

Education in thoracic anesthesia. Lessons learned from the European Association of Cardiothoracic Anaesthesiology (EACTA) programs

ABSTRACT

Technology advancements provide several surgical approaches including thoracoscopic and robotic-assisted thoracic surgery. That adds more challenges for the thoracic anesthesiologists with the required high-level of skills and competencies in the anesthetic, airway management, lung isolation and separation, ventilation, and perioperative analgesic techniques. Thoracic anesthesia has gained the attraction of many anesthesiologists to being specialized in that subspecialty. That raise the concerns about the requirements and structure of formal training into thoracic anesthesia in the United States and Europe regarding. This narrative review aims to analyze the lessons learned from the European Association of Cardiothoracic Anaesthesiology (EACTA) in terms of the current situation, requirements, limitations, competencies, teaching techniques, assessment, and certification.

Key words: Curriculum; education; thoracic

Methods

A review of relevant published articles in peer-reviewed journals from 2009 to August 2020 was conducted. The databases, i.e., PubMed and BioMed Central were searched by 2 independent expert librarians familiar with the literature search. The databases were searched using the following MeSH search terms: "EACTA," "European," "Fellowship," "Thoracic Anesthesia," "COVID-19," and "Training." No language restriction was imposed. In addition, references cited by the retrieved articles were analyzed manually to select further relevant studies. This narrative review aims to provide a framework for implementing training program in thoracic

anesthesia through analyzing the lessons learned from the European Association of Cardiothoracic Anesthesiology (EACTA) in terms of the requirements, limitations, competencies, teaching techniques, assessment, and certification.


History of Specialization in Thoracic Anesthesia in Europe

There is no European consensus on the duration of basic and advanced training, knowledge, skills, and competencies required to become specialized in the field

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of thoracic anesthesia. Neither the European Society of Anaesthesiology (ESA) and national anesthesia societies nor the national authorities acknowledge specialization and training in thoracic anesthesia. Rob Fenech and others worked to develop a preliminary consensus between the EACTA and ESA on the formal fellowship training in cardiothoracic and vascular anesthesia in 2003.^[1] Subsequent sincere efforts have been exerted by Peter Rosseel (Belgium), Peter Alstom (Scotland), and Simon Howell (the United Kingdom) to develop a European recognition of specialization in cardiothoracic and vascular anesthesia which is called as "Certification Process".^[2] EACTA established the fellowship training program in cardiothoracic and vascular anesthesia and critical care at the Leipzig Heart Center, Germany in 2009. The Southampton University, the United Kingdom, Basel University, Switzerland, and Vita-Salute San Raffaele University, Italy have subsequently accredited to host the EACTA Fellowship in 2010, 2013 and 2015, respectively. In 2017, EACTA decided to expand the fellowship programs to other several European centers.^[2] During the period from 2018 to April 2019, the EACTA Education Committee and the Board of Directors (BoD) developed regulatory rules and well-structured curriculum for the basic and advanced fellowship training programs in thoracic anesthesia.^[3]

How to Become a Thoracic Anesthesiologist?

In general, there is no a supporting body of evidence about the minimum required training duration, the number of cases, knowledge, skills, or competencies levels to become specialized in each of anesthesia subspecialties.

Data analysis for 99 observed cardiac surgery cases, which were managed by 16 residents showed that a minimum of 10 cases and 20 to 30 cases were needed to show a satisfactory level of skills for preoperative assessment and for hemodynamic and coagulation management, respectively.^[4] A large study including 297 trainees showed that the number of colonoscopies required to achieve competency in successful cecal intubation success rate was 233.^[5] A small study including 15 novice trainees to perform ultrasound-guided sciatic nerve blocks in cadavers showed that the mean number of trials required to achieve competency was 28.^[6]

That raises the concerns on the number of cases required to show competencies in airway management, lung isolation/separation, one-lung ventilation, and neuraxial and truncal analgesic techniques for thoracic surgery.

