



## **European Association of Cardiothoracic Anesthesiology (EACTA) Cardiothoracic and Vascular Anesthesia Fellowship Curriculum: First Edition**

Gabor Erdoes, Alain Vuylsteke, Jan-Uwe Schreiber, R Peter Alston, Simon Howell,  
Patrick Wouters, Fabio Guarracino, Dragana Unic-Stojanovic, Alberto Hernandez  
Martinez, Marc Vives, et al.

### **► To cite this version:**

Gabor Erdoes, Alain Vuylsteke, Jan-Uwe Schreiber, R Peter Alston, Simon Howell, et al.. European Association of Cardiothoracic Anesthesiology (EACTA) Cardiothoracic and Vascular Anesthesia Fellowship Curriculum: First Edition. Journal of Cardiothoracic and Vascular Anesthesia, 2019, <10.1053/j.jvca.2019.12.014>. <hal-02444810>

**HAL Id: hal-02444810**

**<https://hal.science/hal-02444810v1>**

Submitted on 28 Oct 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

# European Association of Cardiothoracic Anesthesiology (EACTA) Cardiothoracic and Vascular Anesthesia Fellowship Curriculum: First Edition

Gabor Erdoes, MD, PhD<sup>\*,1</sup>, Alain Vuylsteke, MD<sup>†</sup>,  
 Jan-Uwe Schreiber, MD, PhD<sup>‡</sup>, R. Peter Alston, MD<sup>§</sup>,  
 Simon J. Howell, MD<sup>||</sup>, Patrick F. Wouters, MD, PhD<sup>¶</sup>,  
 Fabio Guarracino, MD<sup>#</sup>, Dragana Unic-Stojanovic, MD, PhD<sup>\*,\*</sup>,  
 Alberto Hernandez Martinez, MD, PhD<sup>††</sup>, Marc Vives, MD, PhD<sup>‡‡</sup>,  
 Philippe Gaudard, MD<sup>§§,|||</sup>, Philippe Burtin, MD<sup>¶¶</sup>,  
 Dominique Bettex, MD<sup>##</sup>, Manuel Granell, MD, PhD<sup>\*\*\*</sup>,  
 Andrea Szekely, MD, PhD<sup>†††</sup>, Joost van der Maaten, MD<sup>‡‡‡</sup>,  
 Theofani Antoniou, MD, PhD<sup>§§§</sup>, María José Jiménez, MD<sup>||||</sup>,  
 Laszlo Szegedi, MD, PhD<sup>¶¶¶</sup>, Manfred Seeberger, MD<sup>###</sup>,  
 Joachim M. Erb, MD<sup>\*\*\*\*</sup>, Rajni Singh, MD<sup>††††</sup>,  
 Vera von Dossow, MD<sup>††††</sup>, Purificación Matute, MD, PhD<sup>§§§§</sup>,  
 Peter Rosseel, MD<sup>||||||</sup>, Nandor Marczin, MD, PhD<sup>¶¶¶¶,####</sup>,  
 Giovanni Landoni, MD<sup>\*\*\*\*\*</sup>, †††††, Kirstin Wilkinson, BmedSci<sup>§§§§§</sup>,  
 Paul Diprose, FRCA<sup>†††††</sup>, Chirojit Mukherjee, MD<sup>§§§§§</sup>,  
 Gianluca Paternoster, MD, PhD<sup>|||||||</sup>,  
 Mohamed R. El-Tahan, MD<sup>¶¶¶¶¶,#####</sup>, and the Education and Subspecialty Committees of the European Association of Cardiothoracic Anesthesiology (EACTA)

<sup>\*</sup>Department of Anesthesiology and Pain Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

<sup>†</sup>Department of Intensive Care, Royal Papworth Hospital, Cambridge Biomedical Campus, Cambridge, United Kingdom

<sup>‡</sup>Department of Anesthesia and Pain Medicine, Maastricht UMC, Maastricht, The Netherlands

<sup>§</sup>Department of Anaesthesia, Critical Care and Pain Medicine, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom

<sup>||</sup>Leeds Institute of Medical Research at St. James's, University of Leeds, St. James's University Hospital, Leeds, United Kingdom

<sup>¶</sup>University Department of Fundamental and Applied Medical Sciences and Clinical Department of Anesthesiology and Perioperative Medicine, Ghent, Belgium

<sup>#</sup>Department of Anesthesia and Critical Care Medicine, Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

<sup>1</sup>Address reprint requests to Gabor Erdoes, MD, PhD, Department of Anesthesiology and Pain Medicine, Inselspital University of Bern, Freiburgstrasse, INO D-



