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SCIENTIFIC ARTICLE

Evaluation of a Brazilian's cardiovascular anesthesia fellowship by its former trainees



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Abstract

Background: After advancement of cardiovascular surgery, there is also exponential development of anesthetic techniques in this field. Patients with increasing clinical complexity challenge cardiac anesthesiologists to keep constantly updated. An evaluation of Brazilian's cardiovascular anesthesia fellowship at Dante Pazzanese Institute of Cardiology has been made and information has been collected to evaluate the fellowship program in cardiovascular anesthesia.

Method: Target participants were made up of former fellowships, contacted via e-mail containing an invitation to voluntarily participate. Explanation of the survey's purpose was provided. This communication was signed by the authors and contained a hyperlink to the survey, which was constructed on and hosted on a web platform. The survey was composed of 10 objectives questions designed to describe training and subsequent career.

Results: The adjusted survey response rate was 71%. Two-thirds of respondents agreed that fellowship training provided them an advantage in the job market and 93% of respondents currently work with cardiac anesthesia. At least 87% of participants would recommend the course to other anesthesiologists.

Conclusion: Fellowship graduates judge their technical training as excellent and incorporated the knowledge acquired in their daily practice. However, there are improvements to be made. We believe this document may be useful as a reference for other institutions to develop their own cardiovascular anesthesia fellowship programs.

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PALAVRAS-CHAVE

Anestesia
cardiovascular;
Bolsas de estudo;
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Avaliação do programa de aprimoramento em anestesia cardiovascular por seus ex-estagiários**Resumo**

Justificativa: Com o avanço da cirurgia cardiovascular nos últimos anos, houve também um desenvolvimento exponencial das técnicas anestésicas. Pacientes com complexidade clínica crescente desafiam os anestesiológicos cardíacos a se manterem constantemente atualizados. Uma avaliação do programa de aprimoramento em anestesia cardiovascular brasileira do Instituto Dante Pazzanese de Cardiologia foi feita e informações foram coletadas para avaliar o programa.

Método: Os participantes-alvo eram formados por ex-aprimorandos, contatados via e-mail com um convite para participação voluntária. A explicação do objetivo da pesquisa foi fornecida. Essa comunicação foi assinada pelos autores e continha um link para a pesquisa, que foi construída e hospedada em uma plataforma web. A pesquisa foi composta por 10 questões objetivas destinadas a descrever o treinamento e a carreira subsequente.

Resultados: A taxa de resposta ajustada para a pesquisa foi de 71%. Dois terços dos entrevistados concordaram que o treinamento do programa lhes proporcionou uma vantagem no mercado de trabalho e 93% dos entrevistados trabalham atualmente com anestesia cardíaca. Pelo menos 87% dos participantes recomendariam o curso a outros anestesiológicos.

Conclusão: Os graduados do programa de aprimoramento julgaram sua formação técnica como excelente e incorporaram os conhecimentos adquiridos em sua prática diária. No entanto, há melhorias a serem feitas. Acreditamos que este documento possa ser útil como referência para outras instituições desenvolverem seus próprios programas de aprimoramento em anestesia cardiovascular.

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Introduction

Since the first cardiac procedure performed using cardiopulmonary bypass (CPB) by Gibbon in 1953, cardiovascular surgery has experimented great advancements. These advancements were followed by exponential developments of intraoperative monitoring techniques, coagulation and hemodynamic management.^{1,2} As these developments take place, patients with increased health risks and complex medical problems pose unique challenges to the cardiac anesthesiologists requiring constant technical updates.

Anesthesiology medical residency programs give general information and training in most areas of interest, like cardiovascular surgery. However, specific skills that are constantly in evolution are inconsistently acquired during this period, leading many professionals that intend to work in these areas to search for further training. Currently, entities like American Accreditation Council for Graduate Medical Education (ACGME) and European Association of Cardiothoracic Anaesthesiology (EACTA) recognize and create consensus documents for fellowship programs in adult Cardiothoracic and Vascular Anesthesia (CTVA).^{3,4}

Unfortunately, in Brazil, there is no formal accreditation of anesthesiology subspecialties, nor is there an official survey on the number of programs in CTVA. To our knowledge, there are few programs that focus on cardiovascular surgery. One of them is offered by Dante Pazzanese Institute of Cardiology (IDPC) and has anesthesiologists as main target audience. The duration and program content are summarized in [Appendix 1](#).

This survey provides insights into how former fellows assess the quality of their training from the perspective of their current practice.

