



MAXIMIZING POSTGRADUATE SURGICAL EDUCATION IN THE FUTURE

by James M. McGreevy, MD, FACS

Most practicing surgeons agree that their surgical residency was the most exciting time of their medical career. However, looming changes right now promise to make the residency experience an even better one.¹ Within the next few years, residency programs will transform from an apprenticeship model, which has served well for almost 100 years, into a formalized curriculum-driven experience where competence, not time, defines the duration of training. Residents will be required to demonstrate progress toward defined milestones, including an ability to assess their progress in training and develop a learning program based upon their clinical experiences. Deliberate

practice, reflection, and portfolios are established components of adult learning that will help develop these skills in postgraduate educational experience.

SURGICAL TRAINING IN THE PAST

In order to fully appreciate what is happening in postgraduate surgical education now, it is important to understand the history of this topic. Until the 1920s, physicians who wanted surgical training would travel to the clinics run by respected surgeons, such as the Murphy Clinic in Chicago, IL, or the Gross Clinic in Philadelphia, PA. The master surgeon at institutions such as these would demonstrate operative techniques in open operating rooms.

William Halsted, MD, FACS, instituted the first surgery house staff training system in the U.S. when he developed the Surgery Residency at Johns Hopkins Hospital.² Dr. Halsted adapted the German training system for surgery by taking medical students into the hospital as resident physicians, meaning that they actually lived in the hospital. Dr. Halsted advanced the residents as he saw fit, until he believed they were ready for independent practice. Some residents were in the Hopkins Program for up to 13 years. Mark Ravitch, MD, FACS, a true renaissance surgeon who finished his academic career at the University of Pittsburgh, PA, was in the Hopkins system for eight years when Alfred Blalock, MD, FACS, was named chair. Dr. Ravitch did not finish that program for several more years. Dr. Blalock's second chief resident was William Watson, MD, FACS, who underwent an 11-year training program, including two years of neurosurgery.

This training model changed somewhat over the next 50 years. By the 1970s, residents no longer had to live in the hospital. They made a little more money, they were allowed to marry as house staff, and the American Board of Surgery defined the length of the residency as five years.

Nonetheless, surgical training was still akin to an apprenticeship. House staff spent long hours in the operating room watching the senior residents work. They were expected to learn almost everything by observation. Formal evaluation meetings were rare; the most common form of feedback was simply an invitation to return for another year. The plan was a pyramid; all the interns competed for few chief positions.

Today, the Surgery Residency Review Committee has eliminated pyramid programs, has required that residents receive regular evaluations, and has placed limits on work hours. However, the biggest change in postgraduate education since Dr. Halsted introduced a structured, academic, and scientifically based training system is just around the corner.

RESIDENCY IN THE FUTURE

The future postgraduate educational experience will be better than it was in the past because residents will be evaluated based upon their demonstrated competence with manual skills and cognitive tasks, both of which will be measured by valid instruments. They also will be given immediate feedback, so that they can incorporate new knowledge within the

context of what they already know. Furthermore, postgraduate surgical education will be driven by explicit and measurable criteria. Progress toward defined milestones and a resident's ability to assess that progress will determine fitness to practice.

Program directors are struggling to implement these changes, which represent a major cultural shift. This training paradigm will require that surgical educators exert more active and individualized effort. The system will no longer tolerate so-called surgeon teachers who allow the resident to watch an operation and never say a word. Residents will have to work harder as well and will be expected to develop a practice of lifelong learning and continuous self-improvement.

Effecting these major changes will require training programs to develop solid curricula built upon good goals and objectives. When residents show up to work on their first day, they deserve to know precisely what is expected of them. Residents should be given a list of explicit expectations that they can use to monitor their educational progress, rather than hope that they can survive this one-month rotation unnoticed. Residents should expect immediate feedback on their daily performance because the value of feedback decays with time. In the present day, most residents usually do not get feedback until months after they leave a rotation, when a typical evaluation system processes faculty opinion. The ideal program will schedule mid-rotation and end-of-rotation evaluation sessions for all.

In the future, residents should expect feedback that facilitates effective self-assessment in relation to a standard defined by their peers' performance. A self-evaluation followed by faculty critique is one method that might be used in the development of the habit of lifelong learning. Educational leaders suggest that a portfolio is essential to lifelong, self-directed learning.

Two concepts from educational psychology that form the foundation of an effective portfolio and give the portfolio vitality and vibrancy are deliberate practice and reflection.