- <sup>\*\*</sup>Department of Anesthesia and Intensive Care, Institute for Cardiovascular Diseases Dedinje, School of Medicine University of Belgrade, Belgrade, Serbia
- <sup>††</sup>Department of Anesthesia and Intensive Care, Hospital Universitari Bellvitge, Barcelona, Grupo Policlinica, Ibiza, Spain
- <sup>‡‡</sup>Department of Anesthesia and Critical Care, Hospital Dr. Josep Trueta, Girona, Spain
- <sup>§§</sup>Department of Anesthesiology and Critical Care Medicine, CHU Montpellier, Montpellier, France
- <sup>|||</sup>Department of Anesthesiology and Critical Care Medicine Arnaud De Villeneuve, University of Montpellier, Montpellier, France
- <sup>¶¶</sup>Clinique Du Millenaire, Montpellier, France
- <sup>##</sup>Institute of Anesthesiology, University and University Hospital Zurich, Zurich, Switzerland
- <sup>\*\*\*</sup>Department of Anesthesia, Critical Care and Pain Medicine, University General Hospital Consortium of Valencia, Valencia, Spain
- <sup>†††</sup>Department of Anesthesia and Intensive Care, Semmelweis University, Budapest, Hungary
- <sup>‡‡‡</sup>Department of Anesthesiology, University Medical Center Groningen, The Netherlands
- <sup>§§§</sup>Onassis Cardiac Surgery Center, Athens, Greece
- <sup>||||</sup>Academy of Medical Science and Health of Catalunya and Balears, Hospital Clinic Barcelona, University of Barcelona, Centro Médico Teknon, Barcelona, Spain
- <sup>¶¶¶</sup>Department of Anesthesiology, C.U.B., Brussels University Hospital, Brussels, Belgium
- <sup>###</sup>Department of Anesthesia, University Hospital Basel, Basel, and Klinik Hirslanden Zurich, Zurich, Switzerland
- <sup>\*\*\*\*</sup>Department of Anesthesiology, Emergency Medicine and Pain Medicine, University Hospital Basel, Basel, Switzerland
- <sup>††††</sup>Department of Anesthesiology, Heart Center Leipzig, University of Leipzig, Leipzig, Germany
- <sup>‡‡‡‡</sup>Institute of Anesthesiology, German Heart and Diabetes Center Bad Oeynhausen, Ruhr-University Bochum, Bad Oeynhausen, Germany
- <sup>§§§§</sup>Servicio de Anestesiología y Reanimación, Hospital Clínic, University of Barcelona, Barcelona, Spain
- <sup>|||||</sup>Departments of Anesthesia and Intensive Care, University Hospital Brussels, Brussels, Belgium
- <sup>¶¶¶¶</sup>Section of Anesthetics, Pain Medicine and Intensive Care, Department of Surgery and Cancer, Faculty of Medicine, Imperial College London, London, United Kingdom
- <sup>####</sup>Department of Anesthesia, Royal Brompton and Harefield NHS Foundation Trust, Harefield Hospital, Harefield, Middlesex, United Kingdom
- <sup>\*\*\*\*\*</sup>Anesthesia and Intensive Care Department, IRCCS San Raffaele Scientific Institute, Milan, Italy
- <sup>†††††</sup>Vita-Salute San Raffaele University, Milan, Italy
- <sup>‡‡‡‡‡</sup>Cardiac Anesthesia and Critical Care, University Hospital Southampton, Tremona Road, Southampton, United Kingdom
- <sup>§§§§§</sup>Department of Anesthesia & Intensive Care, Helios Clinic for Cardiac Surgery, Karlsruhe, Germany
- <sup>|||||||</sup>Division of Cardiac Resuscitation, Cardiovascular Anesthesia and Intensive Care, San Carlo Hospital, Potenza, Italy
- <sup>¶¶¶¶¶</sup>Cardiothoracic Anesthesia, Anesthesia, Surgical Intensive Care and Pain Medicine, College of Medicine, Mansoura University, Mansoura, Egypt
- <sup>#####</sup>Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

This special article summarizes the design and certification process of the European Association of Cardiothoracic Anesthesiology (EACTA) Cardiothoracic and Vascular Anesthesia (CTVA) Fellowship Program.

The CTVA fellowship training includes a two-year curriculum at an EACTA-accredited educational facility. Before fellows are accepted into the program, they must meet a number of requirements, including evidence of a valid license to practice medicine, a specialist degree examination in anesthesiology, and appropriate language skills as required in the host centers. The CTVA Fellowship Program has 2 sequential and complementary levels of training—both with a modular structure that allows for individual planning and also takes into account the differing national healthcare needs and requirements of the 36 countries represented in EACTA. The basic training period focuses on the anesthetic management of patients undergoing cardiac, thoracic, and vascular surgery and related procedures. The advanced training period is intended to deepen and to extend the clinical and nontechnical skills that fellows have acquired during the basic training.

The goal of the EACTA fellowship is to produce highly trained and competent perioperative physicians who are able to care for patients undergoing cardiac, thoracic, and vascular anesthesia.

**Key Words:** fellowship; training; cardiac; thoracic; vascular; anesthesia

CARDIOTHORACIC AND vascular anesthesia is a subspecialty of anesthesiology devoted to the perioperative care of patients undergoing cardiac, thoracic, and vascular surgery and related procedures. The European Association of Cardiothoracic

Anesthesiology (EACTA) supports a well-grounded training in cardiothoracic and vascular anesthesia in the form of the Cardiothoracic and Vascular Anesthesia (CTVA) Fellowship Program, which comprises basic and advanced training in

EACTA-accredited educational facilities. The aim of EACTA’s CTVA Fellowship Program is to improve the quality of perioperative patient care by promoting and harmonizing training and education in cardiovascular and thoracic anesthesia.

Curriculum Design and Certification

The CTVA curriculum is open to all physicians irrespective of their country of origin, religion, gender, or sexual orientation. Before being accepted as a fellow, candidates must provide evidence of a valid license to practice medicine and a specialist degree examination in anesthesiology at their national level. Candidates must be EACTA members in good standing. Appropriate language skills as defined by the host centers are required in accordance with national and international regulations (generally level B2).

The CTVA Fellowship Program has 2 sequential and complementary levels of training, referred to as basic and advanced. Each level comprises 12 months of continuous training, resulting in a CTVA Fellowship Program with an overall duration of 24 months.

CTVA Basic Training Program

The basic training period focuses on the anesthetic management of patients undergoing cardiac, thoracic, and vascular surgery and related procedures. This includes preoperative patient assessment—with special focus on cardiac, thoracic, and vascular diseases—and the familiarization with surgical techniques, procedures, and associated

problems. In the course of the basic CTVA program period, fellows should optimize their ability to determine perioperative morbidity and establish an appropriate perioperative management plan that carefully considers patient- and procedure-related factors.

