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Special Article

The Educational Evolution of Fellowship Training in Cardiothoracic Anesthesiology – Perspectives From Program Directors Around the United States

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THIS SPECIAL article about the fellowship training in cardiothoracic anesthesiology presents perspectives from educational leaders in this subspecialty from around the United States. The article begins with a historical overview of the origins and gradual development of the fellowship in adult cardiothoracic anesthesiology (ACTA) to the current era of official accreditation and a formal match process for fellowship applicants. The ACTA fellowships around the United States are then classified by size into large, medium, and small programs.

After this introduction to the history and current landscape of the fellowship, a "large program perspective" is then developed by Dr. Capdeville who has served for nearly a decade as the program director for the largest fellowship in the United States based at the Cleveland Clinic. The program directors from small programs (Dr. Ural and Dr. Broussard from the Oschner Health System; Dr. Goldhammer at Thomas Jefferson University) then highlight the "small program perspective" with its advantages and disadvantages. After these perspectives from opposite ends of the ACTA fellowship spectrum, this special article then examines the current ACTA landscape around the United States in greater detail before concluding with a "middle road" perspective from the ACTA program team at the University of Pennsylvania.

The Specialty Speaks Out

The opening article from the inaugural issue of the *Journal of Cardiothoracic Anesthesia* (appropriately renamed the

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Journal of Cardiothoracic and Vascular Anesthesia in February, 1991) was entitled "Cardiothoracic Anesthesia: The Specialty Speaks Out."[1] In this 1987 editorial, Dr. Joel Kaplan introduced the Journal as a platform to enhance communication amongst cardiothoracic surgeons, cardiologists, cardiothoracic anesthesiologists, intensivists, perfusionists, and related specialties. The specialty was establishing itself as a unique component of anesthesiology training and practice, where other subspecialties were already more firmly rooted. This opening and expansive editorial was later followed in December 1990 by a commentary, entitled "Cardiothoracic Anesthesia: A Shrinking World," that lamented the trend that international institutions were outpacing those in the United States with respect to scientific investigation and publication.[2] Almost 3 decades later since those editorials, the specialty is complex and continuously evolving, keeping pace worldwide with clinical investigation, new and exciting technologies, advanced procedures, and an increasingly challenging patient population.

The progress in devices is very apparent since the introduction of the HeartMate I (ThermoCardiosystems, Inc, Danvers, MA), a bulky and noisy left ventricular assist device that was at the time a technological wonder. This first-generation device has ultimately been replaced in the current era by miniaturized pumps that can be held in the palm of one's hand![3] It is little wonder then that cardiothoracic anesthesiology is a popular fellowship choice among anesthesiology residents opting to spend a further year for subspecialty training.

Based on a 2014 survey by the American Board of Anesthesiology that included 1,628 Clinical Anesthesiology (CA)-2 residents (response rate 35%), 54% of responders planned to pursue post-residency fellowship training, with the most popular fellowship being cardiothoracic anesthesiology.[4] The Practice Management Committee of the American Society of Anesthesiologists recently published its 5th annual survey of graduating anesthesiology residents.[5] The top 2 reasons cited by anesthesiology residents for pursuing a fellowship were "*interested in that subject and wanted to learn more/develop skills*" and "*thought it would make you a more competitive/desirable candidate when looking for a job.*"[5] The most popular fellowships in anesthesiology were cardiothoracic anesthesiology, pediatric anesthesiology, pain medicine, and critical care medicine. More than 25% of residents chose a fellowship in cardiothoracic anesthesiology.

The Road to Recognition for the Adult Cardiothoracic Anesthesiology Fellowship

It seems odd that decades ago, the notion of cardiothoracic anesthesiology as a recognized and unique specialty worthy of additional formal training would lead to debate. Cardiothoracic anesthesiology fellowship programs have been in existence at leading institutions around the United States since the 1970s: as an example, the fellowship at the Cleveland Clinic was started in 1976. The Society of Cardiovascular Anesthesiologists was founded in 1979, with the first meeting being held in New Orleans in November of that same year.[6] Furthermore, in 1979, the first edition of "Kaplan's Cardiac Anesthesia" was published: this leading textbook for the specialty is considered by most to be the "bible" of cardiothoracic anesthesiology and is now in its 7th expanded edition in 2017.

The evolution and gradual integration of transesophageal echocardiography (TEE) into our practice of cardiothoracic anesthesiology has been a milestone that has truly set our specialty apart.[8] The first National Board of Echocardiography examination of special competence in advanced perioperative TEE was administered in 1998. When one also considers the technological advances of cardiac surgical and interventional cardiology procedures, it becomes inherently clear that specialized training is essential to master the practice of cardiothoracic anesthesiology.[3,7] Today, the expectation of many anesthesia practices is that fellowship training is essential to be part of the cardiothoracic anesthesiology team.[7,8]

Presently there are 66 accredited ACTA fellowship programs with a total of 209 fellows in the United States according to the Accreditation Council for Graduate Medical Education (ACGME – all details available at www.acgme.org, https://apps.acgme.org/ads/Public, last accessed November 3, 2017). To lend perspective to these totals, there are currently 148 ACGME-accredited anesthesiology residency programs across the United States with a reported total of 6,403 filled positions. There are currently 58 ACGME-accredited fellowship programs in critical care medicine and pediatric anesthesiology, respectively, with reported totals of 188 and 221 filled positions, respectively. As a further comparison, there are currently 32 ACGME-accredited fellowships in obstetric anesthesiology and 12 for regional anesthesiology/acute pain medicine with 40 and 41 reported filled positions, respectively. Although there are 102 ACGME-accredited fellowships in pain medicine with a reported total of 367 filled positions, these fellows are from multiple specialties, including anesthesiology. The ACGME-accredited ACTA fellowship has become one of the biggest and most popular fellowships in anesthesiology across the United States.

The Rationale for and Road to ACGME Accreditation

In a 1992 editorial from the *Journal of Cardiothoracic and Vascular Anesthesia,* Dr. Wynands and Dr. Kaplan discussed subspecialty training in cardiothoracic anesthesiology and the dilemma it posed regarding certification, based on the survey by Dr. Reves and colleagues about the effects of the extended curriculum in anesthesiology.[9,10] In this editorial, Dr. Wynands and Dr. Kaplan highlighted that fewer anesthesiology residents were opting to spend time in 12-month subspecialty education, with the greatest decline in subspecialty training from 26% in 1987/1988 to 4% in 1990/1991 (an 83% decrease).[9] This sharp decline may have been due to the 1988 modification of the CA-3 year in anesthesiology by the American Board of Anesthesiology in which this final year of anesthesiology residency was expanded from an elective year to a year devoted to advanced clinical or specialty-oriented training (advanced clinical track, clinical scientist track, or subspecialty clinical track).[7,9] The editorialists concluded that

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