

ORTHOPAEDIC SURGICAL EDUCATION

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Orthopaedic residency training is currently in a period of transition. This has had an unsettling effect on trainees as well as on the academic orthopaedic surgeons who train them. But this problem has deep roots, in the history of surgical training, and its legacy.

Additionally compounding this has been changing expectations, both on the part of trainees and staff surgeons. They have experienced what could be described as a “Generational disconnect.” The most obvious contributing factor to this has been new regulations that limited the work hours of trainees. This, in and of itself, has been a mixed blessing but there larger changes in medicine, surgery and society.

What we lack is reliable, useful data to guide our evolution. This paper will try to provide some of that, as well as to make suggestions for the future.

THE HISTORY OF SURGICAL PROFESSIONALISM AND TRAINING

Josef Fischer traced the gradual transition of surgical education from pure apprenticeship to formal training program based in academic medical centers. {Fischer, 2005 #23} This has mirrored the rise of scientific professionalism among surgeons as a group, but very ancient contrasts in culture persist between surgeons and other physicians. He argued these are reflected in self-perception, and reflected in the way we train.

Historically, the practice of medicine was strictly divided in Medieval times by religious edicts prohibiting medical



Figure 1: Ambrose Paré

clergy from touching the body or bodily waste. {Bagwell, 2005 #8} This was codified by Pope Innocent III, Fourth Lateran Council. This created a niche for the so-called “Barber-Surgeon,” who performed basic surgery and bloodletting. Barber-surgeons were trained in the way of a guild--fathers trained sons, etc.

This group took a step toward formal legitimacy after 1540 in Britain, when a

Parliamentary act created the Guild of Barbers and Surgeons of London (later the Royal College of Surgeons). Yet a cultural distinction remains--British surgeons are still called “Mister.”

At the pinnacle of this tradition stands Ambrose Paré, a French Barber-Surgeon of the 16th century. Trained only informally, he gained fame as a military surgeon and then began publishing on surgical indications, techniques, and outcomes. His prominence brought him into conflict with medical establishment of whom he was dismissive.



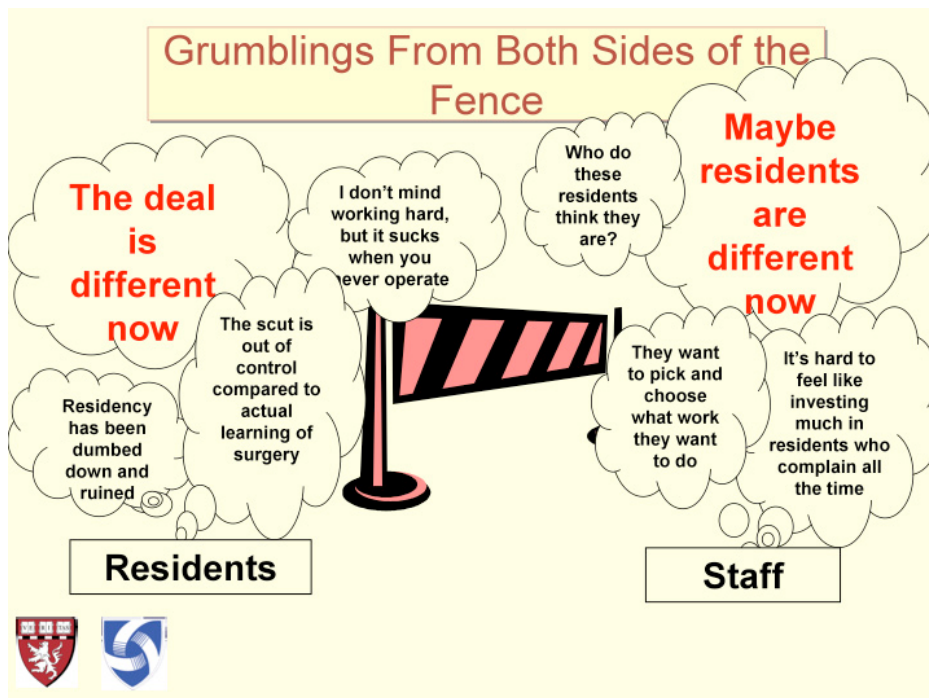
Figure 2. William Halstead

What we regard as modern surgical training developed along with anesthesia and antisepsis. These advancements made major surgery possible, and minor surgery became reproducibly beneficial. William Halstead is commonly considered the father of modern surgical training. {Osborne, 2007 #4} Figure 2. Born 1852, he was a pioneer

in surgical techniques ranging from transfusion to ORIF of patella fractures. He was distinctive in that he insisted on rigorous understanding of surgical anatomy and disease processes. He instituted a hospital-based, academic track to prepare academic surgeons.

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It is fair to say that our “modern” basis of surgical training is based on Halstead’s principles. Halstead’s system of residency training had several “assistant residents” who worked with him for one year or more, and a smaller number of “Chief residents” who worked with him for eight years. The program included rotations and was based within academic medical center. After its introduction training programs designed following Halstead’s model largely supplanted community-based apprenticeships.

