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Special Article

European Association of Cardiothoracic Anesthesiology and Intensive Care (EACTAIC) Fellowship Curriculum: Second Edition

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This document represents the first update of the Cardiothoracic and Vascular Anaesthesia Fellowship Curriculum of the European Association of Cardiothoracic Anaesthesiology and Intensive Care. After obtaining feedback from exit interviews with fellows in training, graduate fellows, and program directors, 2 modified online Delphi procedures with questionnaires were conducted. A consensus was reached when two-thirds of responding committee members gave green or yellow ratings on a traffic light system, and >70% indicated strong agreement or agreement on a 5-point Likert scale. The new

regulations include the following: (1) more flexibility in the fellows' rotation, as long as the total number of days, rotations, and cases are completed during the training year; (2) recommendation for strict compliance with national working-time guidelines; (3) no extension of fellowship training to compensate for annual and/or sick leave, unless the required minimum number of cases and rotations are not reached; (4) interruption of fellowship training for >12 months is allowed for personal or medical reasons; (5) introduction of a checklist for quantitative assessment of standard clinical skills; (6) recommendations for a uniform structure of exit interviews; (7) possibility of a 1-month training rotation in a postanesthesia care unit instead of an intensive care unit; and (8) provided all other requirements have been met, the allowance of progression from the basic training year to the advanced fellowship training year without first passing the transesophageal echocardiography examination.

CARDIOTHORACIC AND VASCULAR ANESTHESIOLOGY is a subspecialty of anesthesiology that is dedicated to the perioperative care of patients undergoing cardiac, thoracic and vascular surgery, and related interventional procedures. The European Association of Cardiothoracic Anaesthesiology and Intensive Care (EACTAIC) supports a well-grounded training in cardiac, thoracic and vascular anesthesia, and critical care in the form of the Adult Cardiothoracic and Vascular Anesthesia and Intensive Care (CTVAIC) Fellowship Program, which comprises basic and advanced training and certification at EACTAIC-accredited educational institutions. The aim of the EACTAIC CTVAIC Fellowship Program is to improve the quality of perioperative patient care by promoting and harmonizing both training and education in cardiac, thoracic and vascular anesthesia, and critical care within Europe and beyond.

Methods

Based on resolutions passed at the 2020 and 2021 Annual Meetings of the EACTAIC Education Subcommittee (EduCom), a working group was established to gather input from fellows and program directors to update the first curriculum,[1] which was created in April 2019. Beginning in September 2020, 2 years of information were collected from a variety of sources, including emails, communications to members, annual meetings of program directors and members of EduCom, the evaluation of exit interviews with candidates at the end of their fellowship years, and feedback from graduating fellows. Changes to the initial curriculum were captured through several internet-based questionnaires created using SurveyMonkey (Momentive), the URL links of which were emailed to all EACTAIC EduCom and task force members. Reminder emails were sent at specified intervals during the conduct of the surveys to encourage the participation of as many members as possible.

The first part of each questionnaire measured respondents' agreement with the issues, and was scored using a traffic light system (green, yellow, and red) to represent agreement or disagreement with the proposed changes to the updated curriculum. For proposals to be adopted, they had to be rated green or yellow by at least two-thirds of the responding members to be considered a consensus between the EACTAIC EduCom and the task force. The second part of the questionnaire quantitatively assessed members' responses using a five-point Likert scale ranging from 1 to 5 and representing "strongly agree," "agree," "neither agree nor disagree," "disagree," and "disagree at all." An agreement was defined as >70% of members responding either strongly agree or agree with each statement. All members gave consent to participate in the questionnaires and data analysis, as well as disclosing any conflicts of interest. Completion of the questionnaires was voluntary. In accordance with the general data protection regulations in the European Union, all data collected were anonymized, secured, and will be retained in the EACTAIC archiving system for 10 years from the date of questionnaire completion.

The first round of questionnaires included 54 questions about the 21 changes proposed by graduate fellows and program directors. The first questionnaire was distributed to the 33 members on October 17, 2021, followed by reminder emails to those who had not responded, and ended on November 23, 2021. The second round of questionnaires included 14 questions on agreement with the introduction of a checklist in the direct observation of procedural skills form to assess the 7 minimum skills required in the first edition of the EACTAIC curriculum,[2,3] as well as recommendations on standardization of the topics and structure of the final exit interviews with the fellows. In addition, 2 of the 13 statements that did not meet with agreement in the first questionnaire were clarified and included in the second questionnaire. The first related question pertained to allowing substitution at institutions with fast-track cardiac anesthesia programs of a 1-month rotation in their postoperative anesthesia care unit (PACU) instead of an intensive care unit (ICU) rotation for training in the care of postoperative patients after cardiothoracic and vascular surgery. The second question related to the provision by program directors of more explicit communication on the learning objectives to fellows prior to each of their training rotations and modules.

The working group strictly adhered to the EACTAIC regulations for the Adult CTVAIC Curriculum,[1] the White Paper prepared by the Board,[4] the assignments required of the EACTAIC host centers,[5] and other EACTAIC regulations for fellowship programs.[6-10] The results of the questionnaires were circulated to all members of EduCom. A manuscript then was drafted by the working group before being circulated to all members of the EduCom and EACTAIC Board of Directors for revision and subsequent approval before the final paper was written, edited, and submitted for publication.

Results

First Questionnaire Round

Thirty-one members of the EduCom completed the first questionnaire, which corresponded to a response rate of 94%. Two members of the EduCom failed to answer some

questions. In the traffic light section, >92% of respondents indicated green or yellow lights to rate the importance to adopt 20 of the 21 proposed changes into the second version of the EACTAIC CTVAIC Fellowship Curriculum (Table 1). The following changes ([summary of answers with *strongly agree* and *agree* rating in percentages]; *previous text as used in the first edition*) were agreed upon by the survey participants with an agreement rate of >70% (Table 2):

1 Before being accepted as a fellow, candidates must have both a valid license to practice medicine and a specialist degree examination in anesthesiology, which are recognized in the host country ([87%]; *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).*

Table 1
Traffic Light Responses to First Questionnaire

	Suggested Changes	Green	Yellow	Red
1	Before being accepted as a fellow, candidates must have a valid license to practice medicine in the host country and a valid specialist degree examination in anesthesiology that is recognized in the host country.	24/31 (77%)	5/31 (16%)	2/31 (7%)
2	EACTAIC allows flexibility in the rotation of the fellow among the various training rotations so as not to burden the host center's schedule. However, the fellow should complete the total number of days at the end of the training year to meet the minimum required duration of the basic and advanced training rotations.	29/31 (94%)	2/31 (6%)	0/31 (0%)
3	Alternatively, host centers may be accredited to offer training only in cardiac, cardiothoracic, cardiovascular, or thoracic and vascular anesthesia. In these cases, the 12 months of basic training should be devoted to the specialties offered.	25/31 (81%)	6/31 (19%)	0/31(0%)
4	Working time directives should always be observed in accordance with applicable national law. Overtime must be compensated.	26/31 (84%)	5/31 (16%)	0/31 (0%)
5	The CTVAIC Fellowship program should be completed within a 24-month training period and should not be interrupted by frequent/extended absences due to illness or personal circumstances. No significant extension of training period is required to compensate for annual and sick leave, as outlined in the signed employment agreements, unless the Fellow does not meet the training objectives and the minimum number of cases and rotations required.	31/31 (100%)	0/31 (0%)	0/31 (0%)
6	Extended absence from training due to sick leave or personal circumstances will require a reasonable extension of the training period to meet the required minimum training rotations, caseload, and competency levels. The EACTAIC Education Chair could allow freezing the training program for a maximum of 6 months in case of legitimate reasons for medical or family leave of absence.*	29/31 (94%)	2/31(6%)	0/31 (0%)
7	EACTAIC recognizes completion of this training period as the basic EACTAIC Fellowship. Completion of the EACTAIC Basic Fellowship Training Program is a prerequisite for participation in the EACTAIC Advanced Fellowship Training Program. EACTAIC will issue the basic training certificate as soon as possible after completion of the basic training period and passing the exit interview.	25/31 (81%)	4/31(13%)	2/31 (6%)
8	The fellow should receive clear learning objectives from the program director prior to the start of each basic and advanced training rotation.	19/31 (61%)	11/31(36%)	1/31 (3%)
9	The number of thoracic cases required should be increased from 25-30 in the dedicated 1.5-month rotation, and/or centers should be encouraged to establish contractual arrangements with nearby centers with a high volume of thoracic cases to offer exchange fellowship rotations in thoracic anesthesia.	17/31 (55%)	9/31 (29%)	5/31 (16%)
10	The number of minimum vascular cases required should be increased from 25-30 within the dedicated 1-month rotation, and/or encourage centers to have contractual agreements with close centers with a high volume of vascular cases to offer exchange fellowship training rotations in vascular anesthesia.	18/31 (58%)	8/31 (26%)	5/31 (16%)
11	A 1-month rotation in the PACU at institutions with a fast-track program may be substituted for an ICU rotation.	14/31 (45%)	10/31 (32%)	7/31 (23%)
12	The training rotation in the ICU or PACU should be well-structured to acquire the required knowledge, skills, and competencies.	28/31 (90%)	2/31 (7%)	1/31 (3%)
13	Fellows who have prior experience in a dedicated ICU for the care of patients in cardiac, thoracic, and vascular anesthesia (eg, through residency or a specific period of formal training) may be exempt from the 1-month ICU rotation.	13/31 (42%)	11/31 (35%)	7/31 (23%)
14	Specification of techniques (eg, techniques of extracorporeal circulation, including ECMO, mechanical circulatory support, and ventricular assist devices).	20/31 (65%)	9/31 (29%)	2/31 (6%)
15	Specification of training in echocardiography; training in TTE and TEE in accordance with EACVI through training courses and classical teaching and simulation-based training whenever possible.	23/31 (74%)	8/31 (26%)	0/31 (0%)