In 2017, the program directors at the six accredited hosting centers at that time, the members from the nine EACTA

Subspecialty Committees, BoD, and advisory educational leads have extensive discussions over a 36-months period to develop a consensus on the basic and advanced training required to master cardiothoracic and vascular anesthesia.^[3] In the light of unavailable supporting studies, an expert consensus shows levels of agreement on a minimum training rotation for a 1.5-month period or performing a minimum of 25 thoracic cases is needed to show a basic competency in thoracic anesthesia. Additional "optional" advanced training for 3 to 6 months is required to show advanced competency levels.^[3]

EACTA acknowledges that consensus must be validated through a re-evaluation of the feedback collected from the faculty and trainees and surveying the panel of experts using a Delphi technique after a period of 36-months from generalization the EACTA standards.

Requirements for Fellowship Training

The cardiothoracic and vascular anesthesia fellowship training program is a clinical subspecialty of anesthesiology which was developed EACTA to deal with patients suffering from cardiothoracic and vascular diseases undergoing surgery and related procedures.^[3] There are several requirements that need to be met by both the training centers and applicants to enter the training program.

Duration of training

Generally speaking, the EACTA Fellowship training should be continuous for a minimum of 12-month for obligatory basic training including 1.5 months rotation (a minimum of 25 thoracic cases) in thoracic anesthesia to a maximum of 24 months for optional advanced modular training including a 3 to 6 months modular training as shown in Table 1.

The fellowship training requires an uninterrupted specific period of training for the recognition of the basic or advanced EACTA fellowship program. Annual leaves are usually regulated in accordance with contractual requirements with the training centers. Thus, interrupting fellowship training by frequent and/or prolonged periods of absence (>1 month in total) should be compensated with proportional extension of the training. Exceptional circumstances such as health conditions or maternal leaves leading to repeated or prolonged interruption should be reviewed by the Chair of the Education Committee and colleagues for arbitration.^[3]

The training centers

The training centers should have adequate facilities, equipment, and volume of cases to allow effective training for the trainees during the fellowship training as shown in Table 2.

Table 1: The EACTA curriculum for the basic and an advanced training in thoracic anesthesia. (Reproduced from the EACTA's Curriculum)^[3]

Training Rotation	Duration
Obligatory Basic Training (First Basic Year)	
Thoracic anesthesia	1.5 months Minimum of 25 thoracic cases
Optional Training (Second Advanced Year)	
Thoracic Anesthesia Module	3 to 6 months
Protective One Lung Ventilation	
Selective lobar collapse using bronchial blocker	
Lung isolation or separation using double lumen tubes	
Loco-regional anesthetic techniques for thoracic surgery	
Competency in performing ultrasound guided nerve blocks	
Organizational Module	3 to 6 months
To communicate effectively with surgical colleagues/other members of the team.	
To be able to summarize a case to critical care staff.	
Understand how to communicate with the intubated patient in intensive care.	
To be able to recognize the need for senior help when appropriate.	
Maintain accurate clinical records.	
Presentation of material to departmental meetings and participation in clinical audit.	
Full participation in multi-disciplinary clinical audit.	
Commitment to continued professional development.	
Research Module	3 to 6 months
Principles of clinical trials including design, end points, inclusion/exclusion criteria.	
Understanding of GCP requirement for clinical research involving patients.	
Basic understanding of European and specific national ethics frameworks.	
Principles of sample size and study power determinations and basic statistical evaluation.	
Principles of patient and data confidentiality arrangements.	
Understanding tools for data collection, analysis, and reporting.	
Principle international basic science priorities in the field of cardiac anesthesia.	
Ethics and practicalities of biological sample collection storage and biobanking.	
Principles and ethics of scientific publishing	

Although recognition of the national authorities of the fellowship training in thoracic anesthesia can be challenging, the administration head of the training center should acknowledge the fellowship training in thoracic anesthesia. There should be a signed authorization from the training center or the national authorities to allow the trainee for providing direct patient care during his/her training program, under supervision from the legal representative of the training center with declaration of the financial arrangement and responsibilities for both parties.^[7] Working hours directives should be respected according to the prevailing national law.^[7]

It is mandatory for the candidate to keep a monthly portfolio or logbook records of all clinical and educational activities. EACTA

requires 3-monthly documentary evaluation process including (1) the number of cases performed, (2) evaluations of the trainee, and (3) informing EACTA if there is a new nominated program director or faculty or if the fellowship training is interrupted by any trainee for any reason.^[8] This periodic feedback helps EACTA in future planning and for quality control.^[3]