The primary objective of this survey is to understand the reasons that influenced anesthesiologists to carry out a CTVA fellowship and the impact on their professional careers. Secondary objectives included collection of data to provide insights into the strengths and weakness of the program.

Methods

We evaluated data collected from a survey sent to 21 cardiovascular fellow, considering that 4 former fellows could not be tracked, graduated at IDPC – São Paulo, Brazil, from 2005 to 2016. The IDPC institutional review board determined that this study was exempt from approval as human subject research.

The survey was composed of objective questions designed to describe their training and subsequent influence on professional careers. Main topics evaluated were: reasons for anesthesiologists' applications, general impressions of the program, potential improvements in anesthetic practice and job market position, and sense regarding cardiovascular anesthesia subspecialty. More details of the 10 question survey can be viewed as Supplemental Digital Content 1 (<https://pt.surveymonkey.com/r/66HQQR6>) or in [Appendix 2](#).

Potential participants were contacted via e-mail containing an invitation to voluntarily participate and an explanation of the survey's purpose. This communication

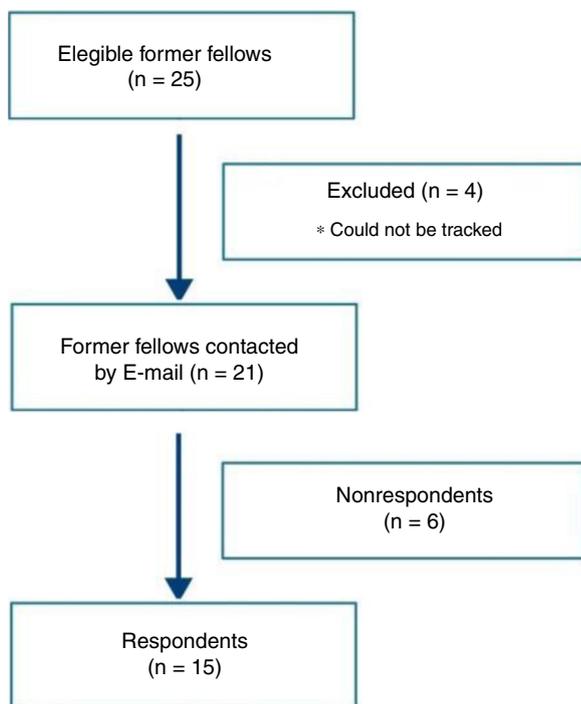


Figure 1 Flowchart of survey respondent's selection.

was signed by the authors and contained a hyperlink to the survey, which was constructed on and hosted at Survey Monkey[®] platform (www.surveymonkey.com).

Participants of the survey were aware that identified results were intended for publication. To protect confidentiality, their computer Internet protocol and e-mail addresses were not tracked. Initial contact was made on May 13, 2017, with reminders sent to non-responders on May 20 and June 15. The survey was closed on July 5, 2017.

Results

The adjusted survey response rate was 71% (15 of 21 e-mail contacts) (Fig. 1). Full text and responses to the survey's first 10 questions are supplied as Supplemental Digital Content 2 (<https://pt.surveymonkey.com/results/SM-W3JWBFPF>).

Fellowship graduate demographic

Most respondents (86%) completed their training within the past 3 years. All respondents completed residency training in Brazil and most of them are Brazilians (80%).

Fellowship training characteristics

Regarding supervisory patterns, 73% of respondents reported being directly supervised by a faculty member at least half of the time and it was the same percentage of fellows who believe their expectations were met by the course. Among others, 7% strongly disagreed that the training met their expectations and 20% were neutral.

Most individuals evaluated the objectives proposed by the fellowship program as well rated (agree or strongly agree): highlights for adult cardiac anesthesia (100%), management of pharmacological arsenal (100%) and pediatric cardiac anesthesia (93%). Moreover, 80% believe that their anesthetic practice was improved after the course. However, 53% of the participants stated that they disagree or strongly disagree of having been properly trained in the subject electrophysiology. Furthermore, 33% of interviewees pointed out frailty in both research training and extracorporeal circulation subjects (Fig. 2).

Postfellowship career

Two-thirds of respondents agreed that fellowship training provided them an advantage in the job market and ultimately in securing a desirable position. In addition, 93% of respondents currently work with cardiac anesthesia at an average of 2.25 days per week.