(*continued*)

Table 1 (*continued*)

	Suggested Changes	Green	Yellow	Red
16	Exchange programs; fellows may participate in exchange programs with other institutions to gain specific clinical experience in certain subspecialties that are underrepresented in their host centers, such as anesthesia for heart and lung transplantation.	17/31 (55%)	11/31 (35%)	3/31 (10%)
17	There is a greater need for more training in research during the training year.†	7/31 (22%)	12/31 (39%)	12/31 (39%)
18	There is a need for increased exposure to complex cases during the advanced training year.†	14/31 (45%)	12/31 (39%)	5/31 (16%)
19	It is necessary to use the University Hospital of Southampton competency checklist instead of the CanMEDS levels for assessing skills and knowledge in the curriculum, overlooking case numbers, and focusing on competency levels.	8/31 (26%)	17/31 (55%)	6/31 (19%)
20	At 4-month intervals and at the end of each training rotation, the faculty members responsible for training the fellows submit a critical evaluation of each fellow's acquired competencies to the CTVAIC Program Director using a standardized form.	18/31 (58%)	6/31 (19%)	7/31 (23%)
21	A request to participate in the exit interview may be made to the board of directors, which will consider such requests on a case-by-case basis. The following conditions must be met before a request can be made: (1) a statement signed by all parties that they have no objection to the request; (2) statement by the applicant that his or her presence is solely for the purpose of facilitating the interview, including a detailed explanation of how this will be accomplished; (3) statement by the applicant that all parties have the right to interrupt the conversation and remove the applicant if necessary for the proper conduct of the conversation. In such a case, the reason for the decision should be recorded.	19/31 (61%)	11/31 (36%)	1/31 (3%)

Voting in the first questionnaire on the importance of the proposed changes is based on a traffic light scale in which *green* means the changes should be included, *yellow* means they would be useful to be included, and *red* means they are not important enough to be included. CanMEDS, please refer to.[2,3,11]

Abbreviations: EACTAIC, European Association of Cardiothoracic Anesthesiology and Intensive Care; CTVAIC, Cardiothoracic and Vascular Anesthesia and Intensive Care; EACVI, European Association of Cardiovascular Imaging; ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; PACU, postanesthesia care unit; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography.

* Despite this consensus, 73% of respondents voted for interrupting the Fellowship training for acceptable medical and family reasons for up to 6 months period.

† The need for more research training in the curriculum was excluded because only 61% of respondents chose green or yellow traffic lights to rate its importance of including.

2 EACTAIC allows flexibility in the rotation of the fellow among the various training rotations so as not to overburden host centers' scheduling. However, the fellow should complete the total number of days by the end of the training year to meet the minimum required durations of the basic and advanced training rotations ([100%]; *not addressed in the first edition)*.

3 Alternatively, host centers may be accredited to offer training only in cardiac, cardiothoracic, cardiovascular, or thoracic and vascular anesthesia. In such cases, the 12 months of basic training should be devoted to the specialties offered ([84%]; *Alternatively, host centers can be accredited to offer only training in either cardiac, cardiothoracic, cardiovascular or thoracic and vascular anesthesia)*.

4 Working time directives should be observed in accordance with applicable national law. Overtime must be compensated ([87%]; *not addressed in the first edition)*.

5 The CTVAIC Fellowship Program should be completed within a 24-month training period and should be uninterrupted by frequent/extended absences due to illness or personal circumstances. No extension of training is required to compensate for annual and sick leave, as outlined in the signed employment agreements, unless the fellow does not meet the training objectives and the required minimum number of cases and rotations ([94%]; *The CTVAIC Fellowship Program should be completed in a continuous 24-month period of training and uninterrupted by frequent and/or prolonged periods of absence because of illness or personal circumstances. Prolonged and/or frequent absences from training for sick leave or personal circumstances require a proportionate extension of the training period)*.

6 Extended absence from training resulting from sick leave or personal circumstances will require a proportionate extension of the training period to meet the required minimum training rotations, caseload, and competency levels. The EACTAIC Education Chair can determine when there are legitimate reasons for personal or medical leave and the suspension of training but for no more than 12 months ([86%]; *Absence from training for sick leave or personal circumstances requires a proportionate extension of the training period)*.

7 EACTAIC will recognize the completion of basic EACTAIC Fellowship by certification. Completion of the EACTAIC Basic Fellowship Training Program is a prerequisite for progression into the EACTAIC Advanced Fellowship Training Program. EACTAIC will issue a certificate of basic training as soon as possible after the completion of the training period and passing the exit interview ([86%]; *EACTAIC will recognize this period of training with certification for a basic EACTAIC Fellowship in adult cardiothoracic and vascular anesthesia. Basic certification is a prerequisite for entry into the advanced training program. Fellows may then proceed into the advanced training period either at the same host center where basic training had been completed or at any of the other institutions accredited by EACTAIC. After the*

