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COVID-19 Disruption in Cardiothoracic Surgical Training: An Opportunity to Enhance Education



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"When written in Chinese, the word crisis is composed of two characters. One represents danger and the other represents opportunity." John F. Kennedy

The coronavirus disease 2019 (COVID-19) pandemic has been disruptive to individuals, organizations, universities, markets, governments, and the health care industry worldwide. It has simultaneously provided an opportunity for thoughtful engagement and potential improvements in nearly every circumstance.

While the COVID-19 pandemic has drastically changed health care management, there has also been a significant impact on surgical training. Much of the resident and fellow operative experience is completely halted or significantly reduced as surgical trainees are deployed elsewhere to perform shift work, mostly in intensive care units or emergency departments, managing the sickest of those affected by COVID-19.

Most programs have suspended all nonurgent procedures. In some programs, residents are not operating at all as efforts exist to reduce individual exposure to COVID-19 infection by maintaining in-patient services to an absolute minimum except for the occasional emergency. For many future cardiothoracic surgeons, their principle procedures at present may be simple bedside procedures learned during internship, such as arterial and central venous catheter insertion, intubation, tracheostomy, or peripheral cannulation for extracorporeal membrane oxygenation, rather than complex cardiac surgical procedures that would enhance their skill base. Across procedural fields, a major imbalance of resident-ability to case-complexity has occurred.

Postgraduate Surgical Training Programs

Although many training programs will be able to absorb a few months of altered experience, the impact on shorter training programs may be more severe. For many trainees in cardiothoracic surgery, the latter half of their

final year of training is the most impactful, with access to increasingly complex cases and greater autonomy. These trainees have matured to competently perform their most complex cases during this crucial time while still under the guidance and supervision of seasoned faculty educators. Training is most commonly time delineated and progressive before transition to the next phase of their career—either an additional subspecialty fellowship (eg, congenital, transplant, structural heart, etc) or their first "job" as a staff surgeon.

While this precious developmental time for senior residents is currently threatened, there may be a competing interest of ensuring that the outgoing residents have received all of their necessary training, even if that means a time extension for their training, while minimizing the potential detrimental effect of this increased resident complement on the incoming or junior residents. Certainly, the delay in surgical training will be widespread, and the effect thereof felt throughout surgical training, regardless of postgraduate year. It is safe to assume that during this break in routine training, every resident will be affected to varying degrees.

The effect of this disruption extends to certification as well. The American Board of Thoracic Surgery (ABTS), like other surgical boards, has long relied on case logs as one of the criteria of eligibility for certification. For larger-volume programs, residents and fellows have likely completed their case requirements, developed autonomy, and are eligible for certification. However, that may not be the situation in smaller, shorter programs or "top-heavy" programs in which most of the surgical experience is accumulated in the later months of training. The national organizations responsible for program oversight and individual certification are actively working to find solutions for the immediate collateral impact of COVID-19 on current trainees. This solution will likely be individualized for each trainee requiring consideration for board eligibility.

This pandemic directs attention toward the challenges that arise with unanticipated interruption of training and provides the stimulus and opportunity for reevaluation. Program directors are uniquely poised to comprehend the needs of their individual trainees as well as the teaching capabilities of their faculty. By improving not

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only resident learning but also faculty teaching, cardiothoracic surgical residency training is elevated and can be sheltered from insults like COVID-19, which impact an entire program. In the future, and at an individual level, many residents will benefit from the flexibility and ingenuity that allows for unexpected and unpreventable absences from training. Although there is no substitute for actually performing surgical procedures, the following outlines several potential complements to enhance surgical training.

Technical Competency Assessment and Program Director Responsibility

Concerted efforts by program directors and the ABTS are dedicated toward the assessment of technical abilities. To determine competency and board eligibility, the ABTS does rely on total case volume as well as program director sign off. Minimum case requirements are thoughtfully determined by expert consensus among leaders of the ABTS, the governing board that assumes responsibility for the assessment of competency for thoracic surgeons. Written and oral components of board certification examine knowledge, critical thinking skills, and judgment.¹

At present, because there is no formal external examination of technical performance or proficiency upon completion of residency, the case log and the assessment of the program director appropriately carry significant weight. Creating a valid, reproducible, and discriminating technical metric for certification has been an area of great interest for the ABTS; however, many logistic challenges and objective grading processes need to be navigated.

The case requirements are comprehensive and representative of the skills needed to succeed in clinical practice. But it is important to note that case requirements are the minimum number of cases required. Many residents may acquire more than the minimum number. It is expected that as residents mature, they are performing the more critical portions of procedures, culminating with the skill and autonomy required of an attending surgeon. Individuals may advance at separate paces, with some achieving competency earlier than others. In some cases, when residents are deficient in case volume requirements in specific areas, the sign off by faculty and program directors assumes increased significance.

The responsibility of the program directors includes constant evaluation of each individual's technical performance throughout postgraduate residency training based on feedback from the entire faculty. By direct observation and supervision, program directors will continue to play a critical role in ensuring case completion and providing an environment for successful achievement of competency.

The Milestones Project was designed by the Accreditation Council on Graduate Medical Education to establish the definition of competency in the domains of medical knowledge, patient care, and technical skills for

each specialty. It serves as a useful framework for program directors to assess a trainee's progress toward achieving competence. However, there is no standard approach to the assessment of these skills or a uniform solution for when a deficiency is identified.