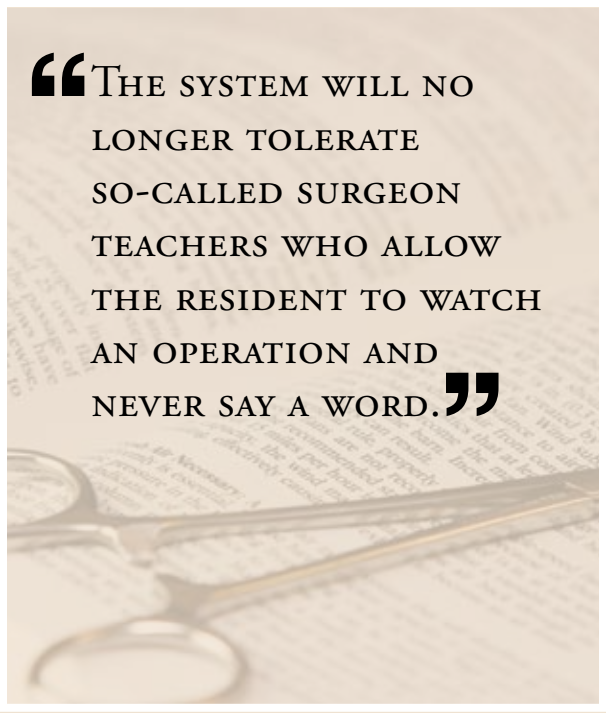
DELIBERATE PRACTICE

K. Anders Ericsson, PhD, an academic psychologist at Florida State University, Tallahassee, has devoted a lifetime to researching expert performance. His research has focused on the question, "What makes expert performers different from the rest of

the population?” He carefully studied chess players, musicians, as well as individuals who excelled in many other disciplines and found evidence that some commonly held opinions about expert performers did not withstand scientific scrutiny. Surprisingly, he discovered that “The performance of experts, who are nominated by their peers based upon extensive experience and reputation, is occasionally unexceptional for representative tasks from their domain of experience.”³ So, the surgeon who completes the largest series of a certain operation may not be the best. In addition, Dr. Ericsson demonstrated that natural ability alone does not account for expert performance.⁴

Another interesting finding from Dr. Ericsson’s research is that practice alone, that is, simple, unstructured practice, does not lead to expert performance. For example, often, students of Alpine skiing do not take lessons. So, even though they ski 50 to 80 times a year, they do not improve above a certain level of proficiency because they keep repeating and reinforcing the same bad habits until their amateurish form becomes so engrained that they can never improve. With lessons they are more likely to reach a much higher level of performance. So, feedback from expert coaches, identification of those aspects of skiing that those coaches have noted as the essentials, and repeated practice of those core skills most likely will result in improvement of performance. These activities are the essence of deliberate practice theory; without feedback, even motivated subjects do not improve with repetition.

As residents enter their postgraduate experience, their mentors should encourage deliberate practice. According to Dr. Ericsson, there are three steps to this process. First, the mentor must identify for the student the representative tasks that capture the essence of expertise in a domain. For instance, what are the basic and essential steps in successful cannulation of the internal jugular vein? A good surgical resident can write these steps without much effort. Second, students must have immediate feedback while learning a procedure. And third, students must have the opportunity to practice the procedure over a long period of time. Interestingly, Dr. Ericsson found that for all high performers studied—chess grandmasters, violin and piano virtuosos, and so on—a decade of deliberate practice at a minimum was required to create an expert. Most



**“THE SYSTEM WILL NO
LONGER TOLERATE
SO-CALLED SURGEON
TEACHERS WHO ALLOW
THE RESIDENT TO WATCH
AN OPERATION AND
NEVER SAY A WORD.”**

surgical residencies provide the minimum time to acquire surgical skills. Deliberate practice theory applies to every clinical activity residents will be asked to master in the surgery residency. Mentors and dedicated surgery educators must cultivate a habit of distilling clinical activity to essential representative tasks. The best time to do this is at the scrub sink just before the operation. Similarly, the best time for the faculty member to give immediate feedback to the learner is at the end of the operation while the team is applying the dressing and assisting in the emergence from anesthesia.

Through his observations of expert performers, Dr. Ericsson described three constraints on deliberate practice. The first was the time and energy required of the students, as well as their access to teachers, material, and facilities. Residents can overcome this first hurdle by maintaining a high energy level and being proactive about their education. Surgeons must create an atmosphere in their operating room that encourages residents to talk about what is on their minds.

The second constraint is that deliberate practice is not inherently motivating; it is hard work and can be seemingly unrewarding in the short-term. Residents must have passion and clear career goals to achieve a high level of performance during residency. This passion usually resides within the excellent student, but requires the enthusiasm of an excellent teacher to blossom fully.

Third, deliberate practice is effortful activity that can be sustained only for a limited time each day. Dr. Ericsson found that experts concentrated their practice periods into meaningful activity but allowed for recovery between sessions. The limits on work hours will produce more rested residents. Hopefully, few programs still exist that give the tacit hint that a good house officer will stay at work in violation of the work-hours policy.

Many will argue that surgeons innately practice skills that they feel the need to learn, such as knot-tying, cardiac auscultation, or electrocardiogram reading. Deliberate practice theory adds two important features to such informal practice: the distillation of an activity to its essential component tasks and quality, timely feedback.

REFLECTION

Another powerful concept from educational psychology that enhances the benefits derived from deliberate practice is reflection. The properly practiced habit of reflection can help students to define the representative components of a professional activity, and, with the task of getting feedback, to define just what is needed to deliberately practice.