Halstead of course was a general surgeon, but orthopaedic surgical training mirrored the evolution of general surgery, of which it is a branch. In 1914 the American Medical Association (AMA) published a list of approved hospitals for specialty training internships. The training course at that time included an internship that progressed to a preceptorship, then a period in practice, then an academic thesis, and finally election to AOA. In 1934 the American Board of Orthopaedic Surgery was incorporated. By the 1940s most orthopaedic training programs were 4-5 years and hospital-based, but a “preceptor” track persisted until 1957. In this track a candidate did a one-year internship, 1 year surgery, 5 years apprenticeship to certified orthopaedist, 5 years practice at an approved hospital, and then was certified.

This brief history may seem a little far away and abstract but I believe this history has contemporary consequences. Surgeons have set themselves as a breed apart among physicians. We take pride in the manual aspects of vocation. As a group, it is fair to say we are surly and resistant to direction when it is given by medically-trained people. Finally, surgical training has never fully relinquished its roots in guild-type apprenticeship.

This contrast is highlighted by one modern surgeon, Josef Fischer, who many readers of the Harvard Orthopaedic Journal

may know. In a lecture to the Midwest Surgical Association in 2004, entitled, “On the uniqueness of surgery,” Dr. Fischer highlighted these issues with regard to 80-hour work week. His address was sprinkled with slightly combative topic headings like, “The So-Called Leadership of Medicine,” which he contrasted with, “The World of Surgery” which he portrayed as noble, dedicated and self-sacrificing. Dr. Fischer’s particular presentation may sound extreme, but the sentiment rings true.

The Harvard Orthopaedic residency reflects this heritage as well. It is set up as a series of “little apprenticeships,” and in fact in 2008 at Harvard we lengthened our rotations in order to amplify this aspect of our residency.

THE CURRENT PROBLEM

These issues have not occurred in a vacuum. Rather they have reflected a social environment that is changing on several levels. First, society’s expectations have changed. The public is aware of the new work hour regulations and this has produced new and specific demands on the part of the patients concerning the role of residents. The financial and production models for surgeons has also changed and they are under new pressure to produce in volume, sometimes at the expense of teaching. The attitude of trainees seems to have changed as well. Younger doctors appear to their elders less willing to endure years of self-sacrificing hard work than their older predecessors seems.

All this has meant that orthopaedic surgical training is changing. There is clearly a change in the role of the trainee as operating surgeon, and to a measurable extent this has accompanied erosion of the “social contract” between resident and attending.

These changes were explicitly investigated by the Simon, Springfield and Nestler on behalf of the AOA, which reported on them in 2006 in the JBJS in a report titled, “Should there be a minimal surgical experience for a graduating orthopaedic surgery resident?” They organized their by analysis by “Pros and Cons.”

Among the Pros, they observe that other specialties gather this information and require a minimum experience, including general surgery, neurosurgery, and pathology. They point out the data is now easy to collect because the Accreditation Council on Graduate Medical Education (ACGME) gathers case logs from each resident during training. This means that orthopaedics could publish mean numbers of operations and allow comparison to those means. To some extent this has been done, and the AOA group found broader support for providing data than for requiring standard.

Among Cons the group observed that the goal of training is to “master sufficient knowledge, skills, and attitudes so they can practice competently and independently.” Specific standards are hard to determine—how many total hip replacements does it take to be competent? Some learners will struggle despite many repetitive cases. How is supervision accounted for? What about other domains of competency, such as ethics or office-based evaluation and management? Should there be standards for these factors?

They observe that current standards for activity other than operating are minimal: 4 hrs/ week conference, ½ day/week outpatient time. And they observe that residents operate a lot. They did a median of 1572 cases (2003-2004). They note that surgical skill is an infrequent cause of failure on ABOS Part II, that nonsurgical aspects of practice underlie most measurable problems such as lawsuits. Even specialties that include numerical standards have left them vague. Finally, the study group called for rigorous study of the impact of 80-hour week on surgical case volume.

80-HOURS AND SURGICAL VOLUME

This question has been studied both quantitatively and qualitatively to varying extents. The results have been somewhat conflicting. Most quantitative studies show no deleterious effect and yet qualitative studies show substantial dissatisfaction with the reduced work hours, both among trainees and among faculty. What does this contradiction tell us?

At NYU/Hospital for Joint Diseases, Baskies, Ruchelsman, Capeci, Zuckerman and Egol studied this. They evaluated 109 consecutive residents’ case logs, from 2000-2006. They found no significant differences for PGY 2, 3, 4, and an increase for PGY 5. They pointed out that this result may be confounded by improved record-keeping during same period.

At the University of Oklahoma Health Sciences Center, Pappas and Teague made a similar study. Surgical logs before and after were compared, and cross-analyzed by junior vs. senior resident. No significant differences between the groups in any category were identified.

