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New Challenges and Opportunities for Echocardiographic Education during the COVID-19 Pandemic: A Call to Focus on Competency and Pathology



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The coronavirus disease 2019 (COVID-19) pandemic has affected our daily routines dramatically in a very short period of time. As an educator in the echocardiography laboratory, I have struggled with the impact the pandemic is having on trainees. Traditionally, cardiovascular echocardiographic education for physicians includes a combination of didactic lectures and case reviews, with hands-on image acquisition and study interpretation by trainees (fellows) supervised by attending physicians. At the core of the teaching process lie traditional didactic methods such as the Socratic method and “pimping,”¹ through which the educator elucidates knowledge gaps and addresses them using collaborative inquiry and demonstration. As part of this interaction, educators rely heavily on nonverbal cues to assess attention, understanding, and the need to slow down and reengage trainees in conversation on salient topics. These interactions are at the heart of mentored instruction. Furthermore, from the practical standpoint, the American College of Cardiology 2015 Core Cardiovascular Training Statement² and the 2019 American College of Cardiology/American Heart Association/American Society of Echocardiography Advanced Training Statement on Echocardiography³ outline specific requirements for time to be spent in the echocardiography laboratory, as well as a combination of competency-based assessments and volume-based targets to ensure trainee proficiency by the conclusion of fellowship. Training programs have allocated specific time blocks to meet these requirements and have designated roles to fellows during these blocks to achieve the necessary competencies to become independent practitioners. In short, the entire traditional pedagogic method on which echocardiographic training relies depends on direct face-to-face contact with trainees and on exposure to a high case volume.

Enter COVID-19. Over the past weeks we have had to implement social distancing measures and have restructured clinical services. By necessity, many fellows have been redeployed to COVID-19 and intensive care unit duties. Typical rotations have been redefined, fundamentally changing trainees’ experience and instruction. As part of these temporary social distancing measures at our institution,

echocardiographic interpretation is currently primarily remote, leaving only one attending physician in the laboratory with no trainees. Moreover, procedure volumes have been dramatically curtailed; all elective procedures have been cancelled, and outpatient echocardiographic volumes are at all-time lows. Hospital beds are currently occupied primarily by patients with COVID-19 in designated negative-pressure wards, and care teams are relying more on point-of-care ultrasound than formal sonographer-obtained imaging to avoid viral spread. As a result, echocardiography volumes have decreased by >50%. In this setting, traditional educational techniques that rely on high clinical volumes with direct educator-trainee interactions no longer work. Although the duration of these changes is unknown, it remains our obligation to prepare current trainees for successful, competent, independent careers.

To confront these challenges we must adapt quickly. To meet our obligations to this and future generations of cardiology trainees, we need to overcome inertia and disrupt the traditional didactic paradigm. At our institution, we have already made significant changes. Didactic sessions have moved completely to shared video platforms. We have quickly adapted to the limitations and opportunities afforded by technology by interacting with trainees through specific didactic questions and polls to ensure audience attention and participation. In place of daily “interesting cases,” which previously were occasions for laboratory members and fellows to huddle together and review a case, we have implemented formal case review “show and tell” sessions during which cases are reviewed as a group on a remote virtual platform with an advanced imaging fellow and attending physician moderating. Side-by-side reading sessions with trainees have temporarily been halted. In their place, fellows independently and remotely report preliminary reads, and the attending physician in turn reviews the study and provides feedback, including a detailed explanation with reference to the frames of interest. Although this process distills the interpretation and thought process of the attending physician, it has led to greater fellow independence and reflection. Anecdotally, fellows now appear more likely to proactively ask questions, effectively creating a virtual Socratic method augmented by opportunities to indicate online resources as directions for further independent reading (articles, chapters, etc.). Through this process, many fellows have “discovered” the wealth of resources our institution has compiled for them over years in our virtual library and have become more likely to directly access guidelines published by the American Society of Echocardiography. Although these resources have always been present, the normal ease of access to the attending physician has made asking the mentor easier than independent investigation. Thus, an unanticipated benefit of COVID-19 has been the promotion of independent reading and discovery.

