“Knowledge is not knowledge unless it is knowledge”

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Early in my surgical training, one of my mentors, Dr Ray Kuretu, stated, “Knowledge is not knowledge unless it is knowledge.” This statement impressed upon me the need to learn, retain, and be able to use information for the benefit of my patients without having to return to a textbook or repeat a mistake. This is possible during one's surgical training largely because of repetition and experience. Unfortunately, repetition and experience take a bit longer to acquire with the current constraints on training. These include reduced work hours, intense scrutiny of outcomes, public reporting, and the highly technical expertise (and stakes) necessary for success in cardiothoracic surgery. To improve surgical education and supplement some of the necessary experiences, simulation and boot camp experiences have emerged. In this issue of the *Journal*, Kenny and colleagues¹ have proposed these as important parts of training the cardiothoracic surgeon of the future.

Kenny and colleagues¹ evaluated 20 first-year cardiothoracic trainees on 2 procedures (pulmonary wedge resection and cardiopulmonary bypass) before and after 2 boot camp-style courses. The first course used simulators and cadavers and the second used live animals for an operating simulation. Performance was evaluated by surgical trainers with Objective Structured Assessment of Technical Skills matrices before and after each course. In addition, clinical supervisors were asked to evaluate trainees after the courses. Not surprisingly, the mean performance scores improved after participation in both courses for both procedures. Kenny and colleagues¹ concluded that the courses improve technical skills, improve confidence, and should be supported by the surgical community.

Interestingly, consistent improvement was not demonstrated in all subskills evaluated after each procedure and each course. Is it possible that the trainees maintained the skills after the first course and therefore had little room for additional improvement after the second, were some trainees slower to learn, or perhaps was each trainee unable to perform each procedure completely? In training cardiothoracic residents, we have all seen variability among

**THE ONLY
SOURCE OF
KNOWLEDGE IS
EXPERIENCE.**

Paraphrase attributed to Einstein stresses need for experience to gain true knowledge (Google images).

Central Message

Applicable Calvin Coolidge quotation: “‘Knowledge comes, but wisdom lingers’...the ability to form judgments requires the severe discipline of hard work and the tempering heat of experience and maturity.”

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trainees in reaching the necessary competency-based milestones.

Kenny and colleagues¹ nicely review the limitations of their evaluation methods in their article. The study only included first-year cardiothoracic surgery residents, trainees served as their own controls, there was no feedback from trainees themselves, and the precourse instruction was not consistent for all participants.

Even though the course was completely supported financially by industry, Kenny and colleagues¹ did not have complete participation with assessments and surveys, and attitudes about the benefits of the courses were not entirely positive. Only 83% of clinical supervisors agreed that the time spent was beneficial, supported attendance at either course, or believed that the courses contributed to the improvement of the trainees' confidence during the year. Only 75% of supervisors believed that the courses contributed to the improvement of the trainees' operative skill during the year. One trainer strongly disagreed with future attendance, although there are no additional data presented to explain this response.

Only 50% of clinical supervisors felt more confident in allowing the trainee to make clinical evaluations and decisions in clinic and consult settings, to make independent clinical decisions on the ward, or to do more of the technical aspects of operating after course 2. After course 1, 74%, 79%, and 68%, respectively, felt more confident in the same areas. Lack of complete participation and “buy in”

by all participants is worrisome and suggests a need for improved validation of methods and demonstration of objective, long-lasting benefits of course participation.

Kenny and colleagues¹ provide a good first step in the systematic evaluation of simulation and live operating boot camp experiences.¹ Others have demonstrated similar results in improving the confidence of trainees,^{2,3} and it is well known that confidence is a key trait of a successful surgeon. Long-term sustainability and applicability of knowledge gained in boot camps (as a significant improvement relative to others who have trained in the traditional manner) were not clearly demonstrated.

Kenny and colleagues¹ suggested that live animal surgery should be supported by the surgical community; however, widespread use of such courses will be limited by financial, ethical, and time constraints. Ethical concerns with regard to use of animal models when other suitable alternatives may be available are vital to consider. Alternative opportunities still exist in training programs that include dedicated

laboratory research before cardiothoracic fellowship. Trainees often spend 2 years in hypothesis-directed research, and these invaluable experiences have helped many cardiothoracic surgeons become comfortable with live cardiothoracic surgery before clinical training. Careful assessment of the “bang for the buck” of live animal models in cardiothoracic training will be necessary to determine whether the use of valuable resources is warranted until clear long-term benefits can be demonstrated by their use.

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