

## Original Article

# Training in paediatric cardiac surgery and the American Board of Thoracic Surgery\*

Edward L. Bove

*Department of Cardiac Surgery, University of Michigan Medical School Ann Arbor, Michigan, United States of America*

**Abstract** Congenital heart surgery has evolved into its own specialty requiring unique techniques and skills. Recognizing the need to establish a special certification in congenital heart surgery, the American Board of Thoracic Surgery began the process in 2005, eventually granting the first certifications to qualified applicants in 2009. The American Council for Graduate Medical Education and the Thoracic Surgery Residency Review Committee have now approved specific training programs throughout the United States that will help to ensure the proper training of congenital heart surgeons for the future.

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THE ROAD TO BECOMING A PAEDIATRIC CARDIAC surgeon is a long one. Following 4 years of medical school, most who aspire this profession go on to complete a 5–7-year residency in general surgery, followed by a 2- or 3-year residency in cardiothoracic surgery, and yet another 1–2 years of specialty training in paediatric heart surgery. Thus, it might take 12 years beyond medical school to reach this goal, and only the last couple of these years are actually spent learning the specialty of paediatric cardiac surgery. There is little doubt that, although the education of a paediatric heart surgeon is and always will be an arduous endeavour, changes have to be made to standardise and oversee the process.<sup>1</sup> In today's modern world of congenital heart surgery, the ability of the trainee to gain sufficient experience during a standard cardiothoracic residency has been significantly impacted by a number of factors, including interventional cardiology procedures, the emphasis on primary repair of even complex CHD in the neonatal period, and the technical complexity of many congenital heart operations. Furthermore, the restrictions

on resident work hours, increasing consumer as well as payer demands, and the “microscope” environment in which we work make things even more difficult. Traditionally, the competence of any trainee at the end of his or her residency was evaluated by a number of factors including the number of years spent as a resident, number of operations performed, and the personal observations of the programme director and teaching faculty. An examination process, both in service and written and oral examinations administered by the American Board of Thoracic Surgery (ABTS) following satisfactory residency completion further defined the competence of the trainee and resulted in the certification of that individual by the ABTS. This process for most residency programmes in the United States of America, however, consists of very little congenital heart experience, and hardly qualifies anyone to practise the specialty as it currently exists. The old model of “apprenticing” with an experienced congenital heart surgeon for a period of time is no longer suitable for the demands required today. A perfect storm of factors, including fewer applicants to the specialty, general surgery residents who are less well prepared for complex open vascular procedures, little time spent learning congenital heart surgery during a standard cardiothoracic residency, a competitive job market, and the shift to early repair of CHD, resulted in the ABTS adopting an integrated 6-year residency programme where residents are accepted directly out of medical school

Correspondence to: E. L. Bove, MD, 1500 East Medical Center Drive, 5144 Cardiovascular Center, Ann Arbor, MI 48109, United States of America. Tel: +734-936-4980; Fax: +734 936 7353; E-mail: elbove@umich.edu

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into a standard 2- or 3-year cardiothoracic training programme.<sup>2,3</sup> In addition, the Board has adopted a special certification in congenital heart surgery for qualified applicants upon satisfactory completion of an additional year of congenital heart training.

So why now? Congenital cardiac surgery has developed into its own specialty with unique techniques and skills. Current cardiothoracic residency programmes do not prepare the trainee to specialise in this field, and non-American Council for Graduate Medical Education (ACGME) accredited fellowships in congenital heart surgery lack uniformity and quality control. Programmes with a structured curriculum in the anatomy and pathophysiology of CHD in designated teaching centres with sufficient volume and appropriate support services are needed to educate today's congenital heart surgeon.

