

Original Article

Landmark lecture on surgery: paediatric cardiothoracic surgery – training the next generation of congenital heart surgeons*

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Abstract *Introduction:* Recent changes in surgical education have had an impact on our congenital training programmes. The mandate of the 8-hour workweek, a rapidly expanding knowledge base, and a host of other mandates has had an impact on the readiness of the fellows who are entering congenital programmes. To understand these issues completely, we interviewed the top congenital experts in the United States of America. The purpose of this paper is to share their insight and offer suggestions to address these challenges. *Methods:* We used a qualitative thematic analysis approach and performed phone interviews with the top five congenital experts in the United States of America. *Results:* Experts unanimously felt that duty-hour restrictions have negatively affected congenital training programmes in the following ways: current fellows do not seem as conditioned as fellows in the past, patient handoffs are not consistent with excellent performance, the mentor–mentee relationship has been affected by duty-hour restrictions, and fellows may be less prepared for real-world practice. Three positive themes emerged in response to duty-hour restrictions: fellows appear to be doing less menial task work, fellows are now better rested for learning, and we are attracting more individuals into the speciality. Experts agreed that congenital fellowships should be increased to 2 years. There was support for both the traditional and integrated residency pathways. *Discussion:* We are in a new era of education and must work together to overcome the challenges that have arisen in recent years.

Keywords: Congenital training; surgical education; skill acquisition

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Current challenges in paediatric programmes

There have been many changes in surgical education over the past decade that have had an impact on our congenital training programmes. The mandate of the 80-hour workweek has resulted in a decreased continuity of care and less training hours available for residents to attain proficiency. Residents today are experiencing a 50% decrease in night and weekend

call: a time when the most challenging patients arrive and there is more reliance on oneself to manage care. In addition, we are experiencing a rapidly expanding knowledge base and increasingly complex procedures, leaving residents to learn more technically challenging procedures in fewer hours. Faculty are facing increased demands and additional pressure to perform with excellent outcomes. There has been an explosion of technological advances such as TAVR, TEVAR, and MitralClip, which the faculty themselves are just learning. This is causing a competition for operating room time and the junior faculty are less inclined to give up procedures to fellows as in years past. In today's environment, because of decreased hours in their own training programme, junior faculty feel they need to “take the case” to benefit

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their own education and training. All of this results in residents and fellows having less autonomy and less confidence to function independently.

Another challenge today is that learners get their information from various technology sources and have grown up looking at screens and smart phones. They are more accustomed to e-learning and rely less on talking with patients and rounding to acquire information. This may cause a disconnect and difficulty conversing with patients. In addition, there are a host of other Accreditation Council for Graduate Medical Education mandates that may take the resident away from clinical duties and operative cases, such as wellness mandates and quality improvement training.

Finally, there have been relatively few congenital surgeons trained outside of the United States since 2006 when the American Board of Thoracic Surgery was approved to offer a congenital surgery subspecialty certification. This is a challenge because practice environments and resources vary greatly in other parts of the world and we do not have a platform to gain other perspectives if we do not venture abroad. Health care needs are universal and are not confined or limited to only one country. When it comes to health care and surgical practice, progress is made around the world and not only in the United States of America.

The overall influence of these changes has had an impact on the readiness of the fellows that are entering our congenital training programmes. Fellows today have had lesser time in training than did fellows in the past. Their skills are less developed and they require further training to feel competent and ready for practice. The mandate of duty hours has created a notion of shift-work mentality, which has an impact on the continuity of care. This may cause a tendency for fellows to become “mechanical” and less able to innovate at the table. To add to this, there are different pathways that a trainee may take to become a congenital surgeon. The traditional route requires 5 years of general surgery residency followed by 3 years of cardiothoracic surgery and either 1 or 2 years of congenital training, equalling 9 or 10 total years. In contrast, the newer route requires only 6 years in an integrated cardiothoracic programme followed by 1 or 2 years of congenital fellowship, equalling 7 or 8 total years. As one can see, the difference in the number of training years to get to the same end is significant. We are currently graduating congenital fellows with a varied level of experience. This puts us at an interesting crossroads in congenital programmes as we are now thinking about extending all fellowships to a minimum of 2 years.

In order to understand these issues more fully, we felt it was essential to get insight and feedback from

the top congenital experts in the United States of America regarding their thoughts about congenital surgical training, the challenges that we are facing, and potential strategies to address these. The purpose of this article was to share the insight from five of the top congenital experts in the United States of America and to offer suggestions to address these challenges.