If unforeseen issues or appeal arise (e.g., fellow–tutor conflicts), this should be reported immediately to the EACTA Education Chair. Then, the BoD has the right to appoint an independent EACTA officer as a “mentor” to assist/moderate/help with this as well as provide protection of both parties.^[8]

EACTA, a specialized European organ in cardiothoracic and vascular anesthesia and critical care medicine, including 52 European and non-European countries, has developed a standardized accreditation procedure for all applying training centers to hosting the fellowship program. The completed application is initially reviewed by the Education Chair against the standard and requirements set.^[3,7,8] These include the legal requirements, facilities, staff, equipment, the volume of cases, required fellowship training positions per year, structure and duration of formal rotations, educational and academic programs, teaching techniques, assessment, practice-based learning and improvement, interpersonal and communications skills, professionalism and system-based practice.^[9] The application would then be discussed by the Education Committee including 26 active Educational Leads. The applying center usually addresses any concerns or comments raised by the members of the Education Committee. The decision on accreditation would then be taken by the majority of votes from both of Education Committee and BoD. Effective from 2018, a formal well-structured one-day site visit by two EACTA officers is required for accrediting the applying centers. Accreditation is normally granted for up to four years for all hosting centers. For re-accreditation procedures, fellows' evaluation and feedback reports will be reviewed. A site visit might be required for re-accreditation if the fellows' evaluation and feedback reports collected are not satisfactory.^[7]

EACTA extended its interest beyond the borders of Europe through accrediting the first ever non-European training center, Dante Pazzanese Institute of Cardiology, São Paulo, Brazil, in 2018 to host the fellowship program. That has the potential to encourage other high-volume, well-equipped and organized non-European centers to apply to host the EACTA fellowship programs.

The faculty

The faculty members should have either training in thoracic anesthesia. The program director and a minimum of two faculty members should declare that they can dedicate a minimum 10% of working time to attend to their responsibilities.^[7]

Table 2: The suggested facilities, equipment and volume of cases required at the training center for thoracic anesthesia (developed from EACTA's Curriculum,^[3] White Paper of the Board of Directors,^[7] and the Tasks Required by the Hosting Centers^[8])

Facilities and Equipment	Volume of Cases per Year
Available emergency room for 24 hr. a day (7/24).	Minimum 100-200 thoracic cases using either thoracoscopy, open thoracotomy, major tracheobronchial surgery, and/or mediastinal surgery. That is based on the number of training residents and fellows at the same time period to provide training a minimum of 25 cases/1.5 months per trainee
Available ward beds dedicated for thoracic surgery patients for 24 hr. a day (7/24).	
Operating rooms (ORs) are adequately equipped for thoracic procedures (e.g., fiberoptic bronchoscopy, different lung isolation tools (double lumen endobronchial tubes, bronchial blockers, etc.), advanced haemodynamic monitoring, and ultrasonography device).	
Designed and equipped post-anesthesia care unit (PACU)/or high-dependency unit (HDU) for thoracic procedures.	
Accessibility for training on high frequency ventilation, extracorporeal membrane oxygenation (ECMO), and Nova-Lung.	
Accessibility for training on interventional pulmonology procedures (e.g., diagnostic bronchoscopy, biopsy, stenting, mass excision, sealing, cryo-coagulation, Laser, etc.).	
Accessibility for training on the different techniques for lung isolation	
Accessibility for training on the different techniques for management of one lung ventilation.	
Accessibility for training on the different techniques for acute post-thoracic surgery pain management including paravertebral, epidural, truncal nerve blockades, and ultrasound guided blocks.	
Accessibility for training on the management of chronic post-thoracic surgery pain.	
Inpatient or outpatient pulmonology medicine.	
Pulmonology laboratory.	
Medical or surgical critical care.	

