurement of blood chemistries, blood gas and acid base analysis, oxygen saturation, hematocrit/hemoglobin, and coagulation functions.
 - I. Facilities are readily available at all times to provide prompt noninvasive and invasive diagnostic and therapeutic cardiothoracic procedures. These include but are not limited to echocardiography, cardiac stress testing, cardiac catheterization, electrophysiological testing and therapeutic intervention, cardiopulmonary scanning procedures, and pulmonary function testing.
 - J. Conveniently located library facilities and space for research and teaching conferences in Cardiothoracic Anesthesia are readily available.
- V. Educational Program
- A. Goals and Objectives

The director and teaching staff will prepare and comply with written goals for the program. All educational components will be related to the program goals. A written statement of the educational objectives will be given to each fellow at the start of the program.
 - B. Clinical Components

The subspecialty fellow in Cardiothoracic Anesthesia will gain extensive clinical experience in the care of adult cardiothoracic patients and their diseases as follows:

 - 1. Adult Cardiothoracic Anesthesia Fellowship Track
 - a. Required Core

1. The required core will be comprised of 8 months of “operating room” clinical activity providing a minimum of 100 surgical procedures involving adult patients requiring CPB -- to include a minimum of 40 anesthetics involving valve repair or replacement and a minimum of 80 procedures involving myocardial revascularization with or without CPB. The fellow will provide anesthetic management for patients undergoing minimally invasive cardiac surgery. The fellow will provide anesthetic management for congenital cardiac procedures performed on adult patients. The fellow will gain sufficient experience to independently manage intra-aortic balloon counterpulsation. The fellow will be actively involved in the management of patients with ventricular assist devices.
2. Additional clinical experience within the full one-year fellowship will include anesthetic management of adult patients undergoing surgery on the thoracic aorta requiring CPB
3. In addition, the fellow will receive experience in the management of adult patients for cardiac pacemaker and automatic implantable cardiac defibrillator placement, surgical treatment of cardiac arrhythmias, cardiac catheterization, and cardiac electrophysiologic diagnostic and/or therapeutic procedures.
4. Additional clinical experience within the full one-year fellowship will include successful completion of advanced perioperative echocardiography education according to the training guidelines from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists “Guidelines for Training in Perioperative Echocardiography”. This will include the study of 300 complete perioperative echocardiographic examinations, at least 150 of which are comprehensive intraoperative TEE examinations personally performed, interpreted, and reported by the trainee.
5. Each fellow will participate in a 1-month rotation managing adult cardiothoracic surgical patients in a critical care.

b. Elective Rotations

Two months of elective rotations (none less than 2 weeks in duration) from the following categories: Inpatient or outpatient cardiology, invasive cardiology, inpatient or outpatient pulmonary medicine, medical or surgical critical care, extracorporeal perfusion technology and pediatric Cardiothoracic Anesthesia. One to two months devoted to a research project in Cardiothoracic Anesthesia may be substituted for the two months of clinical elective rotations.

- C. The didactic curriculum, provided through lectures, conferences and workshops will supplement clinical experience as necessary for the subspecialty fellow to acquire the knowledge to care for cardiothoracic patients and conditions outlined in the guidelines for the minimum clinical experience for each fellow. The didactic components will include the following areas, with emphasis on how cardiothoracic diseases affect the administration of anesthesia and life support for cardiothoracic patients. The didactic program for the adult Cardiothoracic Anesthesia fellowship track will focus primarily on topics pertinent to this patient population. The following represents guidelines for the minimum didactic experience and academic project (see below) for each fellow. *

*Some of the topics listed constitute components of the Core residency in Anesthesiology. They are included in the requirements for the Cardiothoracic Anesthesia Fellowship to emphasize their importance to the foundation of the discipline of Cardiothoracic Anesthesia and to stress the need to reinforce and enrich them in the subspecialty fellowship educational program:

1. Embryological development of the cardiothoracic structures
2. Pathophysiology, pharmacology and clinical management of patients with cardiac disease including cardiomyopathy, heart failure, cardiac tamponade, ischemic heart disease, acquired and congenital valvular heart disease, congenital heart disease, electrophysiologic disturbances and neoplastic and infectious cardiac diseases