John Dewey introduced the reflective process to education in 1933.⁵ He defined reflective thought as an active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends. This concept is more abstract than most pragmatic surgeons are willing to accept. Fortunately, later scientists have refined Dewey's concepts and thereby provided guidance on the use of reflective thought for improved learning.

The reflection process as refined by Kolb involves four steps.⁶ After a learning experience, such as observation in the operating room or in the clinic, students do the following:

- Take stock of what they know and what they do not know by actively reconstructing the clinical experience

- Reflect on what they need to know and extract the salient features that are important for deliberate practice as defined by the context of their current knowledge

- Seek feedback on the state of their current knowledge and their current knowledge gaps

- Plan deliberate practice of the identified concepts the next time they enter the operating room or clinic

According to David Boud, PhD, this process of reflection involves recalling and detailing salient events, with a re-examination of those events in light of one's existing knowledge for the purpose of integrating new knowledge into one's conceptual framework.⁷

Reflection is actually the basis of a generalized movement on the part of many governing bodies in medical education to foster lifelong learning habits in physicians. Practice-based learning (PBL) is the cornerstone of continuous professional improvement. The Accreditation Council of Graduate Medical Education requires program directors to teach PBL along with the other five general competencies. The Association of American Medical Colleges (AAMC) now requires diplomats of the 22 specialty boards that comprise the AAMC to provide evidence of PBL for purposes of recertification. Due to the fact that PBL will be a part of everyone's professional life, reflection on one's personal medical practice, even as an intern, will be rewarding.

How does this process differ from what happens today? Don't many physicians evaluate their practice? Isn't the most frequent question in mortality and morbidity conferences, "What will you do differently next time?" The truth is, no. Most physicians become so busy that they eliminate the habit of reflection that may have informed their residency training. Schön writes,

As practice becomes more repetitive and routine... [t]he practitioner may miss important opportunities to think about what he is doing.... He learns, as often happens, to be selectively inattentive to phenomena that do not fit the categories of his knowing-in-action, then he may suffer from boredom or 'burn-out' and afflict the people around him with the consequences of his narrowness and rigidity.⁸

Students who successfully complete medical school have demonstrated a superior ability to evaluate and assimilate knowledge. Mentors in surgery


residencies must emphasize the important fact that the way students learn to incorporate new information may be as important as the new information itself. Most medical school instructors believe that half of what is learned will be obsolete in five years. Many of those same instructors claim that the rate of obsolescence has accelerated. Dedicated surgery educators must encourage residents to actively maintain the learning skills that they successfully developed in college and medical school. In this time of change, surgery residents will find deliberate practice and reflection helpful as clinical experience grows more tightly restricted.

PORTFOLIO

Another tool to maximize postgraduate surgical education is a personal portfolio. The word “portfolio” comprises two Latin words: “portare” meaning “to carry” and “folio” meaning “leaves.” It refers to a selection of a student’s work compiled over a period of time and used for assessing performance or progress. A personal portfolio should document self-directed learning.

Residents who record everything that they encounter in clinical situations that they do not understand, as well as everything they have difficulty remembering, will build records of self-instruction. The portfolio will grow and become a primary resource for review before major standardized exams. Mentors should help residents to develop their own system of recording reflections on the clinical educational experience and encourage the use of that record as a guide for deliberate practice when residents return to the clinical arena the next day.

CHARGE TO SURGICAL EDUCATORS

In the coming years, surgical training will be remarkably more complex, more difficult, and more rewarding than in the past. Feedback will play a paramount role in developing the surgeons of the future. Without feedback, residents will not progress. Residents should seek and demand quality feedback, and surgical educators should be prepared to provide it. 

Editor’s note

This is an abridged version of a presentation that Dr. McGreevy delivered at an Alpha Omega Alpha induction ceremony at Mount Sinai Medical School, New York, NY.

References

1. Cooke M, Irby DM, Sullivan W, Ludmerer KM. American Medical Education 100 years after the Flexner report. *N Engl J Med*. 2006;355:1339-1344.
2. Carter BN. The fruition of Halsted’s concept of surgical training. *Surgery*. 1952;32(5):18-27.
3. Ericsson KA. Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Acad Med*. 2004;79(10)Supp:S70-S81.
4. Ericsson KA, Krampe RT, Tesch-Romer C. The role of deliberate practice in the acquisition of expert performance. *Psychol Rev*. 1993;100:363-406.
5. Dewey J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process* (revised ed). Boston: D. C. Heath; 1933.
6. Kolb D. *Experiential Learning: Experience As the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall; 1984.
7. Boud D, Cohen R, Walker D. *Reflection: Turning Experience into Learning*. London, United Kingdom: Kogan Page; 1985.
8. Schön DA. *The Reflective Practitioner: How Professionals Think in Action*. London, United Kingdom: Temple Smith; 1983.

Dr. McGreevy is professor of surgery, department of surgery, University of Utah, Salt Lake City.