Table 2
Scaled Responses to First Questionnaire

	Variable	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1	Before being accepted as a fellow, candidates must have a valid license to practice medicine in the host country and a valid specialist degree examination in anesthesiology, which is recognized in the host country.	22/31 (71%)	5/31 (16%)	2/31 (7%)	1/31(3%)	1/31(3%)
2	EACTAIC allows flexibility in the rotation of the fellow among the various training rotations so as not to burden the host center's schedule. However, the fellow should complete the total number of days at the end of the training year to meet the minimum required duration of the basic and advanced training rotations.	19/31 (61%)	12/31 (39%)	0/31 (0%)	0/31 (0%)	0/31 (0%)
3	Alternatively, host centers may be accredited to offer training only in cardiac, cardiothoracic, cardiovascular, or thoracic and vascular anesthesia. In these cases, the 12 months of basic training should be devoted to the specialties offered.	17/31 (55%)	9/31 (29%)	5/31 (16%)	0/31 (0%)	0/31 (0%)
4	Working time directives always should be observed in accordance with applicable national law. Overtime must be compensated.	19/31 (61%)	8/31 (26%)	3/31 (10%)	1/31 (3%)	0/31 (0%)
5	The CTVAIC Fellowship Program should be completed within a 24-month training period and should not be interrupted by frequent/extended absences due to illness or personal circumstances. No significant extension of training period is required to compensate for annual and sick leave, as outlined in the signed employment agreements, unless the fellow does not meet the training objectives and the minimum number of cases and rotations required.	19/31 (61%)	10/31 (32%)	2/31 (7%)	0/31 (0%)	0/31 (0%)
6	Extended absence from training due to sick leave or personal circumstances will require a reasonable extension of the training period to meet the required minimum training rotations, caseload, and competency levels. The EACTAIC Education Chair could allow legitimate reasons for family or medical leave to freeze the 12 months of training for no more than 6 months.*	18/31 (58%)	9/31 (28%)	2/31 (7%)	2/31 (7%)	0/31 (0%)
7	EACTAIC recognizes completion of this training period as the Basic EACTAIC Fellowship. Completion of the EACTAIC Basic Fellowship Training Program is a prerequisite for participation in the EACTAIC Advanced Fellowship Training Program. EACTAIC will issue the basic training certificate as soon as possible after completion of the basic training period and passing the exit interview.	18/31 (58%)	9/31 (28%)	2/31 (7%)	2/31 (7%)	0/31 (0%)
8	The fellow should receive clear learning objectives before the start of each basic and advanced training rotation.	14/31 (45%)	7/31 (23%)	8/31 (25%)	2/31 (7%)	0/31 (0%)
9	The number of thoracic cases required should be increased from 25-30 in the dedicated 1.5-month rotation, and/or centers should be encouraged to establish contractual arrangements with nearby centers with a high volume of thoracic cases to offer exchange fellowship rotations in thoracic anesthesia.	11/31 (36%)	9/31 (29%)	5/31 (16%)	5/31 (16%)	1/31 (3%)
10	The number of minimum vascular cases required should be increased from 25-30 within the dedicated 1-month rotation and/or encourage centers to have contractual agreements with close centers with a high volume of vascular cases to offer exchange fellowship training rotations in vascular anaesthesia.	9/31 (29%)	10/31 (32%)	7/31 (23%)	4/31 (13%)	1/31 (3%)
11	A 1-month rotation in the PACU at institutions with a fast-track program may substitute for an ICU rotation.	10/31 (32%)	8/31 (26%)	7/31 (23%)	2/31 (6%)	4/31 (13%)
12	The training rotation in the ICU or PACU should be well-structured to acquire the required knowledge, skills and competencies.	10/31 (32%)	8/31 (26%)	7/31 (23%)	2/31 (6%)	4/31 (13%)
13	Fellows who have prior experience in a dedicated ICU for the care of patients in cardiac, thoracic, and vascular anesthesia (eg, through residency or a specific period of formal training) may be exempt from the 1-month ICU rotation.	9/31 (29%)	9/31 (29%)	7/31 (23%)	2/31 (6%)	4/31 (13%)
14	Specification of techniques (eg, techniques of extracorporeal circulation including ECMO, mechanical circulatory support, and ventricular assist devices).	13/31 (42%)	12/31 (39%)	4/31 (13%)	1/31 (3%)	1/31 (3%)
15	Specification of training in echocardiography; training in TTE and TEE in accordance with EACVI through training courses,	14/31 (45%)	13/31 (42%)	4/31 (13%)	0/31 (0%)	0/31 (0%)

(*continued*)

Table 2 (*continued*)

	Variable	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
	classical teaching and simulation-based training whenever possible.					
16	Exchange programs; fellows may participate in exchange programs with other institutions to gain specific clinical experience in certain subspecialties that are underrepresented in their host centers, such as anesthesia for heart and lung transplantation.	8/31 (26%)	16/31 (52%)	5/31 (16%)	1/31 (3%)	1/31 (3%)
17	There is a greater need for more training in research during the training year.	5/31 (16%)	6/31 (19%)	9/31 (29%)	9/31 (29%)	2/31 (7%)
18	There is a need for increased exposure to complex cases during the advanced training year.	7/31 (22%)	9/31 (29%)	11/31 (35%)	2/31 (7%)	2/31 (7%)
19	It is necessary to use the University Hospital of Southampton competency checklist instead of the CanMEDS levels for assessing skills and knowledge in the curriculum, overlooking case numbers and focusing on competency levels.	3/31 (10%)	8/31 (25%)	15/31 (48%)	3/31 (10%)	2/31 (7%)
20	At 4-month intervals and at the end of each training rotation, the faculty members responsible for training the fellows submit a critical evaluation of each fellow's acquired competencies to the CTVAIC Program Director using a standardized form.	10/31 (32%)	11/31 (35%)	5/31 (16%)	3/31 (10%)	2/31 (7%)
21	A request to participate in the exit interview may be made to the board of directors, which will consider such requests on a case-by-case basis. The following conditions must be met before a request can be made: (1) a statement signed by all parties that they have no objection to the request; (2) a statement by the applicant that his or her presence is solely for the purpose of facilitating the interview, including a detailed explanation of how this will be accomplished; (3) statement by the applicant that all parties have the right to interrupt the conversation and remove the applicant if necessary for the proper conduct of the conversation. In such a case, the reason for the decision should be recorded.	4/31 (13%)	19/31 (61%)	7/31 (23%)	0/31 (0%)	1/31 (3%)

Consensus analysis to incorporate the changes identified in the first questionnaire based on a 5-point ordinal Likert scale. Consensus was defined as 70% or more agreement. CanMEDS, please refer to.[2,3,11]

Abbreviations: EACTAIC, European Association of Cardiothoracic Anesthesiology and Intensive Care; EACVI, European Association of Cardiovascular Imaging; ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; CTVAIC, Cardiothoracic and Vascular Anesthesia and Intensive Care; PACU, postanesthesia care unit; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography;

* Despite this consensus, 73% of respondents voted for interrupting the Fellowship training for acceptable medical and family reasons for up to 6 months period. Agreements with a rate >70% are marked in grey.

completion of a cardiac anesthesia-based advanced training and successful completion of the certification process for the European Association of Cardiovascular Imaging (EACVI) transesophageal echocardiography (TEE) certification, Fellows become eligible to be certified for an advanced EACTAIC Fellowship in adult cardiac anesthesia).

8 Specification of techniques: for example, extracorporeal circulation including extracorporeal membrane oxygenation (ECMO), mechanical circulatory support, and ventricular assist devices ([81%]; *not addressed in the first edition)*.

9 Specification of training in echocardiography: training in transthoracic echocardiography (TTE) and TEE in accordance with EACVI through training courses, didactic teaching, and simulation-based training whenever possible ([87%]; *not addressed in the first edition)*.

10 Exchange programs: Fellows may participate in exchange programs with other institutions accredited by EACTAIC to gain specific clinical experience in certain subspecialties that are underrepresented in their host centers; for example, anesthesia for heart and lung transplantation ([78%]; *If appropriate facilities are lacking or host centers cannot guarantee sufficient numbers of patients in a selected patient group—for example, heart transplantations in advanced training with a cardiac anesthesia focus—to fulfill the training requirements, the CTVAIC Fellowship Program allows for collaboration among host centers that are certified by EACTAIC to exchange fellows for predetermined periods of the Advanced Cardiothoracic and Vascular Anesthesia Training Program).*

Second Questionnaire Round

The period of the second survey was January 8, 2022, through January 22, 2022. By the end of the survey, 32 responses had been received (97% response rate). All members completed the questionnaire, and >70% of respondents gave green or yellow traffic light ratings to the importance of including 5 of the 6 proposed changes in the second edition of the EACTAIC CVTAIC Fellowship Curriculum (Table 3). The following changes ([summary of answers with *strongly agree* and *agree*, in percentages]; *previous text included in the*

