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The making of a surgeon: 10,000 hours?

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ABSTRACT

There have been many changes in the “making of a surgeon”. Some of the key aspects that have altered residency/fellow training include work hour restrictions; a decrease in autonomy; and the explosion in knowledge, the change in technology, and the movement of complex cases away from General Surgery. There are a number of opportunities for enhancing current surgical training which include the following: 1) returning to reasonable work hour limits; 2) improving the efficiency of resident/fellow training by promoting early development of operative skills and starting down the path toward competency-based education; 3) increasing autonomy in the General and Pediatric Surgery residencies by developing and implementing structured processes for graded autonomy, further promoting the teaching assistant role, and even incorporating time as an attending into the period of training; and 4) developing a paradigm of uniform core surgery training followed by additional qualifications and training in both General Surgery and the surgical specialties.

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I wish to thank the Canadian Association of Pediatric Surgeons for the opportunity to present today and Jack Langer, B.J. Hancock, and the executive council for inviting me to the 2014 CAPS meeting. It is truly a fun Society and most definitely a meeting where anyone can and does speak his/her mind! Today I wish to talk about the development of surgical expertise: how we as a discipline take a young medical student and create a surgeon. Mentors and coaches are key in this process and I wish to acknowledge my mentors: Jim O'Neill when I trained at CHOP, and Arnie Coran and Bob Bartlett during my training and subsequent times on faculty at the University of Michigan. Much of what I know today is from watching and emulating their clinical knowledge and abilities.

In Malcolm Gladwell's book, “Outliers” it is proposed that achievement in a skill requires hard work more than innate talent [1]. It is based on Anders Ericsson's psychological work in expertise [2]. Dr. Ericsson noted that piano and violin students, “...who would end up the best in their class began to practice more than everyone else...until by the age of twenty they were practicing...well over thirty hours a week [1]. In fact, by the age of twenty, the elite performers had each totaled ten thousand hours of practice. By contrast, the merely good students had totaled eight thousand hours, and the future music teachers had totaled just over four thousand hours...The striking thing about Ericsson's study is that he and his colleagues couldn't find any ‘naturals’, musicians who floated effortlessly to the top while practicing a fraction of the time their peers did. Nor could they find any “grinds”, people who worked harder

than everyone else, yet just didn't have what it takes to break the top ranks. Their research suggests that once a musician has enough ability to get into a top music school, the thing that distinguishes one performer from another is how hard he or she works.”

Gladwell goes on to say: “Is there such a thing as innate talent? The obvious answer is yes...Achievement is talent plus preparation. The problem with this view is that the closer psychologists look at the careers of the gifted, the smaller the role innate talent seems to play and the bigger role preparation seems to play...The idea that excellence at performing a complex task requires a critical minimum level of practice surfaces again and again in studies of expertise. In fact, researchers have settled on what they believe is the magic number for true expertise: ten thousand hours.”

When I was in high school, I read the book, *The Making of a Surgeon*, by William Nolen [3]. I was enthralled and loved the idea of working as hard as did Nolen at Bellevue Hospital in New York. When I was a medical student and then resident I worked night and day as did he, but at the University Hospital in Ann Arbor and the Wayne County Hospital near Detroit. It was endless camaraderie and pathology: we were in the trenches taking care of patients, doing good work, and learning like crazy. Nolen starts by asking and answering the question: “How do you make a surgeon? The transformation is a slow process marked by a little more dexterity on one case, a slight improvement in judgment on another, a bit more confidence on a third. Not big jumps, just small steps forward. But when it's all over the new surgeon is turned loose to practice his art, somehow s/he's ready. S/he has to be.” As we will see, there is great concern that many graduating surgery residents today are not “ready”.

With regard to residency, Bill Nolen notes: “Every would-be surgeon travels the same general path: the residency system, a plan originated in 1895 by William Halsted, a professor of surgery at Johns Hopkins Hospital...Briefly, the program consists of five years of training: in each

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succeeding year the trainee assumes more responsibility in every phase of patient management. In the final year he takes full responsibility for surgical patients in everything but name.” Unfortunately, residents aren’t given such autonomy anymore.

There have been so many changes in medicine and in education. Many surgeons long for the good old days, but they aren’t coming back. Let’s see if we can dissect some of the issues and identify opportunities where we instead can change.

The making of a surgeon begins in medical school and, unfortunately, medical students have been marginalized. They are observers, rather than participants. Most of them have never put in IVs or NG tubes. They are not part of the team: they can’t write orders because of the electronic health record (EHR), can’t write notes because of compliance rules in the United States, and they don’t take all night call. Pauline Chen has a provocative blog with the New York Times [4]. She wrote an article discussing the quandary of medical students who are not prepared to be residents: “One night early in my internship, I received a frantic page for help from a fellow intern. For more than an hour he had poked at the patient’s arms and legs. ‘We didn’t have to draw blood in medical school,’ he confessed. My med school didn’t think it was important for us to learn... We had all endured four years of medical school, and we believed that all our lectures, exams and national standardized tests had made us ready to be real doctors, or at least capable interns. But the reality was that in some cases, we were unable to carry out even the most routine duties.”