Methods

We used a qualitative thematic analysis approach to gain insight from five of the top expert congenital surgeons in the United States of America. We selected the experts on the basis of leadership in the field, strong clinical outcomes, and national reputation. Guided by an interview guide, we conducted semi-structured phone interviews with each of the experts. The interviews ranged from 21 to 45 minutes in length. These interviews explored their perceptions about the following topics: current pathways to becoming a congenital surgeon; how recent changes in surgical education have affected congenital programmes; challenges associated with teaching millennial learners; international congenital programmes; and participation in research during fellowship. The interviews were audio recorded and professionally transcribed. The transcripts were analyzed to identify common themes.

Results: expert opinions

When asked which pathway is better for becoming a congenital surgeon there were mixed emotions. In one sense, it was felt that the traditional longer programme is better because fellows enter the fellowship further along on the learning curve. They have an additional 3 years of experience under their belt, which adds to maturity and advanced skill level. The benefit to taking the longer traditional route is that fellows have had a chance to focus on becoming a good doctor and surgeon first, before learning the intricacies of congenital surgery.

However, there was also support for the integrated 6-year programme (I-6) that has some advantages. It was felt that the I-6 programme is more attractive to medical students and therefore attracts stronger candidates. The dedicated time on cardiac, thoracic, and vascular better prepares fellows for what they will eventually be doing, which has the potential for producing a better product at the end. A downside is that you have to train the congenital fellows from scratch. This programme is potentially good if you get the right candidate but could be a catastrophe if the wrong candidate is selected.

The experts unanimously felt that congenital training programmes should be increased to 2 years.

They all agreed that 1 year is not enough to train someone to operate independently and it takes at least 2 years before one can think “congenitally”. One expert recommended an onboarding process where the fellow transitions into a junior faculty role and assumes independent operating responsibilities in a protected environment. He commented that the line between “fellow” and “faculty” is very blurred and does not happen overnight; this protected training period should be different for each individual.

All experts have the same opinion that duty-hour restrictions have negatively affected training programmes. There were four themes that emerged regarding the impact of duty hours on current fellowship training. First, experts noted that current fellows do not seem as conditioned as fellows in the past who were used to staying up all night and working longer hours. Fellows today seem less able to stay focused on patients over a long extended period of time. Second, experts raised the issue of patient handoffs and the fact that handoffs are not consistent with excellent performance. Third, the mentor–trainee relationship has changed as the duty-hour restrictions have been implemented. Experts commented that the concept of “I will teach you how to operate and you can help me run the service” does not exist anymore. The trainee is no longer able to take care of the service because of duty-hour restrictions. Finally, experts raised the issue to the fact that duty-hour restrictions may cause the inability to prepare fellows for real-world practice. Once a fellow completes his/her fellowship they will step into a world that does not have duty-hour mandates.

However, experts did agree that there were some benefits to the 80-hour workweek model. First, they commented that fellows and residents are less likely to perform menial tasks such as drawing labs and transporting patients and are more likely to spend their time in the hospital on education-focused activities. Second, fellows now get more sleep and are more awake and alert to read and study. Third, we appear to be attracting more individuals, in particular women, into the specialty.

Experts commented that one of the biggest challenges with teaching learners today is that they come with their own agenda of what they want to do. They appear to have their own idea about which cases they would like to participate, what they would like to do, and who they would like to work with. Experts encouraged fellows to develop an understanding that there is only a brief period of time to learn as much as possible while faculty are available and willing to teach.

When we asked about international heritage and training abroad, experts had mixed emotions. On one hand, they felt that studying abroad is extremely valuable as it offers a different perspective and

provides a rich opportunity. We are an international specialty and we can learn a lot from our partners abroad. On the other hand, there was a general feeling that many fellows do not want to do two fellowships; most are ready to get through that phase of their lives and start building a practice and increasing their salary. The reality is that you need a certificate from the American Board of Thoracic Surgery to practice in the United States of America.

Finally, there was a general agreement that research should not be required during a congenital fellowship. Fellows are busy and have a lot to learn clinically. Although retrospective reviews or case studies would be reasonable, it is not realistic to think that fellows can work in a research lab.

Discussion: potential solutions

Our overarching goal is to produce highly efficient and competent surgical graduates and highly sought after congenital training programmes. To do this, we need to be keenly aware of the challenges that surround our current training paradigm and continually search for ways to overcome them. Recommended solutions need to focus on what fellows can do to improve their own learning, what faculty can do to enhance training, and what we can do as a society to improve the overall experience.