Basic CTVA training includes modules related to cardiac anesthesia, thoracic anesthesia, vascular anesthesia, postoperative care (postanesthesia care unit [PACU] or intensive care unit [ICU])—with a focus on cardiac, thoracic, and vascular surgery—in addition to modules related to adult transesophageal echocardiography (TEE), interventional cardiology procedures (eg, transcatheter aortic valve replacement [TAVR], MitraClip), and to techniques of extracorporeal circulation (Table 1). The basic CTVA fellowship training also includes active and passive participation in scientific rounds such as interactive seminars, case discussions, morbidity and mortality conferences, journal club meetings, and multidisciplinary team discussions. Participation in clinical and experimental research is encouraged but is not considered an essential part of basic training.

The basic training period is completed under the close supervision of a mentor who is the local CTVA program director or a designated member of the department. The program director and faculty members involved in the training program should be EACTA members in good standing. The mentor must personally provide the fellow with one-on-one clinical supervision during the first 3 months of the period of basic training. Supervision of the fellow by the mentor should then become more indirect, however, with the mentor available within a reasonable period of time.

Table 1  
Basic CTVA Fellowship Rotation Schedule

Basic Program	12 Mo
Modules*	Minimum requirements*
<b>Cardiac anesthesia</b>	<b>7 mo</b>
<b>Intraoperative adult transesophageal echocardiography (TEE)</b>	A minimum of 100 cases with CPB (30% not CABG). Candidates must succeed in passing the theoretical part of the EACVI TEE certification exam.
• Basic and advanced theory of perioperative cardiac echocardiography according to EACVI.	
• Intraoperative training in TEE according to EACVI standards and performance of a comprehensive examination	
<b>Thoracic anesthesia</b>	<b>1.5 mo</b>
	Minimum of 25 thoracic cases
<b>Vascular anesthesia</b>	<b>1 mo</b>
	Minimum of 25 major vascular cases
<b>Post-operative care (PACU)</b>	<b>1 mo</b>
<b>Intensive care (ICU)</b>	Focus on postoperative care of patients who had undergone cardiovascular or thoracic surgery
<b>Adult transthoracic echocardiography (TEE)</b>	<b>0.5 mo</b>
• Training in TEE according to EACVI	Training provided by cardiologists.
<b>Interventional cardiology</b>	<b>0.5 mo</b>
	In hybrid operating room or cardio laboratory
<b>Extracorporeal perfusion</b>	<b>0.5 mo</b>
	Training provided by perfusionists

Abbreviations: CABG, coronary artery bypass grafting; CPB, cardiopulmonary bypass; EACVI, European Association of Cardiovascular Imaging; ICU, intensive care unit; PACU, post-anesthesia care unit; TEE, adult transesophageal echocardiography;

\* Fellows trained for Basic Fellowship in Cardiothoracic and Vascular Anesthesia must complete all modules according to the time specified. Fellows trained for basic fellowship without cardiac anesthesia (eg, thoracic and vascular anesthesia) must complete other modules correspondingly longer.

## *CTVA Advanced Training Program*

The advanced training period is offered in a similar structure to the basic program to comply with the differing national healthcare needs and requirements of the 36 countries represented in EACTA. Host centers and fellows have the option to adapt the advanced part of the training period to match the local conditions at their training facilities and the personal career plans of the fellows.

Primarily, the advanced training period is intended to deepen and to extend the clinical and nontechnical skills that fellows have acquired during their basic CTVA fellowship training. The advanced training period can also be used for training in different but complementary subareas and associated disciplines, provided that they align with the core intention of the CTVA Fellowship Program. The advanced training period should deliver a high level of training in specific aspects of cardiac, thoracic, and vascular anesthesia. Further modules—complementary to clinical training—can be included but are not the focus in the advanced training period (Table 2). However, such modules must be completed in not more than 6 months in total and must be individually accredited with an official agreement between fellows and their host centers.

If appropriate facilities are lacking, or host centers cannot guarantee sufficient numbers of patients in a selected patient group (eg, heart transplantations in advanced training with cardiac anesthesia focus) to fulfill the CTVA fellowship training requirements, the CTVA Fellowship Program allows for collaboration among certified host centers to exchange fellows for predetermined periods of the advanced cardiothoracic and vascular anesthesia training program. Alternatively, host centers can be accredited to offer only training in either cardiac, cardiothoracic, cardiac, and vascular or thoracic and vascular anesthesia. These solutions apply for the basic and the advanced CTVA Fellowship Program. Figure 1 illustrates the different fellowship pathways.

A compound training plan involving more than one host center should be discussed with all parties involved before the fellowship is initiated and must be approved by the chair of the EACTA Educational Committee.

## *Intraoperative Transesophageal Echocardiography*

Interpretation and communication of (pathologic) findings related to adult TEE is an integral part of cardiac anesthesia. Thus, EACTA and the CTVA Fellowship Program directors consider the acquisition of advanced TEE knowledge and skills an obligatory requirement for CTVA fellows with core training in advanced cardiac anesthesia. The CTVA Fellowship Program with focus on cardiac anesthesia can only be completed when all prerequisites for the official TEE certification exam, as defined by the EACVI council, have been fulfilled, including passing the theoretical TEE certification exam (preferably during basic training) and acquisition of a case e-logbook (at the end of advanced cardiac training period at the latest).

## *CTVA Certification*

The CTVA Fellowship Program starts with 12 months of broad-based training in adult cardiac, thoracic, and vascular

anesthesia. EACTA will recognize this period of training with certification for a Basic EACTA Fellowship. Basic certification is a prerequisite to enter the advanced training program. Fellows can then continue for the advanced training period either at the same host center where basic training was completed or at any of the other EACTA-accredited institutions. After completion of the (cardiac-based) advanced training and the certification process for the EACVI TEE certification exam, fellows become eligible to be certified for an Advanced EACTA fellowship. If advanced training focused on thoracic or vascular anesthesia only, the fellow does not require completion of the EACVI TEE certification exam.