Table 3
Traffic Light Responses to the Second Questionnaire

	Suggested Changes	Green	Yellow	Red
1	A checklist should be included to quantitatively assess the standard steps for each of the 7 clinical skills (already included in the first version of the curriculum), ensure transparency and equity in the assessment of clinical skills among the different fellows at the different host institutions, and provide an objective assessment tool.	27/31 (87%)	3/31 (10%)	1/31 (3%)
2	Recommendations were developed for the structure of the exit interview at the end of each year of the EACTAIC CTVAIC Fellowship Program to ensure transparency and equity in the assessment of fellows by different examiners and to eliminate potential bias or conflicts of interest.	24/31 (77%)	7/31 (23%)	0/31 (0%)
3	Fellows may be considered for continuation of the training at the end of the basic training period, even if they have not passed the theoretical part of the EACVI-EACTAIC TEE examination, provided they meet all other requirements, including case numbers, basic rotations, scientific presentations, research activities, etc. In this case, EACTAIC will not issue the certificate of completion of the Basic Fellowship Program until the fellow passes the theoretical part of the TEE exam.	19/31 (61%)	11/31 (36%)	1/31 (3%)
4	A 2-week ICU rotation as part of the 4-week basic ICU rotation or a 3-6-months' advanced ICU rotation is recommended when possible.	15/31 (48%)	8/31 (26%)	8/31 (26%)
5	Consider deferring the mandatory passing of the EACVI-EACTAIC TEE theoretical examination to the second advanced year of training when 2 years of training are planned and the fellow needs a long time to achieve the competencies, knowledge, and skills required in the first basic year of training.	15/31 (49%)	12/31 (39%)	4/31 (12%)
6	In special situations in which the advanced fellowship position at an EACTAIC-accredited training center cannot be filled by a suitable candidate who has completed the Basic Fellowship Training Program, the title of Advanced EACTAIC Fellowship could be awarded as an honor and prestige to exceptionally qualified candidates through an open selection process, even if they have not completed the formal EACTAIC Basic Fellowship Program.	11/31 (35%)	4/31 (13%)	16/31 (52%)

Votes on the second questionnaire on the importance of the proposed changes are based on a traffic light scale in which *green* means the changes should be included, *yellow* means they would be useful to be included, and *red* means they are not important enough to be included.
Abbreviations: CTVAIC, Cardiothoracic and Vascular Anesthesia and Intensive Care; EACTAIC, European Association of Cardiothoracic Anesthesiology and Intensive Care; EACVI, European Association of Cardiovascular Imaging; ICU, intensive care unit; TEE, transesophageal echocardiography.

first edition) were agreed upon by the survey participants, with an agreement rate of >70% (Table 4):

1 A checklist should be included as a quantitative assessment of the standard steps for each of the 7 clinical skills to ensure transparency and equity in the assessment of clinical skills among the different fellows at the different host institutions and to provide an objective assessment tool ([88%]; *notaddressed in the first edition)*.
2 Recommendations were developed for the structure of the exit interview at the end of each year of the EACTAIC CTVAIC Fellowship Program to ensure transparency and equity in the assessment of fellows by different interviewers and to eliminate potential bias or conflicts of interest as well as provide a template for future interviewers ([91%]; *notaddressed in the first edition).*
3 At the end of the basic training year, fellows may progress into the advanced training year, even if they have not passed the theoretical part of the EACVI-EACTAIC TEE examination, provided they meet all other requirements, including case numbers, basic rotations, scientific presentations, research, and passing their exit interview. In such cases, EACTAIC will not issue a certificate of completion of the fellowship until the fellow has passed the theoretical part of the EACVI-EACTAIC TEE exam ([77%]; *notaddressed in the first edition)*
4 Fellows should receive clear learning objectives before the start of each basic and advanced training rotation and before the start of each 3-month evaluation period ([94%]; *notaddressed in the first edition).*
5 A 1-month training rotation in the PACU treating patients who have undergone cardiac, thoracic, and vascular surgery may be substituted for an ICU rotation ([87%]; *notaddressed in the first edition).*

Discussion

Curriculum Design and Certification

The CTVAIC curriculum is open to all physicians irrespective of their country of origin, religion, sex, or sexual orientation. Before being accepted as a fellow, candidates must have both a valid license to practice medicine and a specialist degree qualification in anesthesiology that is recognized in the host country. Candidates must also be members of EACTAIC in good standing. Appropriate language skills, as defined by the host centers, are required in accordance with national and international regulations (generally level B2 or as per the national regulations).

The CTVAIC Fellowship Program has 2 sequential and complementary levels of training that are referred to as basic

Table 4
Scaled Responses to Second Questionnaire

Variable	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1 A checklist should be included to quantitatively assess the standard steps for each of the 7 clinical skills (already included in the first version of the curriculum) to ensure transparency and equity in the assessment of clinical skills among the different fellows at the different host institutions and provide an objective assessment tool.	14/31 (46%)	13/31 (42%)	2/31 (6%)	2/31 (6%)	0/31 (0%)
2 EACTAIC host centers should be encouraged to use the DOPS checklists developed by OLV Clinic (Aalst) as a free smartphone application to assess the clinical skills of Fellows.	9/31 (29%)	12/31 (39%)	7/31 (22%)	2/31 (7%)	1/31 (3%)
3 Recommendations were developed for the structure of the exit interview at the end of each year of the EACTAIC CTVAIC Fellowship Program to ensure transparency and equity in the assessment of fellows by different examiners and to eliminate potential bias or conflicts of interest.	13/31 (42%)	15/31 (49%)	3/31 (9%)	0/31 (0%)	0/31 (0%)
4 Fellows may be considered for continuation of the training at the end of the basic training period even if they have not passed the theoretical part of the EACVI-EACTAIC TEE examination, provided they meet all other requirements, including case numbers, basic rotations, scientific presentations, research activities, etc. In this case, EACTAIC will not issue the certificate of completion of the Basic Fellowship Program until the Fellow passes the theoretical part of the TEE exam.	11/31 (35%)	13/31 (42%)	3/31 (10%)	4/31 (13%)	0/31 (0%)
5 The fellow should receive clear learning objectives before the start of each basic and advanced training rotation.	17/31 (55%)	12/31 (39%)	2/31 (6%)	0/31 (0%)	0/31 (0%)
6 A 1-month training rotation in the PACU to treat patients undergoing cardiac, thoracic, and vascular surgery may be substituted for an ICU rotation.	14/31 (45%)	13/31 (42%)	4/31 (13%)	0/31 (0%)	0/31 (0%)
7 A 2-week ICU rotation as part of the 4-week basic ICU rotation or a 3-6-month advanced ICU rotation is recommended when possible.	6/31 (19%)	12/31 (39%)	3/31 (10%)	7/31 (22%)	3/31 (10%)
8 Consider deferring the mandatory passing of the EACVI-EACTAIC TEE theoretical examination to the second advanced year of training when 2 years of training are planned, and the fellow needs a long time to achieve the competencies, knowledge, and skills required in the first basic year of training.	7/31 (23%)	10/31 (32%)	9/31 (29%)	4/31 (13%)	1/31 (3%)
9 In special situations where the advanced fellowship position at an EACTAIC-accredited training center cannot be filled by a suitable candidate who has completed the Basic Fellowship Training, the title of Advanced EACTAIC Fellowship could be awarded as an honor and prestige to exceptionally qualified candidates through an open selection process, even if they have not completed a formal EACTAIC basic Fellowship.	4/31 (13%)	9/31 (29%)	2/31 (6%)	9/31 (29%)	7/31 (23%)

Consensus questionnaire on including the changes identified during the second round of surveys based on 5-point ordinal Likert's scale. The sums of percentages may be <100% due to rounding. Agreements with a rate >70% are marked in grey.
Abbreviations: CTVAIC, Cardiothoracic and Vascular Anesthesia and Intensive Care; DOPS, direct observation of procedural skills; EACTAIC, European Association of Cardiothoracic Anesthesiology and Intensive Care; EACVI, European Association of Cardiovascular Imaging; ICU, intensive care unit; OLV, one-lung ventilation; PACU, postanesthesia care unit; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography.

and advanced. Each level comprises 12 months of continuous training, resulting in a CTVAIC Fellowship Program with an overall duration of 24 months.