The basic training period must be completed under the close supervision of a mentor who will be the program director or a faculty member. The mentor should be personally available for the trainee (1:1 supervision) during the first 3-months of basic training, physically accessible during the subsequent 3 months, and remotely accessible thereafter.^[3]

The applicant (trainee)

The formal training should be accessible and inclusive for both national and citizens, open to trainees with disabilities and from all backgrounds, countries, and cultures. The applying trainee should be either a board-licensed anesthesiologist or have a completed certificate of training in anesthesia. The applying trainee should be licensed by the national authority at the country of the training center to provide direct patient care. That is an important requirement to differentiate between the formal hands-on fellowship training and exchange-observership training programs. Additionally, B2 language level is often required by the training centers to ensure that the trainees would be able to communicate effectively with the patients and healthcare team members.^[7]

Limitations and Obstacles for Implementing Formal Training

Several obstacles and limitations have been met during the

development of EACTA Curriculum and could be summarized as follows;

First, Europe including 44 countries with diverse national regulations and economic statuses. One of the major obstacles was the fact that several training centers in Spain, Italy, Belgium, France, Hungary, and Eastern European Countries could not pay monthly salaries for trainees.

The members of the BoD and Education Committee agreed in 2017 on dividing the training centers into two categories as follows; Category (A): The training centers which can offer monthly salary payments and Category (B): The training centers which cannot offer salary payments, instead, the candidates may be supported by an educational grant, scholarship, or are self-sponsoring, etc. However, the financial support of the EACTA Fellowship should be regulated by an individual agreement between the hosting center and the fellow. Additionally, the candidates are free to choose between the hosting centers in the two categories.

Second; several training centers do not have enough volume of cases of thoracic and vascular surgery cases. There are two options offered for these centers: (1) to sending the trainees for exchange "hands-on" fellowship training "basic" and "advanced" rotations in thoracic and vascular anesthesia

to other nearby training centers which have high-volume of thoracic and/or vascular surgery cases following signing mutual agreements, (2) these training centers can be accredited to offer only training in either cardiac, cardiothoracic, cardiac and vascular or thoracic and vascular anesthesia.^[3]

Third; several training centers in the United Kingdom, Spain, France and Eastern European countries could not offer two-years fellowship training. Additionally, several overseas fellows could not afford scientific leaves/expenses for two years of fellowship. Thus, fellowship training includes “obligatory” 12-months training in cardiothoracic and vascular anesthesia at all accredited training centers including 1.5-month training period in thoracic anesthesia. The second training year is “optional” for advanced “modular” training including an optional training module for 3-6 months in thoracic anesthesia.^[3]

Fourth; the members of the EACTA Thoracic and Vascular Subspecialty Committees did not accept the idea to drop training in thoracic or vascular anesthesia from the basic training to increase the duration for cardiac training.

Finally, certification in transesophageal/transthoracic echocardiography is only required for trainees who are training in fellowship programs focused on cardiac training.^[3]

Knowledge, Skills, and Competencies

The fellowship training program should be structured to provide the trainee with an opportunity to gain knowledge and to develop skills in the perioperative care of patients with thoracic disease undergoing thoracic procedures. At the end of the fellowship, the trainee should demonstrate competency in preoperative assessment, perioperative care including monitoring, airway management, lung separation, fluid therapy, and blood management, postoperative care of critically ill thoracic surgery patients, perioperative pain medicine, and research. EACTA developed the required knowledge and skills levels for the basic and advanced training in thoracic anesthesia.

A competency framework, adopted from CanMEDS,^[10] identifies and describes the relevant competencies for trainees to effectively meet the health care needs of the patients they serve. These competencies are grouped thematically under seven roles. A competent trainee seamlessly integrates the competencies of all seven CanMEDS Roles.^[3]

Teaching Techniques

Teaching of thoracic anesthesia should include periodic regular attendance of classic lectures, webinars, inter-active

seminars, case discussions, morbidity and mortality meetings, journal club, simulation-based training, hands-on workshops, discussions of controversial topics between the thoracic anesthesia and surgical teams, and national and international specialized meetings in thoracic anesthesia and surgery. Preparing or participating in research projects should be encouraged and supported but is not usually mandatory for the completion of the basic training in thoracic anesthesia.^[3]

Assessment of the Trainees and Training Program^[3]

Assessment of the trainees

Assessment of trainees can be ideally done at quaternary periods. The assessment processes should evaluate knowledge, clinical skills, decision making, safety, judgment, dependability, communication skills, and documentation. That could be accomplished with reviewing the logbook, completing the Direct Observation Procedural Skills (DOPS) forms by the mentor,^[11] and 360-degree multi-source-feedback forms (MSF)^[12] by the direct mentors and other healthcare professionals. The program director must discuss with the trainee (1) the results of 360-degree evaluation and clinical skills evaluation, (2) weak and strong areas for future improvements, and (3) learning objectives for the next 3-months.