The CTVA Fellowship Program should be completed in a 24-month period of training uninterrupted by frequent or prolonged periods of absence owing to illness or personal circumstances. Absence from training for sick leave or personal circumstances requires proportionate extension of the training period. Annual and maternity leave are regulated in accordance with local contractual requirements. Documentation of 12 or 24 months of training is a mandatory requirement for certification of basic and advanced CTVA Fellowship Programs. Appeals for exceptional circumstances owing to illness or personal circumstances that have resulted in repeated or prolonged interruption of training will be reviewed by the chair of the EACTA Education Committee or forwarded to his or her delegates for arbitration. Table 3 summarizes common and differing aspects of the basic and advanced training periods.

## *Maintenance of Competence After the Fellowship Program*

EACTA undertakes indirect measures for (1) quality assurance after completion of the fellowship program including the collection of feedback from all graduates, (2) a graduate survey to facilitate the search for suitable postgraduate job opportunities, and (3) re-accreditation of host centers every 4 years to ensure maintenance of the required educational level.

## **Relevant Competencies**

In accordance with the CanMEDS competency framework,<sup>1-3</sup> relevant competencies for general and specific medical and nonmedical skills are defined as follows:

### • **Medical expert**<sup>4,5</sup>

- General and specific knowledge of anatomy and the pathophysiology of all cardiac, thoracic, and vascular diseases.
- Able to adequately plan the anesthesia and perioperative care for patients scheduled for a cardiac, thoracic, or major vascular surgery, including individual risk estimation.
- Able to safely provide anesthesia to patients undergoing cardiac, thoracic, or major vascular procedures.
- Competent in basic and advanced vascular access techniques as well as basic and advanced hemodynamic monitoring.
- Able to interpret the results of common diagnostic tools including imaging (radiographic, computerized

Table 2  
Advanced CTVA Fellowship Rotation Schedule

Advanced Program	12 Mo
<p><b>Advanced Cardiac Anesthesia Fellowship</b></p> <p>Main topics:</p> <ul style="list-style-type: none"> <li>• Advanced hemodynamic monitoring.</li> <li>• Management of patients with cardiomyopathy, left heart failure, valve diseases, pericardial diseases.</li> <li>• Heart transplantation.</li> <li>• Mechanical circulatory support, eg, IABP, LVAD, RVAD, Impella, ECMO.</li> <li>• Pulmonary hypertension, RV failure</li> <li>• Fast-track heart surgery.</li> </ul> <p><b>Intraoperative transesophageal echocardiography</b></p> <ul style="list-style-type: none"> <li>• Accomplishment of the recommended number of TEE studies according to EACVI.</li> <li>• Assessments of cardiac pathologies related to main topics (above).</li> </ul> <p><b>Advanced Thoracic Anesthesia Fellowship</b></p> <p>Main topics:</p> <ul style="list-style-type: none"> <li>• Protective one-lung ventilation.</li> <li>• Selective lobar collapse using bronchial blockers.</li> <li>• Lung and lung isolation airway management (double-lumen endobronchial tubes and bronchial blockers) and fiberoptic bronchoscopy).</li> <li>• Regional analgesic techniques for thoracic surgery, eg, paravertebral block, thoracic epidural block and truncal nerve blockades.</li> <li>• Ultrasound-guided blocks.</li> </ul> <p><b>Advanced vascular anesthesia Fellowship</b></p> <p>Main topics:</p> <ul style="list-style-type: none"> <li>• Preoperative assessment, risk stratification and medical management of vascular patients.</li> <li>• Elective and emergency open aortic surgery.</li> <li>• Endovascular interventional procedures (EVAR, TEVAR, angioplasty).</li> <li>• Carotid artery interventions.</li> <li>• Pain management in vascular patients, with particular reference to critical limb ischemia.</li> </ul> <p><b>Further modules (optional as an addition)</b></p> <p><b>Intensive or intermediate care of adult cardiothoracic and vascular patients</b></p> <p>Main topics:</p> <ul style="list-style-type: none"> <li>• Circulatory failure (heart failure, shock, cardiorespiratory arrest, cardiac arrhythmias, ischemic heart disease, pulmonary embolism, bleeding complications, vasoplegia).</li> <li>• Respiratory failure (ARDS), pulmonary edema, pneumothorax, pneumonia).</li> <li>• Gastrointestinal failure (peritonitis, pancreatitis, liver failure, NOMI).</li> <li>• Neurological failure (delirium and coma, cerebral ischemia and bleeding).</li> <li>• Airway and chest injuries.</li> <li>• Aortic injuries.</li> <li>• Infectious diseases (SIRS) and sepsis including a sepsis bundle strategy).</li> <li>• Coagulation disorders (DIC), heparin resistance, heparin-induced thrombocytopenia, severe bleeding, transfusion reaction.</li> <li>• Equipment and apparatus (equipment design, physics, standards, limitations; eg, non-invasive and invasive postoperative ventilation, continuous renal replacement therapy devices, non-invasive and invasive hemodynamic monitoring).</li> <li>• Indication, contraindication, drug selection, complications for sedation, anesthesia, analgesia, neuromuscular relaxation, nutrition in the ICU.</li> <li>• Weaning and extubation criteria.</li> <li>• Transfer and discharge criteria.</li> <li>• Extracorporeal circulation for cardiac and/or respiratory support (eg, ECMO).</li> <li>• Respiratory support including endotracheal suction, bronchoscopy (lavage, sampling), percutaneous tracheotomy, invasive and non-invasive ventilation techniques, ventilation in prone position, weaning.</li> <li>• Hemodynamic management and stabilization, including advanced cardiovascular monitoring, positive inotropic and vasoactive therapy, basic and advanced life support, defibrillation, cardioversion, pacing.</li> <li>• Fluid substitution, intravascular volume management.</li> </ul>	<p>Cardiac anesthesia forms the main topic in the advanced training program in cardiac anesthesia.</p> <p>Candidates must succeed in passing the practical part (e-logbook) of the EACVI TEE certification exam.</p> <p>Passing both parts (theoretical and practical) and completion of the certification process by the end of the advanced program is obligatory for granting the Advanced CTVA Fellowship certificate.</p> <p>Thoracic anesthesia forms the main topic in the advanced training program in thoracic anesthesia.</p> <p>Vascular anesthesia forms the main topic in the advanced training program in vascular anesthesia.</p> <p>3-6 mo as part of advanced training in cardiac or thoracic and vascular anesthesia.</p>

