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## Commentary: Cardiothoracic surgery training is more than calculus class

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Shah and colleagues<sup>1</sup> have examined the case logs for cardiothoracic resident physicians in 2- and 3-year programs (excluding I-6 integrated programs) over the last 4 years to assess for trends in case volume. These logs counted both cases in which the resident acted as primary surgeon for the essential components of the case and as the assistant surgeon.

The study has some noteworthy and relevant findings, particularly that the overall volume of cardiothoracic cases that trainees experience has increased, despite increased scrutiny related to public reporting, pressures related to optimal outcomes, and increases in certain percutaneous or nonsurgical treatments such as transcatheter aortic valve replacement, radiofrequency ablation, and endoscopic mucosal resection. The increase in the thoracic case numbers was greater than the cardiac case numbers. The overall increase in volume for trainees is encouraging for our specialty and our trainees.

Although a topic that is interesting and of some importance, the study exposes fundamental issues related to training in the high-risk, high-reward specialty of cardiothoracic surgery. Imagine if in a calculus class you were passed simply based on the number of problems you completed, irrespective of whether any of the answers were correct? Clearly surgical postgraduate education has progressed significantly from the days when simply attending lectures in Europe certified you as a barber-surgeon,<sup>2</sup> to when spending time with an established surgeon was adequate, to actually quantifying experience that includes procedures in which the trainee has done the essential components of the case and asking program

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Although the increase in trainee-performed cases is encouraging, continued efforts are needed to ensure trainee proficiency and identify factors during training that contribute to proficiency.

directors to attest to a trainee's competence. We have come a long way! However, we have a public duty to ensure that graduating resident physicians can perform cardiothoracic surgery safely and competently; we are not just called to answer math questions, lives are at stake. How we, as a specialty, can ensure quality training—particularly during an era when the landscape of the types of cases is changing—is a matter that the American Board of Thoracic Surgery is actively and continuously addressing.

As with any analysis, the quality of the study is inherently limited by the quality of the data. In this instance, logged case numbers (which are known to be inaccurate) were the input data,<sup>3</sup> and do not account for the performance of the trainee technically or in other realms essential to success as a surgeon (eg, critical thinking, judgment, and fund of knowledge)<sup>4</sup>; the extent of a trainee's contribution to the case or input/guidance from the attending surgeon; the outcome; or the ability of the trainee at the time of graduation to be safe and competent. Fundamentally, what should be assessed is the proficiency of the graduate in clinical practice and what we want to understand is which specific elements of training optimize proficiency. That is a much more nuanced question that would require substantially more detailed input data and an evaluation of proficiency of the graduate.

The authors should be congratulated on their efforts to characterize case numbers during cardiothoracic surgery training and how those have changed in recent years, yet we are called to more. Namely, to ensure proficiency as a specialty and to understand what factors lead to that

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ultimate goal. The equivalent of completing case numbers in a calculus class is not considered sufficient to pass calculus. But more importantly, this is not calculus class; the stakes are vastly higher.

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## Commentary: Are cardiothoracic trainees operating enough?

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The goal of cardiothoracic surgery training programs is to produce surgeons who enter the workforce with appropriate medical decision-making and operative proficiency. Previous literature has shown that increased case volumes lead to an increased confidence level among graduating trainees.<sup>1</sup> Although there are many factors that create a great surgeon, operative volume will always be a key factor. As such, trends of overall case volume among trainees are important to understand.

Improvements in medical therapies and endovascular approaches have led to a greater proportion of coronary and valvular disease being treated without traditional surgical approaches.<sup>2,3</sup> Despite this increase, the manuscript by Shah and colleagues<sup>4</sup> showed that cardiothoracic surgery residents have performed more cases over the last 4 years. There was a more significant increase in the number of general thoracic cases performed than cardiac cases. This trend is likely the result of an increase in minimally invasive thoracic surgery performed over time.<sup>5</sup> The shift toward more minimally invasive surgery has prevented nonsurgical



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Training the proficient resident remains the primary goal of cardiothoracic training programs. Understanding changes in case volumes is vital to prepare each trainee adequately.

options like cryoablation from becoming more prevalent. There has not been as rapid a rise in minimally invasive surgical options for cardiac surgery.

Despite using a relatively short time period in their study, Shah and colleagues showed that case volumes are increasing for cardiothoracic trainees. Training this generation of cardiothoracic residents has been affected by duty hours, greater scrutiny of outcomes by hospital administration, and increased use of nonsurgical options for cardiac disease.<sup>6,7</sup> Nevertheless, it appears that the case volume for each trainee has not decreased. Cardiothoracic surgery will continue to evolve, and with it so will the training being provided. Not only do trainees have to know how to do more types of surgeries, but they will also face more complex surgeries in patients who do not respond to nonsurgical

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