Assessment of the training program

Continuous assessment of the program is mandatory to improve the quality of the fellowship program. This can be done through collecting regular feedback from the trainees and mentors to address any complaints or weaknesses during training and to improve the program.^[3]

Final exit interview

A long debate within EACTA has been raised on the feasibility and applicability of performing a final examination for graduation after the basic and advanced training. That would add burden on the shoulders of the trainees and the training centers. Thus, EACTA has developed an online friendly exit interview with the trainee at the end of each training year by an advisory committee including the local program directors and two other independent advisory educational leads. The members of the advisory committee have to sign a declaration for any conflict of interest. The Exit interview includes reviewing and discussing the trainee about his/her achievements, thoughts, and feedback at the end of the training year. The final evaluation consists of four assessment tools; (1) the number of cases performed, (2) the number of internships outside the operating theatres, (3) the results of 360-degree evaluation, and (4) the results of clinical skills evaluation. These evaluation tools are scored

by each member of the advisory committee, with an average score of 70% or above required to pass. The Exit Interview is conducted through secured scheduled Zoom video calls and subsequently recorded for internal use in case of appeals raised and for quality control. Appeals can be submitted by the fellows within one week from the date of the exit interview.^[3]

Certification in Thoracic Anesthesia^[3]

EACTA provides two separate certificates to acknowledge successful completion each of the basic as well as the advanced parts of the fellowship program following passing the exit interview. Completing the fellowship rotations in cardiac, thoracic, and vascular anesthesia either at one or more accredited EACTA training centers, the certification would be extended to Adult Cardiothoracic and Vascular Anesthesia Fellowship. Alternatively, the CTVA Fellowship Program involved only one training period at one single EACTA accredited training center, managing adult patients undergoing adult thoracic surgery exclusively. In this case, the fellowship certification would only be for Adult Thoracic Anesthesia Fellowship. Certification of competencies in additional medical and non-medical skills will be adopted to the composition of the advanced training period.^[3]

Challenges of Fellowship Training during COVID-19 Pandemic

On March 11 the World Health Organization announced the COVID-19 outbreak as a pandemic. There are 11 accredited EACTA cardiothoracic and vascular anesthesia fellowship training centers around the world, offering a total of 35 fellowship positions. Currently, 13 fellows are participating in basic training and 4 in advanced training at EACTA centers. This leads to lockdown in most of the countries around the world and most of the hospital are becoming COVID-19 centers to deal with the rapid increase of infected cases and meet the need for increase the intensive care units (ICU) capacity. Elective surgeries were cancelled or postponed. Some operating theatres are converted to ICU. Because of the lockdown, restrictions, and interruptions of clinical, scientific, and educational training, the fellowship program was not continued as initially planned.^[13] Some centers have reallocated fellows to the ICU to deal with critically ill COVID-19 patients. This situation would not allow the fellows to complete their training as required by EACTA especially the possibility of the second wave of infection is expected. Trainees who are self-sponsored or sponsored for the scholarship will be able to continue their training if the training period is extended. The solutions to this situation

are challenging.^[13] Some EACTA leads have suggested that (1) working in ICU can compensate for the required training period in ICU, (2) scientific activities to be continued online through webinars with active participation from the trainees using video calls, (3) extending the training program to complete the requirements of the fellowship as much as feasible.

Conclusion

We presented a suggested framework for implementing the formal fellowship training in thoracic anesthesia in the Middle Eastern countries as learned from the EACTA experience in developing the standards for fellowship training in thoracic anesthesia. This framework includes the required duration of the training, legal and regulatory standards for the training centers, requirements by the applicants, suggested solutions for the common limitations, knowledge, skills, and competencies, teaching techniques, assessment of the trainees and trainers, and certification processes.

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Conflicts of interest

There are no conflicts of interest.

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