Fellowship perspectives

Among reasons that motivated anesthesiologists to apply for the fellowship training, personal interest (40%), enhance employability (20%) and interest in the academic career (20%) were the most cited (Fig. 3). Another reasons cited were interest in become more familiar with major surgery procedures and critically ill patients.

About 87% of fellows would recommend the fellowship program to other anesthesiologists. In addition, 87% believe that training in cardiac anesthesia changes the outcome of patients undergoing these procedures. Lastly, all of the former fellows believe that the Brazilian Society of Anesthesiology (SBA) should formally recognize cardiac anesthesia as subspecialty.

Open-ended comments

Nine of 15 respondents offered comments in response to 2 open-ended questions. When asked about the single best aspect of their training, the majority of respondents mentioned the large number of major surgeries in critically ill patients. When asked what aspect of their fellowship they would like to improve, the respondents pointed out the need of more theoretical activities.

Discussion

This survey-based study of IDPC CTVA fellowship graduates provided insights into the strengths and weaknesses of the program and subsequent career paths of these anesthesiologists. The 71% survey response rate suggests applicability of its information content, which in turn should prove useful as the fellowship director evaluates the curriculum.

Fellowship creation and quality

The IDPC CTVA was created in the 2004 and since then trained 25 cardiac anesthesiologists.

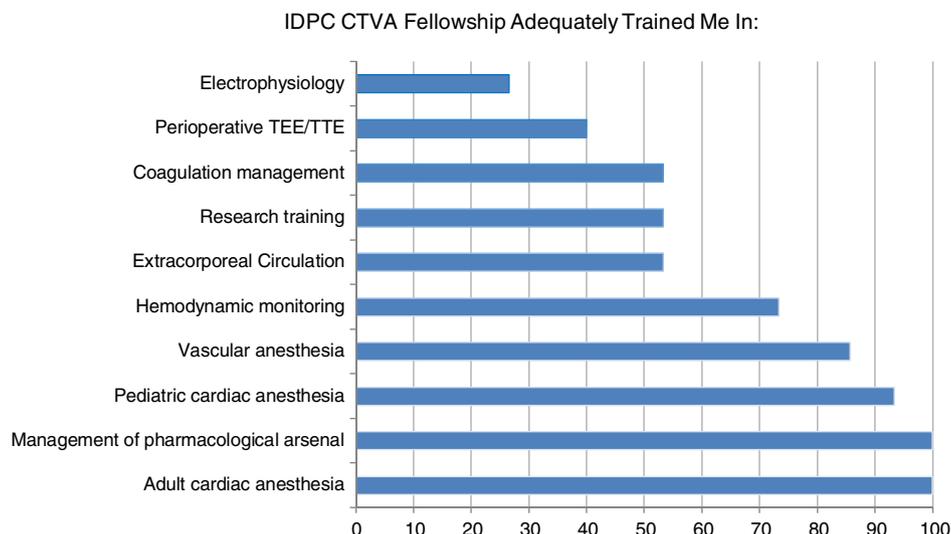


Figure 2 Percentage of participants who said they “strongly agree” or “agree” with the statement, “My fellowship adequately trained me in...” TEE, transesophageal echocardiography; TTE, transthoracic echocardiography.

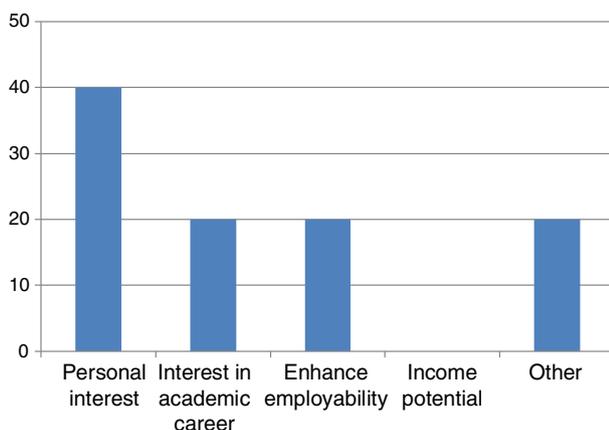


Figure 3 Influential factors for residents who decided to pursue Dante Pazzanese Institute of Cardiology cardiovascular fellowship training after residency.

Participants appear generally satisfied with quantity and quality of technical experience. Most of the topics considered essential for the training of these professionals were well evaluated, particularly those related to cardiovascular anesthesia and pharmacological management. Since anesthesia is a specialty strongly associated with procedures, one of the best evaluated aspects of the program was the huge number of procedures in critically ill patients. Moreover, in most cases experienced anesthesiologists directly supervised them.