(continued)



Table 2 (continued)

Advanced Program	12 Mo
<ul style="list-style-type: none"><li>• Correction of coagulopathy, patient blood management, blood product transfusion.</li><li>• Acute kidney injury and renal replacement therapy.</li></ul> <b>Organizational or research module</b> Main topics: <ul style="list-style-type: none"><li>• Communicating effectively with surgical colleagues and other members of the team.</li><li>• Summarizing a case for critical care staff.</li><li>• Understanding how to communicate with the intubated patient in intensive care.</li><li>• Recognizing the need for senior help when appropriate.</li><li>• Maintaining accurate clinical records.</li><li>• Presenting material at departmental meetings and participating in clinical audits.</li></ul> Skills <ul style="list-style-type: none"><li>• Full participation in multi-disciplinary clinical audits.</li><li>• Commitment to continued professional development.</li></ul>	3-6 mo

Abbreviations: ARDS, adult respiratory distress syndrome; DIC, disseminated intravascular coagulopathy; EACVI, European Association of Cardiovascular Imaging; ECMO, extracorporeal membrane oxygenation; IABP, intra-aortic balloon counterpulsation; ICU, intensive care unit; LVAD, left ventricular assist device; NOMI, nonocclusive mesenteric ischemia; RVAD, right ventricular assist device; RV, right ventricle; SIRS, systemic inflammatory response syndrome; TEE, transesophageal echocardiography; (T) EVAR, (thoracic) endovascular aortic/aneurysm repair.

tomography scanning, magnetic resonance), standard and point-of-care laboratory testing including biochemistry, hematology, conventional coagulation parameters, thromboelastography/thromboelastometry, electrocardiogram, echocardiography and coronary angiography.

- Familiar with the principles of intraoperative neurophysiological monitoring including bispectral index (BIS), near-infrared spectroscopy (NIRS), motor evoked potentials (MEP), somatosensory evoked potentials (SSEP), and intracerebral pressure monitoring (ICP) in procedures with cerebrospinal fluid (CSF) drainage.

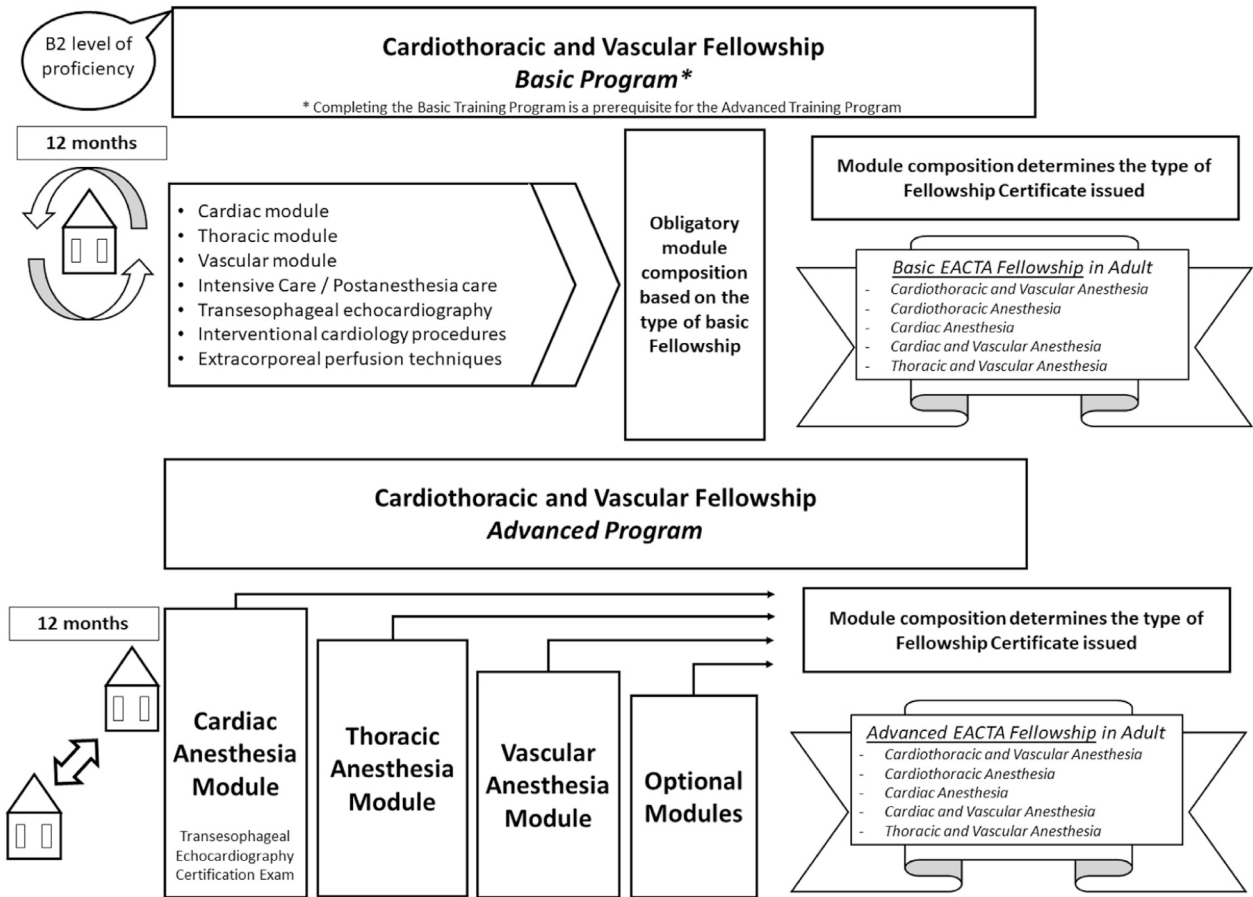


Fig 1. Flow chart illustrating the different fellowship pathways and associated certifications.