In 2005, Directors of the ABTS approved a set of basic principles to establish a special certification in congenital heart surgery.<sup>4</sup> The motivation was to create a recognised and documented standard of education, operative experience, and cognitive knowledge for individuals practising congenital cardiac surgery. The goal of these standards was to improve the overall quality of congenital cardiac surgical care in the United States of America. Thus, applicants for special certification will be required to complete an ACGME, Residency Review Commission (RRC)-approved, congenital heart surgery training period of 12 consecutive months following the completion of an ACGME-approved standard residency programme in cardiothoracic surgery. Both written and oral examinations were developed, and special certification would be granted after satisfactory completion of these examinations in addition to certification in Thoracic Surgery by the ABTS. Although not strictly required for accreditation, the optimal training programme was deemed to be located in a designated teaching centre with a minimal congenital heart surgery volume of 300 cases/year performed on a separate paediatric heart service. There should be a minimum of two congenital heart surgeons, a defined lecture series covering a wide spectrum of CHD, and appropriate support for the trainee to complete a research project. In addition, the congenital resident should have defined rotations in cardiac catheterisation – with respect to haemodynamics – imaging – including echocardiography, MRI, and CT scan – and paediatric critical care. The required minimal operative experience was defined by the Board as a minimum of 75 major congenital cases performed as surgeon during the 12-month residency to include the following index cases:

- ventricular septal defect closure (5 cases),
- repair of tetralogy of Fallot (4 cases),

- repair of atrioventricular septal defect (4 cases),
- repair of coarctation of the aorta (4 cases),
- any combination of arterial switch, Norwood, Damus–Kaye–Stansel, or truncus arteriosus repair (5 cases),
- Fontan or Glenn procedure (5 cases),
- systemic-to-pulmonary artery shunt (5 cases).

The Board also felt that a provision for granting special certification should be made available to those already practising the specialty, the so-called “grandfather pathway”. This pathway was made available only if training and practice began before the congenital residency was officially established in July 2009. To be granted special certification through this pathway, the applicant must have performed a minimum of 75 major congenital heart cases in each of the 2 years immediately preceding the application to the ABTS, not counting cases performed during residency training. A written examination would be administered, but an oral examination was not required.

These new requirements for special certification were formulated after a great deal of discussion about what should be expected to properly certify a congenital heart surgeon in today's environment. An additional year of specialty training should be sufficient for most appropriately selected trainees, but may not be for all. Most importantly, *completion of training does not equal the end of education, and mentorship will always play an important role in the development of any newly minted congenital heart surgeon.* Rare and very complex operations, judgement, experience, and patient safety must always be considered when deciding whether and when the resident is at an appropriate level to perform any operation even under appropriate supervision. The notion of “see one, do one, teach one” no longer applies in the complex environment of congenital heart surgery. A gradual increase in complexity and assumption of responsibility in the operating room are both appropriate and realistic in the proper training environment. It may be argued that the teacher can do a better job than the student; however, this argument should be viewed in the context of a commitment to resident education, which must be made by a programme accepted as an RRC-approved residency in the context of the appropriate training conditions as outlined above.

At present, there are 13 RRC-approved congenital residency programmes in the United States of America. As of December 2015, ABTS certification has been awarded to 25 candidates through pathway one – residency trained – and an additional 157 through pathway two – grandfathers. Of the six written examinations administered to both pathway

one and pathway two candidates each year from 2009 through 2014, the pass rate has ranged from a low of 67% to a high of 82%. Pass rates for the oral examination administered to pathway one candidates have varied from 50 to 100%. The examination was re-benchmarked in 2015, reflecting a shift in those taking the examination to predominately pathway one candidates.

Is the ABTS effort to certify congenital heart surgeons working? Clearly, the process is ongoing, and refinements continue to be made by the ABTS as the information learnt from past years is examined to improve the entire process. ABTS certification has resulted in one unfortunate casualty – namely, the inability to qualify for special certification if training is obtained overseas. Many congenital heart surgeons, including this author, benefitted greatly from spending time at some of the outstanding congenital heart programmes in other countries; however, it is difficult if not impossible to monitor and regulate programmes in different countries while still maintaining the standards set by the Board. Perhaps this can and will change in due time.

Although there is no magical formula for training, the ABTS effort provides a basis to establish reasonable criteria to demonstrate to the public that appropriate steps are being taken to standardise the education of a congenital heart surgeon. It is incumbent on the established residency programmes to

choose optimal candidates and to be committed to their education, both in and out of the operating room. The role and necessity for gradually increasing technical responsibility and performance under appropriate supervision are serious and not all congenital heart programmes can or should undertake it. It must also be remembered that teaching surgery involves far more than learning technical skills.

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