Even though program content was explained before the beginning of the fellowship, we speculate that perceived inadequacies in research training may reflect unrealistic expectations of fellows and even of the fellowship director. Although trainees attend a cycle of lectures on research training (Appendix 1), meaningful expertise

generally requires a focused approach, education in statistics and methodology, and intensive writing experience, none of which is conducive to a primarily clinical fellowship.⁵

We believe that the topic “coagulation management” has not been better evaluated because of the lack of monitoring by viscoelastic blood tests at IDPC. Besides controversy regarding its clinical and cost-effectiveness, the use of point-of-care strategy to guide hemostasis has been increasingly used by cardiac anesthesiologists.^{5,6} Therefore, in addition to enhance institutional efforts to acquire this technology and provide continuous education to fellows in the near future, we should also guarantee adequate training on regular coagulation management tools.

Another key aspect pointed by the current survey was the lack of participants’ knowledge regarding to extracorporeal circulation. In response to this, the program director has recently introduced a one-month rotation focused on the management of mechanical circulatory assist devices such as intraoperative cardiopulmonary bypass circuits, intra-aortic balloon pump and extracorporeal membrane oxygenation (ECMO). This rotation was created as an attempt to meet fellowship demands in the last few years and after consent of IDPC perfusion team.

Fellowship career

In developed countries, up to 70% of anesthesia residents plan to pursue fellowship training. Unfortunately, we do not have this data in Brazil and cannot consider the labor relations in our country similar to those of developed countries. We noticed, however, that the reasons why Brazilian anesthesiologists search for specific training in cardiovascular anesthesia and other areas of interest are largely similar to the ones of those professionals.⁷

Consistent with Desjardins's study, the present study noted that fellowship training is overwhelmingly seen as a worthwhile investment that leads to successful career opportunities.⁸ Proof of this lies in the fact that two-thirds of participants not only believe that specialization has enhanced their employability, but also improved their practice. In addition, most of the interviewees work as cardiac anesthesiologists and would indicate the IDPC CVA Fellowship to colleagues.

Fellowship perspectives

According to recent studies, which reported a two-fold increase in death or major postoperative complications (myocardial infarction, kidney injury or stroke) when cardiac anesthesia was conducted by low experienced professionals, most participants believe that outcomes are better when cardiovascular patients are attended by cardiac instead of general anesthesiologist.^{9,10}

In addition, all participants pointed out the need for SBA recognition of cardiovascular anesthesia as subspecialty. This practice, already adopted in many countries^{3,4} would enable CTVA fellowship programs to create criteria and requirements that guide specialist's training. Furthermore, it would allow the advancement of CTVA in Brazil, improve patient safety and quality of care, meet market demands and also ameliorate working conditions in cardiac surgery context.¹¹

Future directions

Since 2014, the program has been continuously improved in order to fulfill the requirements proposed by EACTA and Society of Cardiovascular Anesthesiologists. One of the most important advances was the recent implementation of an additional year of advanced training in perioperative echocardiography in partnership with IDPC Echocardiography Division. Although the perioperative echocardiography topic has been discussed for more than a decade in Brazil, there is still a deficiency in training these professionals.¹² Nowadays, SBA provides the well-structured Transesophageal Echocardiography Course (ETTI) as a tool for initiation to the subject, however, the proficiency to perform a comprehensive exam requires, in addition to theory, significant training and expertise.^{13,14}

Moreover, a minimum number of 125–150 transesophageal echocardiography (TEE) clinical studies carried out under supervision is required by international societies for official certification.^{15,16} We believe that the additional year of TEE training will contribute to the implementation of this paramount monitor in Brazilian cardiac anesthesia routine.

Limitations

First, information obtained from this study must be interpreted within the well-described limitations of survey design, such as sample size determinations and demographics and the nonresponse bias.¹⁷ Second, most participants concluded the program less than three years ago and their answers may not reflect the opinion of previous fellows. However, we believe that the most recently trained specialists will best portray the aimed proficiency of cardiovascular anesthesiologists, according to international consensus documents. Third, as there is no standard CTVA program in Brazil, we do not have parameters to compare the performance of our program to other centers and count on only a few subjects to evaluate it. The present study was designed to evaluate the program's first year, and did not take into consideration the impressions of participants who underwent an additional year of perioperative echocardiography training, offered since 2015.