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 a special focus on cardiac, thoracic, and vascular diseases—and familiarization with surgical techniques, procedures, and associated problems. During the basic CTVAIC 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 CTVAIC training includes modules related to cardiac, thoracic and vascular anesthesia, as well as postoperative care (ICU/PACU), with a focus on cardiac, thoracic, and vascular surgery, as well as modules related to adult TEE and interventional cardiology procedures—for example, transcatheter aortic valve replacement, MitraClip (Abbott), TriClip (Abbott), left atrial appendage occlusion, patent foramen ovale closure, or electrophysiology procedures, including pulmonary vein

Table 5
Basic CTVAIC Fellowship Rotation Schedule

Basic Program	12 mo
Modules*	Minimum Requirements*
Cardiac anesthesia; transesophageal echocardiography; 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.	7 months; a minimum of 100 cases with CPB (30% other than CABG surgery). Candidates must pass the theoretical part of the EACVI TEE Certification Examination.* Fellows may be considered for continuation of the training at the end of the basic training period, even if they have not passed the theoretical part of the EACVI-EACTAIC TEE exam, provided they meet all other requirements, including case numbers, basic rotations, scientific presentations, research activities, etc. In this case, EACTAIC will not issue the certificate of completion of the Basic Fellowship Program until the Fellow passes the theoretical part of the TEE exam.
Thoracic anesthesia	1.5 months; a minimum of 25 thoracic cases
Vascular anesthesia	1 month; a minimum of 25 major vascular cases
Postanesthesia care unit; intensive care unit	1 month; a focus on postoperative care of patients who undergone cardiovascular or thoracic surgery
Transthoracic echocardiography (only for cardiac anesthesia); training in TTE and TEE according to EACVI through training courses, didactic teaching, and simulation-based training whenever possible.	0.5 months; training provided by cardiologists or echocardiography technicians.
Interventional cardiology (only for cardiac anesthesia)	0.5 months; in a hybrid operating room or cardiology laboratory
Extracorporeal perfusion techniques (only for cardiac anesthesia)	0.5 months; training provided by perfusionists

Abbreviations: CPB, cardiopulmonary bypass; CTVAIC, cardiothoracic and vascular anesthesia and intensive care; CABG, coronary artery bypass grafting; EACVI, European Association of Cardiovascular Imaging; ICU, intensive care unit; PACU, postanesthesia care unit; TEE, transesophageal echocardiogram; TTE, transthoracic echocardiogram.

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

isolation, pacemaker, or defibrillator implantation. In addition, modules related to the techniques of extracorporeal circulation, including conventional cardiopulmonary bypass (CPB) and its modifications of minimally invasive extracorporeal techniques as proposed by the Minimal Invasive Extracorporeal Technologies International Society,[12] ECMO and extracorporeal cardiac life support, mechanical circulatory support, and ventricular assist devices are included (Table 5). The training rotation in the ICU or PACU should be well-structured so as to gain the required knowledge, skills, and competencies levels. A 1-month training rotation in the PACU to treat patients who have undergone cardiac, thoracic, and vascular surgery may be substituted for an ICU rotation.

The basic CTVAIC Fellowship Training Program 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 or experimental research is encouraged, but it is not considered a mandatory part of basic training.

EACTAIC allows flexibility in the rotation of the fellow through the various training rotations so as not to overburden the scheduling of host centers. However, fellows should complete the total number of days and cases by the end of the training year so as to meet the minimum required duration of the basic and advanced training rotations and case numbers. The basic training period is completed under the close supervision of a mentor who may be the local CTVAIC program director or a designated member of the department. All the program director and faculty members involved in the training program should be EACTAIC members in good standing. A mentor who may be the program director, a faculty member, or a supervising consultant in charge, must personally provide the fellow with one-on-one clinical supervision during the first 4 months of the basic training period. Supervision of the fellow by a mentor then should become more remote, however, with the mentor available within a reasonable period of time.

Advanced Training Program

The advanced training period is offered in a similar structure to the basic program in order to comply with the differing national healthcare needs and requirements of the 58 countries represented in EACTAIC. 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, as well as the fellows' personal future career plans.

Primarily, the advanced training period is intended to deepen and extend the clinical and nontechnical skills that the fellows have acquired during the basic CTVAIC Fellowship Training Program. The advanced training period also can be used for training in different but complementary subareas and associated disciplines, provided they align with the core intention of the CTVAIC Fellowship program. The advanced training period should deliver a high level of training in specific aspects of cardiac, thoracic, and vascular anesthesia. Additional modules that are complementary to clinical training may be included but are not the focus of the advanced training period (Table 6). However, such modules must be completed in no more than 6 months in total, and must be individually

Table 6
Advanced CTVAIC Fellowship Rotation Schedule

Advanced Program	3-6 month Optional Modules
Advanced Cardiac Anesthesia Fellowship: Advanced hemodynamic monitoring. Management of patients with cardiomyopathy, left heart failure, valve diseases, pericardial diseases. Heart transplantation. Mechanical circulatory support, eg, IABP, LVAD, RVAD, Impella, ECMO. Pulmonary hypertension, RV failure. Fast-track heart surgery.	3-6 months; Cardiac anesthesia forms the main topic in the advanced training program in cardiac anesthesia. Candidates must succeed in passing the practical part (e-logbook) of the EACVI TEE Certification. Passing both theoretical and practical parts and completion of the certification process by the end of the advanced program is obligatory for advanced CTVA fellowship certification.
Transesophageal echocardiography: The accomplishment of the recommended number of TEE studies as defined by EACVI. Assessments of cardiac pathologies related to main topics in the box above.	3-6 months; Advanced level of knowledge in perioperative cardiac echocardiography according to the EACVI- EACTA process of certification guidelines.
Advanced Thoracic Anesthesia Fellowship: Protective 1-lung ventilation. Selective lobar collapse using bronchial blockers. Lung isolation and 1-lung ventilation management including double-lumen endobronchial tubes and bronchial blockers and fiberoptic bronchoscopy. Regional analgesia techniques for thoracic surgery, including paravertebral, epidural, and fascial plane blocks. Ultrasound-imaged regional blocks.	3-6 months; thoracic anesthesia forms the main topic in the advanced training program in thoracic anesthesia.
Advanced Vascular Anesthesia Fellowship: Preoperative assessment, risk stratification and medical management of vascular patients. Elective and emergency open aortic surgery. Endovascular interventional procedures (EVAR, TEVAR, angioplasty). Carotid artery interventions. Pain management in vascular patients with particular reference to critical limb ischemia.	3-6 months; vascular anesthesia forms the main topic in the advanced training program.
Advanced Intensive/intermediate care of adult cardiothoracic and vascular patients: Circulatory failure (heart failure, shock, cardiorespiratory arrest, cardiac arrhythmias, ischemic heart disease, pulmonary embolism, major hemorrhage, vasoplegia). Respiratory failure (ARDS),(pulmonary edema, pneumothorax, pneumonia). Gastrointestinal failure (peritonitis, pancreatitis, liver failure, nonocclusive mesenteric ischemia. Neurologic failure (delirium and coma, cerebral ischemia and bleeding). Airway and chest injuries. Aortic injuries. Infectious diseases (SIRS) and sepsis including a sepsis bundle strategy. Coagulopathies including DIC, heparin resistance, heparin-induced thrombocytopenia, major hemorrhage, transfusion reactions. Equipment and apparatus (design, physics, standards, limitations, eg, noninvasive and invasive postoperative ventilation, continuous renal-replacement therapy devices, non-invasive and invasive hemodynamic monitoring). Indication, contraindication, drug selection, complications for sedation, anesthesia, analgesia, neuromuscular blockade, nutrition in the ICU. Criteria for weaning IPPV and tracheal extubation. Transfer and discharge criteria. Extracorporeal circulation for cardiac and/or respiratory support (eg, ECMO). Respiratory support including endotracheal suction, fibreoptic bronchoscopy including alveolar lavage and sampling, percutaneous tracheotomy, invasive and non-invasive ventilation techniques, use of prone position and weaning IPPV. Hemodynamic management and stabilization, including advanced cardiovascular monitoring, positive inotropic and vasoactive therapy, basic and advanced life support, defibrillation, cardioversion, pacing. Fluid therapy, intravascular volume management. Correction of coagulopathy, patient blood management, blood product transfusion. Acute kidney injury and renal replacement therapy.	3-6 months
Heart/single-and double-lung transplantation module: Clinical management of end-stage heart and lung disease and surgical options for their treatment. Clinical management of patients waiting heart transplantation. Current limitations of organ transplantation and efforts to increase the available donor pool. Multidisciplinary nature of patient evaluation and listing for transplantation. Donor optimization, management and allograft retrieval. Ex-vivo heart and lung perfusion. Physiology of the denervated organ. Surgical technique of heart transplantation and knowledge of intraoperative and immediate postoperative care, including stability of induction of anesthesia, ventilation, oxygenation, hemodynamic support, and allograft, and noncardiac organ protection. Primary graft dysfunction and indications for mechanical circulatory support. Surgical options for lung transplantation, including minimally invasive lung transplantation and various intraoperative extracorporeal support mechanisms. Intraoperative and immediate postoperative care, including protective ventilation, oxygen delivery, hemodynamic support, indications for inhaled nitric oxide and other pulmonary vasodilators, allograft, and non-pulmonary organ protection. Conservative and extracorporeal treatment options for primary lung	3-6 months