3. Pathophysiology, pharmacology, and clinical management of patients with respiratory disease including pleural, bronchopulmonary, neoplastic, infectious, and inflammatory diseases
4. Pathophysiology, pharmacology, and clinical management of patients with thoracic vascular, tracheal, esophageal, and mediastinal diseases including infectious, neoplastic, and inflammatory processes
5. Non-invasive cardiovascular evaluation: electrocardiography, transthoracic echocardiography, transesophageal echocardiography (TEE), stress testing, and cardiovascular imaging. TEE training will be based upon the advanced echocardiography training objectives of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists “Guidelines for Training in Perioperative Echocardiography”
6. Cardiac catheterization procedures and diagnostic interpretation; invasive cardiac catheterization procedures including angioplasty, stenting, and transcatheter laser and mechanical ablations
7. Non-invasive pulmonary evaluation: pulmonary function tests, blood gas and acid-base analysis, oximetry, capnography, and pulmonary imaging
8. Preanesthetic evaluation and preparation of cardiothoracic surgical patients
9. Pharmacokinetics and pharmacodynamics of medications prescribed for medical management of cardiothoracic surgical patients
10. Perianesthetic monitoring: non-invasive and invasive (intraarterial, central venous, pulmonary artery, mixed venous saturation, cardiac output)
11. Pharmacokinetics and pharmacodynamics of anesthetic medications prescribed for cardiothoracic surgical patients
12. Extracorporeal circulation including, myocardial preservation, effects of CPB on pharmacokinetics and pharmacodynamics, cardiothoracic, respiratory, neurological, metabolic, endocrine, hematological, renal and thermoregulatory effects of CPB and coagulation/anticoagulation before, during, and after CPB

13. Pharmacokinetics and pharmacodynamics of medications prescribed for management of hemodynamic instability: inotropes, chronotropes, vasoconstrictors, and vasodilators
14. Circulatory assist devices: intra-aortic balloon counterpulsation, left and right ventricular assist devices and biventricular assist devices
15. Cardiac surgical procedures: adult and pediatric, minimally invasive, myocardial revascularization, valve repair and replacement, pericardial, neoplastic procedures, and heart and/or lung transplantation
16. Thoracic aortic surgery: ascending, transverse and descending aortic surgery with circulatory arrest, CPB employing low flow, and/ or retrograde perfusion
17. Esophageal surgery: varices, neoplastic, colon interposition, foreign body, and stricture
18. Pulmonary surgery: thoroscopic or open; lung reduction, bronchopulmonary lavage, one lung ventilation, lobectomy, pneumonectomy and bronchoscopy: fiberoptic, rigid, laser resection
19. Postanesthetic critical care of cardiothoracic surgical patients
20. Ventilator modes and management
21. Pain management of cardiothoracic surgical patients
22. Research methodology/statistical analysis
23. Quality assurance/improvement
24. Ethical and legal issues
25. Practice management

Cardiothoracic subspecialty conferences, including lectures, interactive conferences, hands-on workshops, morbidity and mortality conferences, cardiac catheterization and echocardiography conferences, cardiothoracic surgery case review conferences, journal reviews and research seminars will be attended regularly. Active participation of the cardiothoracic anesthesia fellow will be incorporated into the planning and production of these conferences. However, the faculty will be the conference leaders in the majority of sessions. Attendance by subspecialty fellows at multidisciplinary conferences -- especially in cardiovascular medicine and cardiothoracic surgery will be encouraged.

The fellow will complete a minimum of one academic assignment. Academic projects may include grand rounds presentations, preparation and publication of review articles, book chapters, and manuals for teaching or clinical practice, clinical research investigation or similar scholarly activities. The project selection will be subject to approval by the fellowship Program Director.

VI. Evaluation

- A. Faculty responsible for teaching subspecialty fellows in Cardiothoracic Anesthesia will provide critical evaluations of each fellow's progress and competence to the Cardiothoracic Anesthesia Program Director at quarterly intervals. These evaluations will assess essential character attributes, acquired character attributes, fund of knowledge, clinical judgment and clinical psychomotor skills, as well as specific tasks and skills for patient management and critical analysis of clinical situations. The Program Director or designee will inform each fellow of the results of the evaluations at least every 3 months during training, advise the fellow of areas needing improvement, and document the communication. Subspecialty fellows in Cardiothoracic Anesthesia must obtain overall satisfactory evaluations at the completion of 12 months training to receive credit for training.
- B. There will be a regular opportunity for fellows to provide written confidential evaluation of the faculty and program.
- C. Periodic evaluation of patient care (quality assurance) is mandatory. Subspecialty fellows in Cardiothoracic Anesthesia will be involved in continuing quality improvement and risk management.
- D. Cardiothoracic Anesthesia fellows will actively participate in the periodic evaluation and reassessment of the fellowship training goals and objectives.