In conclusion, we have presented a rational survey and analysis of the IDPC CTVA fellowship graduates training and careers. Fellowship graduates judge their technical training as excellent and incorporated the knowledge acquired in their daily practice. There are still improvements to be made, such as enhancement in research training as well as in theoretical schedule and adjustments of electrophysiology rotation, research training and coagulation management aspects. Lastly, we believe this document may be useful as a reference for other institutions on developing cardiovascular anesthesia fellowship programs.

Conflicts of interest

The authors declare no conflicts of interest.

Appendix 1. The Cardiothoracic and Vascular Anesthesia (CTVA) Fellowship Program of the Division of Anesthesiology at Dante Pazzanese Institute of Cardiology (IDPC), Brazil, has been established with the aim of providing a solid clinical and academic experience that forms anesthesiologists who will become experts in the perioperative management of adult and pediatric patients undergoing complex cardiovascular procedures.

Organization

The fellowship program is organized and directed by the local head of Cardiovascular Anesthesia Division (Dr. Caetano Nigro Neto, Ph.D., M.D., Brazilian European Association of Cardiothoracic Anesthesiology (EACTA) representative), in conjunction with the heads of Surgery, Congenital Heart Diseases, Cardiovascular Diagnostic Methods and Interventional Cardiology Departments, as program collaborators.

Program duration

The CTVA – IDPC is offered for anesthesiologists worldwide for one or two year-option programs. The program starts on March and finishes on February of next year.

The second-year training program is optional and can be done in one of the following areas: Advanced Perioperative Echocardiography and Advanced Anesthesia for Congenital Heart Disease, lasting 12 months each.

Program structure

During the first year, the fellow gets a 1:1 supervision with a senior cardiac consultant.

The pragmatic content of the fellowship is divided in:

Theoretical and Scientific Program

Clinical Practice Program

Theoretical and Scientific Program (approximately 280 h): continuous medical education in the field of cardiac (adults and pediatric) and vascular anesthesia is offered. It will be based on lectures emphasizing the conduction of anesthesia, clinical cases and protocols. In addition, a theoretical course of Perioperative Echocardiography with simulation practice will be offered. The fellow will be motivated to develop his/her research skills by participating in clinical trials, multicentre studies and helping on writing papers. Moreover, he/she is encouraged to participate of cardiothoracic conferences. Fellows are required to perform the Advanced Cardiovascular Life Support (ACLS) course within the fellowship.

Clinical Practice Program (approximately 2100 h): The trainee will follow all ICUs activities under supervision of senior specialists and will participate of intensive care ward rounds. Cardiovascular anesthesia clinical practice enrolls different rotations, as follows:

1st month

Introduction to clinical cardiovascular anesthesia section mentored by the program directors or division heads.

Presentation of institutional assistance protocols.

Anesthesia management for standard cardiac procedures.

Participation of intensive care ward rounds and preoperative anesthesia clinic.

Participation in continuous in-house educational activities and clinical case conferences, as well as in research activities.

2nd to 12th months

Hybrid Room (2 months): clinical duties as a member of the heart team for standard and advanced interventional cardiac procedures, including transcatheter aortic valve implantation (TAVI) (transapical/transfemoral), aortic valve bypass and anterolateral mitral valve repairs/replacements, interventions for congenital heart diseases.

Congenital Heart Disease Surgery (1 month): clinical duties for standard and complex congenital heart diseases procedures.

Cardiothoracic Adult Surgery (4 months): clinical duties for standard cardiac procedures (isolated CABG, aortic and mitral valve replacement, aortic reconstruction requiring deep hypothermic arrest, thoracic aortic aneurysm repair and aortic dissection repair).

Vascular Surgery (1 months): clinical duties for different kinds of vascular surgeries and endovascular procedures.

Transesophageal echocardiography (1 month): acquisition of basic TEE skills to obtain standard views with simulation, perioperative and ambulatory exams, under supervision. Moreover, during the whole program the fellow will perform perioperative exams and have books, lectures and teaching in the operating theater, and should be able to perform a self-consistent TEE examination at the end of the program.

Electrophysiology Unit (1 month): clinical duties for procedures in patients with different types of arrhythmias.

Management of adult patients for cardiac pacemaker and automatic implantable cardiac defibrillator placement and surgical treatment of cardiac arrhythmias.

Cardiopulmonary bypass (CPB) and extracorporeal membrane oxygenation (ECMO) Section (1 month): the fellows will be involved in the management of patients treated with VV- and VA-ECMO and will have training for cardiopulmonary bypass skills with the CPB team, under supervision of experienced perfusionists.