Table 3  
Common and Different Aspects Between the Basic and Advanced Training Periods

	Basic Training	Advanced Training
Requirement	Obligatory	Optional
Duration	12 mo	12 mo
Rotations/Modules	Fixed rotations in different areas.	Modular rotations
Prerequisites for entry	Appropriate language skills (B2) License to practice medicine and a specialist degree examination in anesthesiology at national level	Completion of basic EACTA training
EACVI TEE Certification exam (only for cardiac anesthesia fellows)	Theoretical part	Practical part—eLogbook
Number of procedures, 360-degree evaluation and clinical skills evaluation	Reviewed by the end of training	Reviewed by the end of training
Exit exam	No	No
Exit interview	Required at the end of basic training	Required at the end of advanced training

EACVI, European Association of Cardiovascular Imaging; EACTA, European Association of Cardiothoracic Anesthesiology; TEE, adult transesophageal echocardiography.

- Competent in airway management, including techniques of lung isolation and one-lung ventilation.
- Familiar with the principles and guidelines of patient blood management (PBM).
- Familiar with the principles of extracorporeal circulation and in particular, cardiopulmonary bypass (CPB) and other forms of mechanical cardiocirculatory and respiratory support systems.
- Competent in the assessment of patients who are to undergo cardiac, thoracic, and vascular surgery in a preoperative clinic. In addition, the fellow can provide a competent consultation at the request of colleagues from his/her own or other disciplines.
- Able to perform a comprehensive TEE examination and pass the EACVI TEE certification exam at the end of the advanced CVTA fellowship training.
- **Communicator**
  - Able to communicate clearly and competently both with patients and with other professionals.
  - Ability to accurately elicit and synthesize relevant information and perspectives of patients and their families, medical colleagues, and other healthcare professionals.
  - Can effectively communicate information about patients verbally and in writing.
- **Collaborator**
  - Can discuss perioperative management and patient-related decisions comprehensively within a multidisciplinary environment.
  - Works effectively with other healthcare professionals to prevent, negotiate, and resolve professional and interdisciplinary conflicts.<sup>6</sup>
- **Academic Scholar**
  - Has knowledge of innovations and developments in cardiac, thoracic, and vascular medicine and is dedicated to updating this knowledge.
- Can critically evaluate medical information and its sources and apply this appropriately to practice decisions, as medical decisions should be based on the best available evidence.
- Actively participates in and promotes clinical research as well as supporting related basic research.
- Develops a teaching portfolio by delivering lectures at cardiac, thoracic, and vascular anesthesia educational meetings.
- **Professional**
  - Acts professionally with respect to the institutional, national and international rules and laws.
  - Acts professionally with respect to ethical standards.
  - Demonstrates a commitment to physician health (including awareness of burnout syndrome) and sustainable practice.
- **Manager and leader**
  - Demonstrates management and leadership skills in daily practice.
  - Remains composed when under pressure, demonstrating effective leadership and supporting other team members.
  - Contributes to the improvement of healthcare delivery in teams, organizations, and systems.
  - Works efficiently and engages in the stewardship of available healthcare resources.
  - Develops an understanding of adult cardiac, thoracic, and vascular anesthesia in the greater context of cardiac, thoracic, and vascular care within the hospital, community, and country.<sup>6</sup>
- **Health advocate**
  - Responds to individual patients' health needs and issues as part of patient care.
  - Gives high priority to all aspects of patient safety, both inside and outside of the operating room.

## Learning Objectives (Supplement A)

On completion of the basic training period, fellows will be competent in cognitive and practical skills required to undertake cardiac (with or without thoracic and vascular) anesthesia and will be qualified to work as anesthesiologists. The minimum duration required for completion of the basic training is 12 months of full-time employment. Successful completion of the basic program entitles the candidate to enter the advanced program. For each domain, learning objectives are divided into the knowledge, skills, and attitudes that are deemed necessary to achieve the required level of competence (Supplement A), as defined by the Union Européenne des Médecins Spécialistes<sup>2,3</sup>:

- A: observer level (has knowledge of, describes).
- B: performs, manages, demonstrates under direct supervision.
- C: performs, manages, demonstrates under distant supervision.
- D: performs, manages, demonstrates independently

To ensure that all content and skills can be trained sufficiently during the fellowship, EACTA recommends a minimum number of procedures/patients treated per domain. The candidate must have met these minimum requirements before applying for the final assessment.

## Learning and Teaching Methods

### *Adult Cardiac, Thoracic, and Vascular Anesthesia Education*

Regular attendance at subspecialty educational meetings is expected, including lectures; interactive conferences; hands-on workshops; morbidity and mortality reviews; cardiology and echocardiography conferences; cardiac, thoracic, and vascular surgery conferences; journal review clubs; and research seminars offered by the training facility.

### *Active Participation*

Active participation in adult cardiac, thoracic, and vascular anesthesia will be incorporated into the planning and production of educational activities. The faculty will lead in the majority of sessions.