(*continued*)

Table 6 (*continued*)

Advanced Program	3-6 month Optional Modules
dysfunction, including ECMO indications and techniques. Immunosuppressive regimens. Postoperative infections and sepsis. Skills; the insertion and interpretation of measurements from invasive arterial and central venous lines and pulmonary artery balloon catheter. TEE for monitoring left and right ventricular function and diagnosis of primary graft dysfunction/failure. Regional analgesia for thoracic surgery.	
Organizational or research module: Communicating effectively with surgical colleagues and other members of the team. Summarizing a case for transfer to critical care staff. Understanding how to communicate with patients in the ICU who have tracheal intubation. Recognizing the need for senior help when and where appropriate. Documenting accurate clinical records. Presentation to departmental meetings and participating in clinical audits. Skills and full participation in multidisciplinary clinical audits. Commitment to continued professional development.	3-6 mo

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

accredited with an official agreement between fellows and their host centers. If appropriate facilities are lacking, or host centers cannot guarantee sufficient patients in a selected group as, for example, heart transplantations in advanced training with a focus toward cardiac anesthesia, to fulfill fellowship training requirements, the program allows for collaboration among certified host centers to exchange fellows for predetermined periods of their advanced cardiac, thoracic, and vascular anesthesia training program. Alternatively, host centers may be accredited to offer training only in cardiac, cardiothoracic, cardiovascular, or thoracic and vascular anesthesia. In these cases, the 12 months of basic training should be devoted to the specialties offered. These solutions apply for the basic as well as the advanced CTVAIC Fellowship Programs, and different fellowship pathways are shown in Figure 1. A compound training plan involving >1 host center should be discussed with all parties involved before the fellowship is initiated, and must be approved in advance by the EduCom chair.

Intraoperative Transesophageal Echocardiography

The interpretation and communication of pathologic findings related to adult transesophageal echocardiography are integral parts of cardiac anesthesia. Thus, EACTAIC and the CTVAIC Fellowship Program Directors consider the acquisition of advanced TEE knowledge and skills an obligatory requirement for CTVAIC Fellows with core training in advanced cardiac anesthesia. The CTVAIC Fellowship Program, with a focus on cardiac anesthesia, can be completed only when all the EACVI prerequisites for TEE certification have been fulfilled, including passing the theoretical TEE certification examination, which, preferably, is undertaken during basic training, and successful completion of an e-logbook (with the required number of cases) by the end of the advanced cardiac training period.

Fellows may progress to advanced training at the end of the basic training period, even if they have not passed the EACVI-EACTAIC TEE examination, provided they have met all other requirements, including case numbers, basic rotations, scientific presentations, research activities, and passing the exit interview. In such cases, EACTAIC will not issue the certificate of completion of the basic fellowship program until the fellow has passed the theoretical part of the TEE examination. The fellow then must have passed both the theoretical examination and practical parts of the EACVI-EACTAIC TEE certification by the end of their advanced training year before they may apply for an exit interview.

CTVAIC Certification

The CTVAIC Fellowship Program starts with 12 months of broad-based training in adult cardiac, thoracic, and vascular anesthesia. EACTAIC recognizes the completion of this training period as the basic EACTAIC Fellowship Program. Completion of the EACTAIC basic fellowship training is a prerequisite for progression to the EACTAIC Advanced Fellowship Training Program. EACTAIC will issue the certificate of basic training after the completion of basic training and passing the exit interview. Fellows may continue to their advanced training period either in the same host center where basic training had been completed or at any of the other institutions accredited by EACTAIC. After the completion of cardiac anesthesia-based advanced training and obtaining EACVI TEE certification, fellows become eligible to be certified as advanced EACTAIC fellows. If advanced training was focused on thoracic and/or vascular anesthesia only, fellows are not required to undertake EACVI TEE Certification.

The CTVAIC Fellowship Program should be completed within a 24-month training period and should be uninterrupted by frequent/extended absences due to illness or personal circumstances. Unless the fellow fails to reach the training objectives and/or the minimum number of cases and rotations required, no significant extension of the training period is required to compensate for annual and sick leave, as outlined in the signed employment agreements. Extended absence from training due to sick leave or personal circumstances will

require a proportionate extension of the training period to meet the required minimum training rotations, caseload, and competency levels. In cases of legitimate prolonged sick or personal leave of absence, the EACTAIC EduCom Chair may allow the suspension of the training program for a maximum of 12 months. Annual and maternity leave will be regulated in accordance with local contractual requirements. Working Time Directives always should be observed in accordance with applicable national law. Overtime work must be compensated.

Documentation of 12 or 24 months of training is a mandatory requirement for the certification of basic or advanced CTVAIC Fellowship Programs. Appeals for exceptional circumstances because of illness or personal circumstances that have resulted in repeated or prolonged interruption of training will be reviewed by the EduCom Chair or forwarded to their delegates for arbitration. Table 7 summarizes common and differing aspects of the basic and advanced training periods. The members of the board of directors and EduCom have approved a list of suggested solutions for mitigation of the interruption in Fellowship training by the task force (Appendix A).

Maintenance of Competence After the Fellowship Program

EACTAIC undertakes indirect measures for the following: (1) quality assurance after completion of the fellowship program, including the collection of feedback from all graduates; (2) a graduate questionnaire to facilitate the search for suitable postgraduate job opportunities and; (3) re-accreditation of host centers every 4 years to ensure maintenance of their programs at the required educational standard.

Relevant Competencies

In accordance with the CanMEDS competency framework,[2,3,11] relevant competencies for general and specific medical and nonmedical skills are defined as follows:

- Medical expert (defined in accordance with[9,13,14])
  - The fellow has gained general and specific knowledge of anatomy and the pathophysiology of all cardiac, thoracic, and vascular diseases.
  - The fellow is able to adequately plan the anesthesia and perioperative care for patients scheduled for a cardiac, thoracic, or major vascular surgery, including individual risk estimation.
  - The fellow is able to safely provide anesthesia to patients undergoing cardiac, thoracic, or major vascular surgical procedures.
  - The fellow is competent in basic and advanced vascular access techniques and hemodynamic monitoring.
  - The fellow is able to interpret the results of common diagnostic tools, including imaging (radiographic, computerized tomography scanning, magnetic resonance, echocardiography, and coronary angiography), electrocardiogram, standard and point-of-care laboratory testing, including biochemistry, hematology, conventional coagulation parameters, and thromboelastography/thromboelastometry.
  - The fellow is familiar with the principles of intraoperative neurophysiologic monitoring including electroencephalographic estimates of depth of anesthesia, such as bispectral index, near-infrared spectroscopy, motor evoked potentials, somatosensory evoked potentials, and intracerebral pressure monitoring in procedures with cerebrospinal fluid drainage.
  - The fellow is competent in airway management, including techniques of lung isolation and 1-lung ventilation.
  - The fellow is familiar with the principles and guidelines of patient blood management.
  - The fellow is familiar with the principles of extracorporeal circulation and in particular, CPB and other forms of mechanical cardiocirculatory and respiratory support systems.
  - The fellow is competent in the assessment of patients who are to undergo cardiac, thoracic, and vascular surgery in a preoperative clinic. In addition, the fellow is able to provide a competent consultation at the request of colleagues from their own or other disciplines.
  - The fellow is able to perform a comprehensive TEE examination and pass the theoretical EACVI TEE Certification Exams, preferably by the end of the basic CTVAIC Fellowship Training Period and complete the EACVI TEE Certification by the end of advanced CTVAIC fellowship training period.
- Communicator
  - The fellow communicates clearly and competently both with patients and with other professionals.
  - The fellow accurately elicits and synthesizes relevant information and perspectives of patients and their families, medical colleagues, and other healthcare professionals.
  - The fellow effectively communicates information about patients verbally and in writing.
- Collaborator
  - The fellow can discuss perioperative management and patient-related decisions comprehensively within a multidisciplinary environment.
  - The fellow works effectively with other healthcare professionals to prevent, negotiate and resolve professional and interdisciplinary conflicts.[8]
- Academic scholar
  - The fellow has knowledge of innovations and developments in cardiac, thoracic and vascular medicine and is dedicated to updating this knowledge.
  - The fellow 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.
  - The fellow actively participates in and promotes clinical research as well as supporting related basic research.
  - The fellow develops a teaching portfolio by delivering lectures at local or national cardiac, thoracic and vascular anesthesia educational meetings.
- Professional

Table 7
Commonalities and Differences Between the Basic and Advanced Cardiothoracic and Vascular Anesthesia and Intensive Care Fellowships

	Basic Training	Advanced Training
Requirement	Obligatory	Optional
Duration	12 months	12 months
Rotations/Modules	Fixed rotations in different areas	Modular rotations
Prerequisites for entry	Appropriate language skills (B2 and as per the national regulations); License to practice medicine and a specialist degree examination in anesthesiology at national level	Completion of basic EACTAIC training in addition to appropriate language skills (B2 and as per the national regulations); License to practice medicine and a specialist degree examination in anesthesiology at national level if Fellow changes institutions or countries
EACVI TEE certification (only required for cardiac anesthesia Fellows)	Theoretical part assessed by examination	Practical part assessed by eLogbook
Number of procedures, 360˚ multisource feedback evaluation and clinical skills evaluation	Reviewed by the end of training	Reviewed by the end of training
Exit exam	No	No
Exit interview to review training	Required at the end of basic training	Required at the end of advanced training

Abbreviations: CTVAIC, Cardiothoracic and Vascular Anesthesia and Intensive Care; EACTAIC, European Association of Cardiothoracic Anaesthesia and Intensive Care; EACVI, European Association of Cardiovascular Imaging; TEE, transesophageal echocardiography.

— The fellow acts professionally with respect to the institutional, national, and international rules and laws.
— The fellow acts professionally with respect to ethical standards.
— The fellow demonstrates a commitment to physicians' health, including awareness of burnout syndrome and sustainable practice.

• Manager and leader
— The fellow demonstrates management and leadership skills in daily practice.
— The fellow remains composed when under pressure, demonstrating effective leadership and supporting other team members.

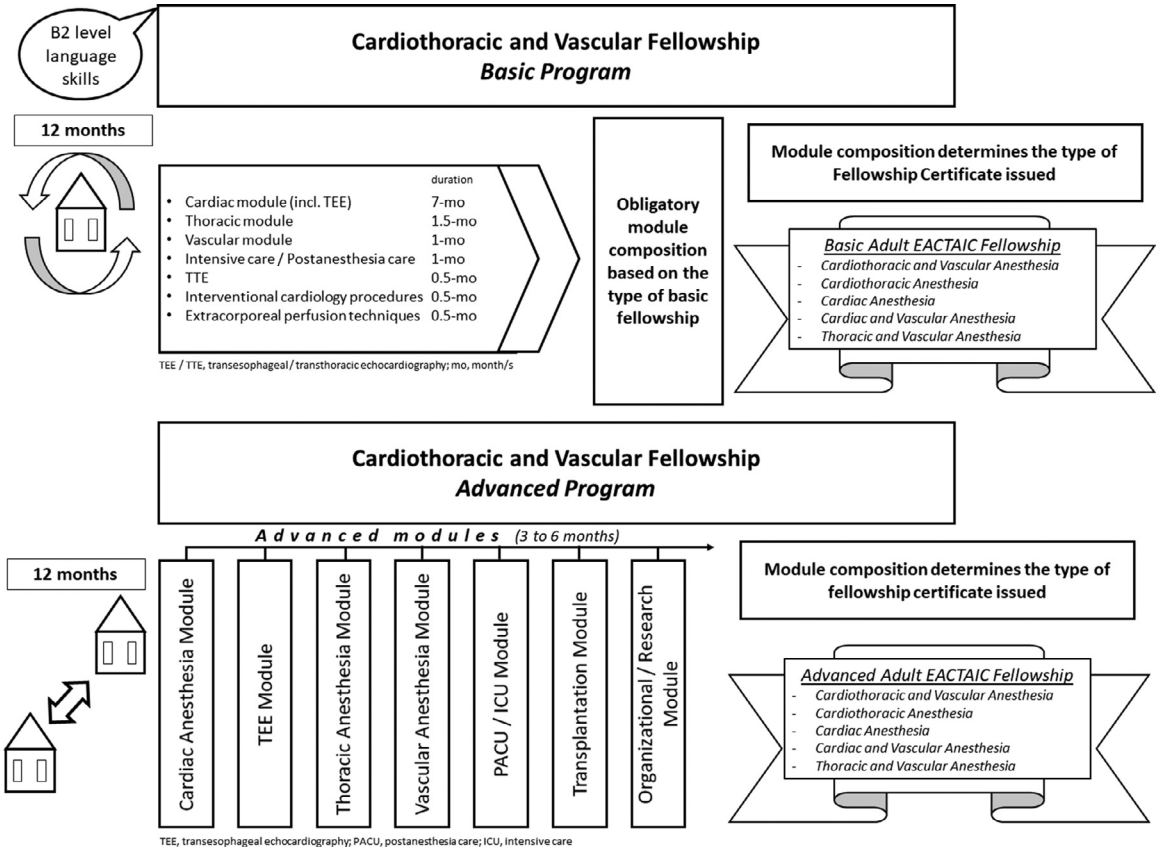


Fig 1. Flow chart illustrating the different fellowship pathways and associated certifications. EACTAIC, European Association of Cardiothoracic Anesthesiology and Intensive Care; ICU, intensive care unit; PACU, postanesthesia care unit; TEE, transesophageal echocardiography; TTE, transthoracic echocardiography.

— The fellow contributes to the improvement of healthcare delivery in teams, organizations, and systems.
— The fellow works efficiently and engages in the stewardship of available healthcare resources.
— The fellow 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.[8]

- Health advocate

— The fellow responds to individual patients' health needs and issues as part of patient care.
— The fellow gives high priority to all aspects of patient safety, both inside and outside of the operating room.

Learning Objectives (Supplement A)

Upon completion of the basic training period, fellows will be competent in cognitive and practical skills required to undertake cardiac along with or without thoracic and vascular anesthesia and will be qualified to work as anesthesiologists. The minimum duration required for the completion of the basic training is 12 months of full-time employment. Successful completion of the basic program entitles the candidate to progress to 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, as defined by the Union Européenne des Médecins Spécialistes[2,3,11]:

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

The fellow should receive clear learning objectives before the start of each basic and advanced training rotation and before the start of each evaluation period, which will be every 4 months. To ensure that all content and skills can be learned sufficiently during the fellowship, EACTAIC requires a minimum number of procedures and/or patients treated in each 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—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 that are offered by the training facility—is expected.