Fellows

The most important thing that a fellow can do to prepare themselves for practice is to learn his/her trade. Gaining clinical competence is the absolute most important aspect of training. Without it, it is impossible to lead others and build a successful clinical practice. Fellows must focus on establishing a solid foundation of clinical skills and knowledge.

In order to do this, it is essential to prepare for the operating room, clinic, rounds, and other daily activities. Preparing for the operating room means understanding all of the indications, contraindications, and potential complications. It means thinking ahead about any barriers and/or challenging aspects of the case and anticipating the postoperative course.

It is imperative to practice technical skills outside of the operating room. Fellows must participate in “deliberate practice”, a term first coined by psychologist K. Anders Ericsson. Dr Ericsson has spent his career studying the development of expertise. Based on his research in skill acquisition, deliberate practice can lead to significant improvements in performance when individuals are given a task with a well-defined goal; motivated to improve; provided with immediate feedback; and provided

with opportunities for repetition and practice. Ericsson has studied the area of expertise extensively and several studies have shown a consistent relationship between the amount of deliberate practice and the development of expertise. To reach the level of an “expert” he estimated that over 10,000 hours of deliberate practice are needed.^{1–3} Learning correctly from the beginning is the key to this; therefore, fellows should continually seek out feedback from faculty members.

In addition, fellows must learn to be self-starters and recognise that learning does not stop after 80 hours. Time spent outside of the hospital should focus on reading for cases, practicing new skills, and preparing for other educational activities. Fellows should understand that they need to “own it” and are responsible for pushing their own education forward. They need to utilise physician extenders effectively while recognising that they themselves need to know everything about their patients. It is critical for fellows to seek out role models and not wait for someone else to do this for you. Faculty members are more than willing to engage with a fellow who is active in their learning and asks for feedback and help.

Faculty

As faculty members, we need to recognise that the apprenticeship model is different from when most of us trained. Fellows no longer get all of the experience that they need just from being in the hospital. However, the apprenticeship is still important in congenital training programmes; fellows need to understand the anatomy differences in all children and need exposure to all anomalies and cases. Because of hour restrictions, faculty must become innovative in their teaching methods and look for teachable moments. It is essential that we capitalise on all of the teaching time that we have and maximise the time that we spend with fellows in the operating room, at the scrub sink, on rounds, etc. It is also important to give consistent and constructive feedback to fellows. This is one of the most important ways that we can improve their skills and make the time they are in the hospital more efficient.

As mentioned earlier, it is important to recognise that teaching is done differently today. In cardiothoracic surgery, we are working with younger learners in our integrated programmes who do not have the same accompanied skills as in the past. We need to understand their level of training and target our teaching efforts to their skill level accordingly. We can help improve the efficiency of learning by recommending online resources and encouraging practice in the simulation lab. Only through repetition and deliberate practice of surgical skills will they

reach the next level in their training and eventual mastery.

We also need to recognise that the service demands placed on residents and fellows keep them continually responding to the next problem; this prevents structured time set aside for education. With this in mind, it is helpful to minimise the menial and unnecessary clerical functions that are often placed on the residents and fellows. This can also be accomplished by using physician extenders who can help offload some of the service components of resident work so that they can focus on diagnostic decision-making and participation in operative cases. In an effort of efficiency, we need to define a comprehensive curriculum that is up to date. This means including only topics that are current and relevant to the patients that they care for. Teaching and testing information that is obsolete – i.e. diseases that are no longer a significant problem – is of little value to current residents.

Society

As a society, we should work to develop exchange programmes for our congenital fellows. Going abroad will expose our fellows to other cultural norms, practices, and health care models. This will help dispel myths and stereotypes and encourage international collaboration.

Conclusion

We need to recognise that we are in a new era of education and must work together to overcome the challenges that have surfaced over recent years. In order to do that we need to focus on solutions that help us best prepare graduates who are technically proficient, can communicate, who take accountability for their own learning, and who provide exceptional care to the patient. As faculty members, we need to have the same attributes, intellectual curiosity, and secure ego that we expect in our graduates. In addition, we need to take a personal interest in being a mentor and a role model; we cannot be effective teachers if we are not good role models. We must recognise that we have the privilege of educating the next generation of surgeons, discovering new knowledge and helping our fellows do the same.

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Conflicts of Interest

None.

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