### *Attendance*

Attendance at multidisciplinary conferences, particularly in cardiovascular medicine and cardiothoracic surgery, will be encouraged.

### *Academic Assignment*

The fellow will complete a minimum of one academic assignment. Academic projects may include presentations at grand rounds, writing, and publication of review articles, book chapters, and manuals for teaching or clinical practice, clinical

research investigation, or other scholarly activities. The project selection will require the advance approval of their program director. An oral or scientific poster presentation at an international or national meeting by a fellow from every host center is required each year as evidence of scientific engagement/training.

### *Exchange With Other Training Facilities*

Fellows may participate in exchange programs with other institutions to gain specific clinical exposure for specific subareas that are underrepresented in their host centers (eg, anesthesia for heart transplantation). Such exchanges are at the discretion of the program director, but there should be prior communication with, and approval by the EACTA education chair.

## Assessment

### *General Principles of Assessment*

Faculty members responsible for teaching fellows will provide the CTVA program director with critical evaluations of each fellow's progress and competence at three-month intervals using a standardized form. The evaluations will assess essential and acquired character attributes, level of knowledge, clinical judgment and psychomotor skills, as well as specific procedural skills needed for patient management and critical analysis of clinical situations.

The CTVA program director or a designate will provide feedback to fellows on their evaluations at least every 3 months during their training, identifying areas in need of improvement and documenting the communication in writing. Fellows must obtain a satisfactory overall evaluation on completion of their basic training to receive certification.

### *Assessment of Fellows*

The elements listed below will form part of the assessment of the fellow during their training. In addition to evaluation by faculty members and EACTA representative(s), it will be essential for the fellow to learn from reflection on their training experiences.

During discussions with fellows, the tutor or head of training will address the results of the 360-degree evaluations and clinical skills evaluations. 360-degree (of CanMEDS competencies) is a feedback diagnostic tool that helps the candidate to improve his or her personal competencies and supports the self-assessment. During the basic fellowship, at least one 360-degree feedback must include at least 5 persons invited to submit an evaluation of the competencies of the candidates. Feedback is restricted to internal sources (supervising anesthesiologists, surgeons, nurses) using a standardized questionnaire based on existing multisource feedback forms.<sup>7</sup> Clinical skills evaluation (CSE) or Direct Observation of Procedural Skills (DOPS) is intended to give feedback to the fellow about his ability to plan and perform various clinical tasks. CSE is to be performed by a supervisor, the head of training or another appropriate person



(cardiothoracic anesthesiologist) based on a standardized form which can be based on already existing forms.<sup>8</sup>

The following additional assessment tools should also be used:

- Evaluation discussions held every 3 months
- During discussions with fellows, the tutor or head of training will address:
  - Results of 360-degree evaluations and clinical skills evaluations.
  - Personal reports from the faculty (if available).
  - Reflection and self-assessment by the fellow.
  - Learning goals for the next 3 months.
  - Feedback from fellows on the quality of the education and any aspects of the curriculum that are not being addressed by their training.

The mandatory tasks that must be evaluated during the fellowship are the following:

- Pre-anesthetic evaluation including risk.
- Induction of anesthesia in adult patients undergoing cardiac, thoracic, and vascular surgery.
- Placement of central venous lines with or without ultrasonic imaging.
- Placement of arterial lines with or without ultrasonic imaging.
- Management of weaning from CPB.
- Placement or insertion of pulmonary artery balloon catheters.
- Lung isolation techniques and fiberoptic bronchoscopy.

### *Documentation*

Fellows are required to maintain a record of their training in the form of a logbook during their fellowship. If available, an electronic system such as a computer database may be used. The required information to be documented in the logbook is as follows:

- Anonymized record of patients managed by fellows during their fellowship. The data set recorded for each case must include a minimum of age, sex, ASA, type of surgery, anesthetic procedure(s), relevant comorbidities, and if applicable, EuroSCORE II.
- Reports of TEE exams, which must comply with the EACVI reporting requirements.
- Summaries of their 3 monthly evaluations and related discussions.
- Results of their clinical skills evaluations.
- 360-degree multisource feedback.

### *External Evaluation or Assessment*

At the end of the fellowship, the logbook and all its contents (except the 360-degree multisource feedback) will be sent to

the chair of the education committee. The chair of the education committee will forward it to 2 EACTA representatives who are external to the host center, for assessment. In addition, fellows are required to undergo an exit interview by an advisory committee formed by 2 external assessors and the program director from the host center. Fellows can apply for the interview once they have met the requirements for number of procedures, required internships outside the operating room, and CSE and 360-degree evaluation. The external evaluation or assessment is scored as pass or fail and yes or no (360-degree evaluation). An average score of 70% or above is required to pass (Supplement B; EACTA Evaluation Form). The Advisory Committee should provide feedback to the fellow, describing both the strengths and weaknesses of their documentary evidence. Fellows will be awarded certification if they obtain a 'pass' mark on CSE and complete all other assessment tools (eg, 360-degree evaluation). If this is not the case, training will be deemed incomplete and the fellow cannot be awarded certification in the EACTA Fellowship Program. These fellows will have to be enrolled for an additional period of training at the host center under either direct or remote supervision in order to satisfactorily fulfill the requirements. Fellows who feel they were unfairly denied certification may appeal the advisory committee's decision within seven days of the day after the interview. The appeal must be submitted in the form of a signed and dated letter to the chair of the education committee and sent by registered mail within the expiration period. The decision of the advisory committee regarding the appeal will be communicated to fellows within twenty calendar days after that on which the appeal was received.