There are several proposed tools that facilitate learning, technical advancement, and assessment of skill. For example, detailed "shared learning goals" created by faculty and residents jointly and predetermined per case can be formulated on specific case components and advanced based on individual resident performance. This system could lend both efficiency and autonomy to training while providing guidance to attending surgeons regarding level-appropriate goals. These also foster entrustment between the residents and attending surgeons.²

Also, development of a valid and reliable specific case-by-case operative performance assessment review would be helpful in determining certain areas that need improvement for deliberate practice and establish future technical goals for proficiency and progress. These assessment tools could enhance the current reliance on case logs by objectively ensuring that the technical components of the operation are being performed in a logical sequence as well as reliably and consistently.

Provision of Autonomy

Autonomy has frequently been used as another surrogate for technical competency. Unfortunately, the demonstration of autonomy can be challenging, even before COVID-19, and such opportunities are usually concentrated in the last few months of training. The reasons for the challenge are multifactorial. In general, there are a reduced number of straightforward cases as patients become sicker (ie, advanced heart failure, more comorbidities, etc) and often present for multiple reoperations. Rapidly developing percutaneous technology, such as angioplasty, drug-eluting stents, atrial septal defect closure devices, and transcatheter aortic valve replacements, are some examples that have replaced many open straightforward operations. In addition, there is an expectation by the public for institution/program transparency with increased public reporting and, associated with it, mounting scrutiny on surgical outcomes.³ The cumulative effect of these issues may result in difficulties meeting case requirements. Hence, residents may progress more slowly through training and are allowed to perform only the more complex procedures toward the end of their postgraduate training period.

More than 20% of surgical residents worry that they will not feel confident performing procedures independently before concluding training.⁴ Trainees should be reassured that their cognitive and technical skills development is on a continuum throughout residency training and persists into the early years of independent practice as a staff surgeon. Although a complex case may seem overwhelming, in many situations, the complexity can be

broken down into fundamental components of other cases with which the resident is familiar and skilled. The ability to combine these skills with sound judgment, efficiency, and expertise marks maturation as a surgeon.

Educator Training

While surgical education has improved significantly over the last decade with the implementation of simulation and advanced imaging techniques that allow better preparation for procedures, there are still gaps in surgical educator training that could be improved.⁵ Teaching skills must be a deliberate practice by academic surgeons and requires preparation, patience, and determination. Attending-level courses are available through the American College of Surgeons and previously through the Joint Council on Thoracic Surgery Education. Both courses focused on acquiring skills in program development, teaching, delivery, and receipt of feedback, program assessment, and educational administration and leadership. In its first 5 years, the Joint Council on Thoracic Surgery Education "Educate the Educators" course had 156 attendees representing 97% of all training programs.⁶

These types of courses may be the best opportunities for attending surgeons to enhance and improve teaching skills. Consideration should be given to broader accessibility and perhaps even mandatory attendance for surgeons working in an academic setting. These courses are certainly invaluable for program directors that have the added responsibility of program evaluation, identification of assessment tools, and formulating a plan for remediation when needed.

Adjuncts to Technical Training

Educational techniques have expanded significantly and range widely. There are increasing data to support the use of simulation that allows residents to improve skill and master challenging situations before encountering them in the operating room.⁷ For a multitude of reasons, simulation is greatly underused.⁸ Odell and colleagues⁹ reported that programs may lack resources to construct simulation centers and purchase high-fidelity models. In addition, simulation requires ownership with maintenance of equipment and a significant time commitment by faculty. The "Top Gun" program demonstrated that simulation practice leads to improved skills performance for cardiothoracic surgery trainees.¹⁰

Other programs, such as the Thoracic Surgery Directors Association Boot Camp, have favorable reviews from residents but have limited enrollment availability. Surgical coaching programs that focus on individual continuous improvement of technical and nontechnical skills, such as leadership, teamwork, and communication, provide excellent resources and promote performance improvement in the operating room.¹¹

Lastly, there is ample evidence that videotaping of operative cases provides valuable data on technical skills and communication skills between faculty, operating room staff, and trainees.^{12,13} Such assessments may be limited due to hospital resources, feasibility, time, cost, bias, and adequate review.¹³ It is imperative to explore ways to make these resources more widely available and affordable.

Summary

The COVID-19 pandemic has highlighted the need to mitigate the impact of interruptions in postgraduate surgical training, whether from a pandemic or from unanticipated institutional or personal trainee issues. The current forced interruption of normal training activities is a stimulus to improve present learning paradigms through critical analysis and incorporation of novel educational models, to enhance our educational programs for residents, and to develop stronger educators with novel approaches to skills training, assessment, and remediation while focused on incorporating a competency-based model. This careful reappraisal may optimize and improve postgraduate surgical education for future generations and protect training in the setting of a global, institutional, or individual setback.

In the case that residents complete their training programs in June, future partners must acknowledge their potential deficiencies in some areas and provide adequate mentorship while recognizing the sacrifices that residents and academic training centers have made while caring for the COVID-19 population. As educators, mentors, and leaders in our specialty, it is important to proactively identify our challenges to learning in the setting of unanticipated interruptions and provide safe, feasible, and equitable solutions for resident training.

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