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- Intensive Care Unit (1 month): rotation in the Department of Intensive Care Medicine (optional), depending on pre-fellowship ICU qualifications and experience. The goal of this rotation is to focus on the post-operative care of cardiovascular patients and pain management.
- During the last 30 days of the first year, the fellow should be working independently, under remote supervision. A senior faculty member is immediately available.
- At the end of the first year period, the fellow will be able to:
- Understand normal cardiovascular anatomy and physiology.
 - Perform a comprehensive preoperative evaluation of cardiovascular patients, interpreting the cardiovascular function tests in a rational way.
 - Understand pathophysiological changes of the aortic, coronary, valvular diseases and their anesthetic implications. Moreover, he/she will should understand the pathophysiology of main congenital cardiopathies and their anesthetic implication.
 - Provide rational perioperative use of the following drugs: antiarrhythmic, inotropic, chronotropic, vasopressors, vasodilators, beta blockers, diuretics, anticoagulants.
 - Understand fundamentals of extracorporeal circulation (CPB and ECMO) and circulatory assistance devices (intra-aortic balloon counterpulsation, ventricular assist device).
 - Understand the principles of myocardial and brain protection, as well as changes in physiology associated with hypothermia.
 - Know the physiology of coagulation and adequately interpret coagulation tests, as well as critically manage perioperative bleeding using drugs and transfusion therapy.
 - Plan and perform anesthesia for vascular procedures.
 - Basic knowledge of how to install, interpret and handle an external pacemaker.
 - To develop an anesthetic strategy for the cardiac patient for non-cardiac surgery and for procedures performed outside the surgical block.
 - Demonstrate ability to install and interpret data from arterial, central venous and pulmonary artery catheters.
 - Perform basic and intermediate perioperative transesophageal and transthoracic echocardiography – TEE/TTE.
 - Respond to stress and emergency situations, as well as coordinate actions with other professionals and units involved in patient care.
- Fellows are expected to act* in a respectful, courteous, civil and ethical manner in the best interests of their *patients*.
- Participate actively of research activities; acquire the ability to critically interpret published literature and to make significant contributions to research projects.
- Evaluation of the fellow**
- Fellow's progress will be evaluated and discussed every 3 months by the program's director and consultants. His/her professional attitude, knowledge, and clinical judgment will be assessed, as well as practical skills, social competence, efficiency of patient management and performance in critical clinical scenarios.
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Appendix 2. Survey of the Specialization Course in Cardiovascular Anesthesia of the Dante Pazzanese Institute of Cardiology (IDPC) Graduates.

1. What motivated you to hold the IDPC Cardiovascular Anesthesia Specialization Course?
 - () Personal interest
 - () Academic career interest
 - () Improve employment conditions
 - () Enhance financial gains
 - () Other (please specify)
2. Have my expectations been met by the course?
 - () Strongly agree
 - () Agree
 - () Neutral
 - () Disagree
 - () Strongly disagree
3. What percentage of direct patient care was supervised by a faculty member during the course:
 - () less than 25%
 - () 25–50%
 - () 51–75%
 - () >75%

4. Do you currently work on cardiac anesthesia? If yes, how many days a week?
 I do not work with cardiac anesthesia
 Yes. If this option is selected, specify how many days in a week.
5. Has there been improvement in my anesthetic practice after the Specialization Course?
 Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
6. Did the Specialization Course in Cardiovascular Anesthesia provide an advantage in the job market?
 Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
7. Would you recommend the IDPC Cardiovascular Anesthesia Specialization Course to other anesthesiologists?
 Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
8. Do you believe that there are changes in the outcome of patients undergoing heart surgery when treated by cardiac anesthesiologists compared to general practitioners?
 Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
9. In your opinion, should the Brazilian Society of Anesthesiology recognize the area of cardiac anesthesia as subspecialty?
 Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
10. In relation to the following topics, the IDPC Cardiovascular Anesthesia Specialist Course adequately trained me in (mark an "X"):

Strongly agree Agree Neutral Disagree Strongly disagree

Adult Cardiac Anesthesia

Pediatric Cardiac Anesthesia

TEE Basics

Use of Vasoactive Drugs

Vascular Anesthesia

Principles of Extracorporeal Circulation

Electrophysiology Study

Coagulation Management

Hemodynamic monitoring

Research

Endovascular Procedures/Hybrid Room

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