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 1 academic assignment. Academic projects may include presentations at grand rounds, the 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. A minimum of 1 faculty member at each host center is required to present or publish at least 1 scientific contribution with the fellow during their training year, as evidence of scientific engagement or as a part of the training.

Exchange With Other Training Facilities

Fellows may participate in exchange programs with other institutions to gain specific clinical experience in certain subspecialties that are underrepresented in their host centers (for example, anesthesia for heart and lung transplantation). Such exchanges are at the discretion of the program director, but there should be prior communication with and approval by the chair of the EACTAIC EduCom.

Assessment

General Principles of Assessment

At 4-month intervals and at the end of each training rotation, the faculty members who are responsible for training submit a critical evaluation of competencies that the fellows have acquired to the CTVAIC Program Director using a standardized format. 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. Fellows must obtain a satisfactory overall evaluation on completion of their basic training in order to receive certification.

Assessment of Fellows

The elements in Table 8 will form part of the assessment of the fellows during their training. In addition to evaluation by faculty members or their representatives, including members who are not included in the EACTAIC accredited faculty but have supervised their clinical practice, it will be essential for fellows to learn from reflection on their training experiences.

Table 8
Assessment of Fellows

• Evaluation discussions held every 4 months or end of advanced training modules
• During discussions with fellows, the tutor or head of training will address:
Results of 360˚ evaluations* and clinical skills evaluations†Personal reports from the faculty (if available).Reflection and self-assessment by fellows.Learning goals for the next 4 moFeedback from fellows on the quality of the education and any aspects of the curriculum that are not being addressed by their training.

* 360˚ evaluation of CanMEDS competencies is a diagnostic tool that helps candidates improve their personal competencies and supports their self-assessment. During the basic fellowship, at least 1 360˚ feedback must include at ≥5 colleagues invited to submit an evaluation of the competencies of the candidate. Feedback is restricted to internal sources, including supervising anesthesiologists, surgeons, intensivists, cardiologists, and nurses using a standardized questionnaire based on existing multisource feedback forms.[13]

† Clinical skills evaluation is intended to give feedback to fellows about their ability to plan and perform various clinical tasks. Clinical skills evaluation is to be performed by a supervisor, the head of training, or another appropriate person (cardiothoracic anesthesiologist) based on a standardized form that can be based on already existing forms.[3] The task force developed a checklist for the quantitative assessment of the standard steps for each of 7 clinical skills included in the first edition, with the aim of having an objective tool and through Direct Observation of Procedural Skills, so as to promote transparency and equality of their assessment across the different fellows and host centers (Supplement B).

The assessment tools that should be used are reported in Table 8.

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

- Preanesthetic evaluation, including age-related alterations and frailty assessment for risk stratification.
- 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/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 information required 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, American Society of Anesthesiologists score, type of surgery, anesthetic procedure (s), relevant comorbidities, and, if applicable, European System for Cardiac Operative Risk Evaluation II score.
- Reports of TEE examinations that must comply with the EACVI reporting requirements (eLogbook).
- Summaries of their 4-monthly evaluations and related discussions.
- Results of their clinical skills evaluations (CSE).
- Submission of 360˚ multisource feedback.

External Evaluation and Assessment

At the end of the fellowship, the logbook and all its contents, with the exception of the 360˚ multisource feedback, will be sent to the chair of the EduCom. The chair of the EduCom will forward it to 2 EACTAIC 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. The sequence of steps required to organize the exit interview has previously been published (Appendix B).[6] Fellows can apply for the interview once they have met the requirements for the number of procedures, required internships outside the operating room, CSE, and 360˚ evaluation.

Recommendations for the structure of the exit interview to be undertaken at the end of each year of the EACTAIC CTVAIC Fellowship Programs have been developed to promote transparency and equality in the assessment of fellows by different interviewers and to exclude potential bias or conflicts of interest as well as provide a template for future interviewers (Supplement C).

The external evaluation and assessment are scored pass or fail or yes or no (360˚ evaluation). An average score of 70% or more is required to pass (Supplement D; EACTAIC Evaluation Form and Scoring Sheet).[10] The advisory committee will provide feedback to the fellows, 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˚ evaluation). If this is not the case, training will be deemed incomplete, and the fellow cannot be awarded certification in the EACTAIC 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 and wish to appeal (together with the program director) against the decision made after the exit interview must inform the EACTAIC EduCom Chair within 7 calendar days of the decision or interview with a written statement providing the reasons for the appeal.[7] The appeal must be submitted in the form of a signed and dated letter and sent by registered mail or by email within the expiration period. The decision of the advisory committee regarding the appeal will be communicated to fellows within 20 calendar days. The appeal process is performed according to the defined scheme (Appendix C).[7]

A request by a third party to participate in the exit interview may be made to the board of directors, which will consider such requests on a case-by-case basis. The following conditions must be met before a request can be made: (1) a statement signed by all parties that they have no objection to the request; (2) a statement by the applicant that his or her presence is solely for the purpose of facilitating the interview, including a detailed explanation of how this will be accomplished; (3) a statement by the applicant that all parties have the right to interrupt the conversation and remove the applicant if necessary for the proper conduct of the discussion. In such a case, reasons for the arrived decision will be recorded.

Program Assessment and Escalating Issues

There will be regular opportunities for fellows to provide confidential written evaluations of the faculty and program to the EduCom Chair.[8] Fellows who experience difficulty during the training period may turn for advice to their program director, faculty members, or the head of the department at their host center. A fellow who feels unable to approach any of these people should contact the Chair of the EACTAIC EduCom. The chair can provide confidential, neutral, independent, and informal advice to help fellows address their concerns. The Chair of the EACTAIC Education Committee can accompany fellows in discussions of their problems or issues with faculty or administrators and act as an informal mediator between the trainee and the faculty or administrators. The chair also can help effect positive change by providing feedback on patterns of problems and complaints submitted to the program director. Fellows can contact the Chair of the EACTAIC Education Committee with general questions either by email, telephone, or in person.

Periodic evaluation of patient care for quality assurance is mandatory. Subspecialty trainee fellows in cardiac, thoracic, and vascular anesthesia will be involved in ongoing quality improvement and risk management.[15] Fellows in cardiac, thoracic, and vascular anesthesia will actively participate in the periodic evaluation and reassessment of their fellowship training goals and objectives.[8]

Unforeseen circumstances, such as a personal conflict between a fellow and 1 or more tutors, should be reported immediately to the EduCom. The board of directors then has the right to appoint an independent EACTAIC officer as a "mentor" to assist and help resolve the circumstances, as well as to protect both parties. Should any conflict arise, for example, between the fellow and program director or the program director and EduCom, then de-escalating measures will be instituted before any restrictions are considered (Appendix D).

Limitations of the Surveys

The 2 surveys have some limitations. The ideal Delphi process aims to reach a consensus by soliciting the opinions of experts through a series of iterative questionnaires. In contrast, the authors' questionnaires included the rationale for the proposed changes and the concerns of working group members about whether those changes should be included in the second version. However, despite the concerns expressed and evidenced by the consensus reached for many proposed changes, the authors do not believe that respondents' answers in these survey rounds were biased.

Conclusions

EACTAIC continues to develop its fellowship programs with the goal of ensuring high-quality, standardized education in Europe and worldwide so as to train highly skilled and competent perioperative physicians capable of caring for patients undergoing cardiac, thoracic, and vascular anesthesia and critical care. To achieve this, a consensus was required among centers offering fellowship programs on the knowledge, skills, and competencies required for mastery of cardiac, thoracic, and vascular anesthesia and critical care. Resulting from this consensus, the second edition of the EACTAIC Fellowship Curriculum was developed that encompasses basic and advanced training and certification requirements as well as the required educational objectives, relevant competencies, and learning and teaching methods to achieve high-quality, standardized training. Subsequently, the revised curriculum has been endorsed by the European Society of Anaesthesia and Intensive Care. Future evaluations of both graduating fellows and the CTVAIC Fellowship Program will be critical to demonstrating the validity and effectiveness of the revised curriculum.

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Conflict of Interest

None.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1053/j.jvca.2022.05.022.

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