### *Program Assessment*

- There will be regular opportunities for fellows to provide confidential written evaluations of the faculty and program to the EACTA education chair.<sup>6</sup>
- A fellow who experiences difficulty during the training period may turn for advice to the program director, faculty members, and the head of the department at the host center. A fellow who feels unable to approach any of these people should contact the chair of the EACTA education committee. The chair can provide confidential, neutral, independent, and informal advice to help fellows address their concerns. The chair of the EACTA education committee can accompany the fellow in discussions of problems or issues with faculty or administrators and act as an informal mediator between the trainee and the faculty or administrators. The chair can also help effect positive change by providing feedback on patterns in problems and complaints submitted to the program director. Fellows can contact the chair of the EACTA education committee with general questions either via email, telephone, or in person.
- Periodic evaluation of patient care (quality assurance) is mandatory. Subspecialty trainees in cardiac, thoracic, and vascular anesthesia will be involved in continuing quality improvement and risk management.<sup>9</sup>

- Trainees in cardiac, thoracic, and vascular anesthesia will actively participate in the periodic evaluation and reassessment of the fellowship training goals and objectives.<sup>6</sup>
- Should unforeseen circumstances arise, such as a personal conflict between a fellow and one or more tutors, this should be reported immediately to the chair of the education committee. The board of directors then has the right to appoint an independent EACTA officer as a “mentor” to assist and to help resolve the circumstances as well as to protect both parties.

## Conclusion

Currently, EACTA continues to develop its fellowship program to ensure high-quality, standardized training in CTVA. Consensus is required between centers hosting fellowship programs as to the knowledge, skills, and competency necessary to master cardiac, thoracic, and vascular anesthesia and critical care medicine. The EACTA curriculum includes requirements for and certification of basic and advanced training, educational objectives, relevant competencies, and learning and teaching methods. Further assessments of both the fellows and the CTVA Fellowship Program are essential to test the efficacy of the current curriculum. The goal of the EACTA fellowship is to produce highly trained and competent perioperative physicians who are able to care for patients undergoing cardiac, thoracic, and vascular anesthesia. The curriculum should be further developed in order to include training for pediatric cardiothoracic and vascular anesthesia.

## Conflict of Interest

All authors are members of European Association of Cardiothoracic Anesthesiology (EACTA).

## References

- 1 European Union of Medical Specialists. European Training Requirements in Anaesthesiology. Available at: [https://www.uems.eu/\\_\\_data/assets/pdf\\_file/0003/64398/UEMS-2018.17-European-Training-Requirements-in-Anaesthesiology.pdf](https://www.uems.eu/__data/assets/pdf_file/0003/64398/UEMS-2018.17-European-Training-Requirements-in-Anaesthesiology.pdf). Accessed August 9, 2019.
- 2 Training Requirements for the Specialty of Anaesthesiology, Pain and Intensive Care Medicine. European Standards of Postgraduate Medical Specialist Training. Available at: [https://www.uems.eu/\\_\\_data/assets/pdf\\_file/0004/44428/UEMS-2013.18-European-Training-Requirements-Anaesthesiology.pdf](https://www.uems.eu/__data/assets/pdf_file/0004/44428/UEMS-2013.18-European-Training-Requirements-Anaesthesiology.pdf). Accessed August 9, 2019.
- 3 CanMEDS 2015 Physician Competency Framework. In: Frank JR, Snell L, Sherbino J, editors. CanMEDS 2015 Physician Competency Framework, Ottawa, ON: Royal College of Physicians and Surgeons of Canada; 2015.
- 4 Feneck R, Jakobsen CJ, Ranucci M, Poelaert J, Schlack W, Metzler H. Consensus Document of the European Society of Anaesthesiology (ESA) and the European Association of Cardiothoracic Anaesthesiology (EACTA) for European Education and Training in Anaesthesia for Cardiothoracic and Major Vascular Surgery. A Proposal for Accreditation of Educational and Training Programmes. Available at: [http://www.eacta.org/wp\\_live\\_eacta13\\_6T3tah/wp-content/uploads/2013/09/pdf-0091.pdf](http://www.eacta.org/wp_live_eacta13_6T3tah/wp-content/uploads/2013/09/pdf-0091.pdf). Accessed August 9, 2019.
- 5 The Accreditation Council for Graduate Medical Education (ACGME) Program Requirements for Graduate Medical Education in Adult Cardiothoracic Anesthesiology (Subspecialty in Anesthesiology). Editorial revision: effective July 1, 2019. Currently-in-Effect Program Requirements incorporated into the 2019 Common Program Requirements. Available at: [https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/041\\_AdultCardiothoracicAnesthesiology\\_2019.pdf?ver=2019-06-17-094931-337](https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/041_AdultCardiothoracicAnesthesiology_2019.pdf?ver=2019-06-17-094931-337). Accessed August 9, 2019.
- 6 El Tahan MR, Vasquez LEM, Alston RP, Erdoes G, et al. Perspectives on the fellowship training in cardiac, thoracic, and vascular anesthesia and critical care in Europe from program directors and educational leads around Europe. J Cardiothorac Vasc Anesth 2019. <https://doi.org/10.1053/j.jvca.2019.09.029>; pii: S1053-0770(19)30990-5. [Epub ahead of print] PMID: 31668743.
- 7 Australian and New Zealand College of Anaesthetists (ANZCA). Multi-source Feedback (MSF) Paper Form. Available at: <http://www.anzca.edu.au/documents/multi-source-feedback.pdf>. Accessed August 9, 2019.
- 8 European Board of Anaesthesiology. Union Européenne des Médecins Spécialistes (UEMS) Anaesthesiology Section. European Training Requirement ETR in ANAESTHESIOLOGY. The Standing Committee on Education and Professional Development (EPD) of The Section and Board of Anaesthesiology. Available at: <http://www.eba-uems.eu/resources/Copenhagen/ETR-Anaesthesiology-2018.pdf>. Accessed August 9, 2019.
- 9 Myers MF, Herb A. Ethical dilemmas in clerkship rotations. Acad Med 2013;88(11):1609–11.