Medical students take histories and perform physicals on patients, but they no longer are integrated into the care of patients. As William Osler noted, “He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all.” [5]. In fact, this deficit in medical school training is the beginning of the “delayed maturation” that we are seeing in surgical education. It compounds the limitations already placed on resident surgical education. It makes achieving an effective 10,000 hours more remote.

It is important to understand the structure of program accreditation and surgeon certification in the United States. The ACGME (Accreditation Council for Graduate Medical Education) accredits programs through the Residency Review Committee (RRC) review process. It is responsible for 9,500 programs and, in 2015, will begin to accredit both M.D. and D.O. programs in the United States. The American Board of Medical Specialties (ABMS), of which the American Board of Surgery (ABS) is a part, only certifies those surgeons who have completed training in accredited programs. Thus, the ABS is dependent on the ACGME to indicate via accreditation that the board candidate’s residency training and education met appropriate standards. The ABS certifies individuals who have met a standard of education, training, and knowledge at ACGME-accredited programs. The Program Director must sign off that the individual surgeon completed the residency or fellowship and met such standards.

The Fellowship Council oversees approximately 50% of the General Surgery fellowships in the U.S.: Advanced GI surgery, Endoscopy, MIS,

Bariatric/Metabolic, HPB, and non-ACGME approved Colorectal and Thoracic. The Fellowship Council provides a match and accredits these fellowships. Many societies offer exams to certify the fellows related to their specialty. It is complicating that these fellowships are outside of the rubric of the ACGME and the ABS, but the leaders of the involved Boards, Councils, and Societies are considering options for resolving this problem.

What are some of the key aspects that have changed residency training? **The first, of course, is work hour restrictions.** The work hour issue became viral based on the case of an 18 year old named Libby Zion who was on an MAO inhibitor for depression and presented to Cornell Medical College/New York Hospital in Manhattan with unexplained fevers, agitation, and jerking motions [6]. After reviewing the case with the attending, who was at home, the first year resident gave Demerol. Subsequently, Libby developed hyperthermia, cardiac arrest, and died. This was from serotonin syndrome and a drug–drug interaction between MAO-inhibitors and Demerol that was not broadly known at the time [7,8]. Her father was an attorney, a columnist for the New York Daily News, and well-connected. He called it a murder and asked for a grand jury investigation which, along with the State Board, eventually exonerated the residents. However, a blue ribbon panel led by a physician, Bertram Bell, a physician who promoted the need for resident supervision, established that residents should not work more than 80 hours a week or 24 hours in a row and that senior physicians needed to be present in the hospital at all times. The New York legislature passed this into law in 1989.

In 2003, similar duty hours were adopted by the ACGME: residents could only work a maximum of 80 hours/week and had to have 1 day in 7 free, both averaged over 4 weeks [9]. They could not be on duty more than 24 hours and had to have 10 hours off between duty/call. Most physicians thought this was a travesty, but in 2011 the ACGME, based on the recommendation of the Institute of Medicine, further tightened and complicated the duty hours. As you can see in Table 1, PGY-1’s could only work for 16 hours before needing to “nap” and the time off between duty periods should be 10 hours, but had to be 8 hours, unless you were an intermediate resident in which case it had to be 14 hours, unless you were a senior resident in which case you had to get ready to practice and, therefore, could have irregular or extended periods. All confusing and complex. Basically, most centers went to a day/night system of call.

Steven Knope was a medical student in New York Hospital around the time of the Libby Zion incident and had this to say: “I worked 36 hours straight and slept in the hospital every 3rd night: I often averaged 120 hours of work per week in the hospital. My generation of physicians often trained 40 hours more *per week* than interns and residents of today. Doctors today see less disease during a critical point in their training than they used to. They lose continuity of care by having to leave sick patients during critical points in their illnesses.” [7].

We, as a profession, should have controlled the hours before it became a legislative issue. We knew it was too much. But, in many ways

Table 1
Summary and comparison of 2003 and 2011 resident duty hours.

	2003	2011
Week hours	80 hours per week, averaged over 4 weeks	80 hours per week, averaged over 4 weeks
Time free of duty	1 day in 7 free averaged over 4 weeks	1 day free every week averaged over 4 weeks
Maximum duty period length	Duty must not exceed 24 hours.	a) Duty periods of PGY-1 residents must not exceed 16 hours. b) Duty periods of PGY-2 residents and above must not exceed 24 hours.
Minimum time off between duty periods	10-hour time period between all duty and call periods	a) PGY-1 residents should have 10 hours, and must have 8 hours free between duty periods. b) Intermediate-level residents should have 10 hours, and must have 8 hours between duty periods. They must have at least 14 hours free of duty after 24 hours of in-house duty. c) Residents in the final years must be prepared to enter the unsupervised practice of medicine and care for patients over irregular or extended periods within the context of the duty periods above.

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