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The impediments to meeting Core Cardiovascular Training Statement^{2,3} time and volume requirements, however, may be more difficult to overcome. Recently, the National Board of Echocardiography has reinforced that despite COVID-19, the mandated time and volume requirements for achievement of level 2 training are to remain unchanged. Trainees affected by the pandemic, however, will be allowed an additional year to complete these requirements. Although this extra time will allow trainees to meet traditional training standards, the impact this decision will have on young faculty members starting their first years in practice may be detrimental and in my view may be unnecessary. Drs. Ryan and Wiegiers⁴ in their article “Who Is a Competent Echocardiographer?” quote a definition of competency as “an observable ability of a health professional, integrating multiple components such as knowledge, skills, values, and attitudes...[that] can be measured and assessed to ensure their acquisition.”⁵ With this philosophy in mind, our laboratory has focused on promoting achievement of competency rather than time and volume requirements as primary metrics of progress. For image acquisition, we have created mechanisms for trainees to track point-of-care ultrasound studies and have added mentor involvement to verify the suitability and adequacy of these studies. We envision that in the future we will rely more heavily on “scan labs” with standardized patients and specific goals for each session. We have developed an eight-part scanning curriculum that requires trainees to demonstrate competency in image acquisition in each major echocardiographic view (parasternal long, parasternal short, apical four, diastology, apical five/three, apical two, subcostal, and right ventricle–focused evaluation) and to demonstrate the ability to combine them into a full study and acquire additional views when necessary (e.g., in cases of valvular heart disease or pericardial evaluations). This curriculum can easily be implemented in “scan labs” to make up for lost scanning time during this crisis. Because current stress echocardiography volumes are insufficient for competency, we have identified 25 stress echocardiography cases that we have previously reviewed during our quality improvement meetings and have created a deidentified case library for trainees. Each case includes a brief clinical vignette including information that would have been available at the time of the original study. Trainees independently interpret these studies, after which they are provided with the official interpretations as well as follow-up anatomical correlation (mainly invasive coronary angiography). This process, although still promoting independent reading, enriches the amount of true pathology to which trainees are exposed and provides a valuable correlation as a validation of echocardiographic findings. Among the included pathologies are single-vessel ischemia,

multivessel ischemia, left bundle branch block, and cardiomyopathy with viable ischemic, nonviable, and nonischemic myocardium. We have plans to continue to enrich this library with other cases, including valvular heart disease, pulmonary hypertension, hypertrophic cardiomyopathy, and diastolic stress testing. In effect, we have confronted the challenge of low clinical volumes by shifting the focus of the training experience from a high-volume, low-pathology model (typical of echocardiographic training) to a lower volume, enriched pathology model aimed at promoting competency through exposure to often unusual pathology. Training in transesophageal echocardiography in this environment remains challenging, and we are currently focusing on preferentially training our advanced imaging fellows in this modality. To confront this challenge, we plan to explore other tools such as simulators in the near future, though we recognize that this may not be a widely available resource.

The COVID-19 pandemic has disrupted our routines as educators and taken us out of our comfort zones. The adaptations we have used to confront this new situation represent a break with tradition, but I believe they may establish new paradigms that will improve the overall training experience by enhancing the focus on pathology and competency. As we gradually return to our traditional structure, the beneficial changes made to the echocardiography curriculum during the COVID-19 disruption will be integrated into our prior curriculum, supplementing the traditional curriculum with competency- and pathology-centered tools and exercises. Hopefully these educationally beneficial adaptations will result in an improvement in the overall experience of the future echocardiographers and leaders in our field.

REFERENCES

1. Brancati FL. The art of pimping. *JAMA* 1989;262:89-90.
2. Ryan T, Berlacher K, Lindner JR, Mankad SV, Rose GA, Wang A. COCATS 4 Task Force 5: training in echocardiography: endorsed by the American Society of Echocardiography. *J Am Soc Echocardiogr* 2015;28:615-27.
3. Wiegiers SE, Ryan T, Arrighi JA, Brown SM, Canaday B, Damp JB, et al. 2019 ACC/AHA/ASE advanced training statement on echocardiography (revision of the 2003 ACC/AHA clinical competence statement on echocardiography): a report of the ACC Competency Management Committee. *J Am Soc Echocardiogr* 2019;32:919-43.
4. Ryan T, Wiegiers SE. Who is a competent echocardiographer? *J Am Soc Echocardiogr* 2019;32:944-6.
5. Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR, et al. Competency-based medical education: theory to practice. *Med Teach* 2010;32:638-45.