Similar studies have been made in other disciplines. Within general surgery Durkin, McDonald Munoz and Mahvi at the University of Wisconsin looked at ABSITE (general surgery in-training exam) scores and operative logs from 1997 to 2005 of all general surgery residents. They found ABSITE scores improved significantly after the restriction of work hours, and the number of major cases recorded by graduating residents did not change.

At UCLA de Virgilio, Yaghoubian, Lewis, Stabile and Putnam reviewed trauma patient morbidity and mortality data, ABSITE percentile scores, first-time pass rates on boards and found them all unchanged. Total operative case volume was unchanged, and volume done as a chief resident—was increased. They calculated the cost of extra mid-level providers needed at \$359,000/ year.

Qualitative studies are far more negative in their assessments, however. At Hospital for Joint Diseases Immerman, Kubiak and Zuckerman made a national survey of residents and

program directors and noted a generational split. They found junior residents were more likely than senior residents and program directors to perceive the work-hour regulations as having a positive effect on education. Junior residents also viewed the new regulations positively for surgical training and patient care, while senior residents and program directors viewed them more negatively.

WHERE WE STAND NOW

There are grumblings from both sides of the fence that stands between staff and residents.

Boiled to its essence the complaint of residents is that the deal has changed. They expected to work hard but that in return they would be the priority for staff to train in surgery. On the other hand the staff surgeons perceive that residents seem to have changed. They appear less committed and more choosy than residents in the past, or than they remember themselves as being.

Certainly contradictions abound in the data, as well as in these perceptions:

When you count cases there’s been no decrease in volume. Yet residents and faculty agree they think residents are operating less. Residents are objectively better rested and studying harder. Yet residents and staff alike report significant dissatisfaction with the changes. Why is this?

A closer look at surgical experience after the 80 hour rule shows us that partly it depends on what is counted. When corrected for three factors—total CPT codes vs. number of operations, the changing total volume of surgery, and for the resident’s role in surgery—it becomes apparent that trainees really aren’t operating as much, or in the same ways, as they once were.

At Michigan State University, Damadi and colleagues studied volume in a general surgery program and controlled for overall change in operative procedures, which had gone up significantly in the same period that duty hour restrictions were introduced. Relative to total volume they found an overall decrease of nearly 20% occurred in resident operative volume.

At Thomas Jefferson University, Kairys and colleagues analyzed logs of total major operations, where the general surgery residents classify their role as surgeon, first assistant, or teaching assistant. They after 80-hour rule total operations reported as surgeon decreased from 930 to 909 (2.3%), and chief-year operations decreased from 252 to 231 (8.3%). Junior totals were unchanged. Totals in other categories (first assistant, teaching assistant) decreased 79% and 66%.

Compounding this, fellows and mid-level practitioners play a greater role in the operating room than they once did. At Harvard for example total fellows across all Harvard-affiliated hospitals increased from 17 in 2002, to 40 by 2008 (136%). Surgical volume has increased but that much, and residents report they are more often double-scrubbed with a fellow than in the past. Also some surgery is now performed in venues that are off-limits to residents. Most of Harvard’s major teaching hospitals now has an affiliated surgery center, and every one of these limits resident’s role compared with fellows, NPs, and PAs.

Finally there is also considerable new pressure for surgical productivity, which makes it harder to slow down operations to take the time to teach. Residents become resentful as they realize they are useful for certain jobs, but excluded from others. Financial pressures have continued or even increased the need for residents as an inexpensive and relatively expert labor force—they are willing to work early, late, weekends, holidays. But it's more efficient to operate alone or with experienced fellow or PA.

TOWARD A SOLUTION

This is so complex partly because more has changed than just work hours. Seen in a social context, the imposition of an 80-hour work week is a small part of larger trend eroding the autonomy and privilege of medicine. The autonomy of residents has declined, and would have irrespective of 80 hour work week. Much of this has been driven by the public. Through constant exposure to hospital TV programs like ER and Scrubs, patients have learned the vocabulary of the hospital hierarchy. It is common now for patients to demand in an accusatory tone, "Are you an attending? I only want the attending to touch me."

Autonomy of trainees is unlikely return to the "good old days," and this is probably a good thing for patient safety. We can surmise that supervision of residents will only increase, along with legislation and regulation. Yet continuous decline in operative experience is unacceptable.

What can we do? I believe that finding answers begins with asking good questions.

Has quality of surgical training changed?

Even if raw number of cases is the same, is learning still as good?

Are residents more often double scrubbed with a fellow or a PA than in the past?

Is a resident only asked to scrub when an assistant is needed?

Are resident attitudes actually different now?

Asking and answering these questions in a clear, unbiased and unemotional way is critical for our future.

Some better data would help. One simple improvement would be modify the orthopaedic surgery ACGME operative log so that it records the resident's role in surgery or presence of other trainees. This is already the way general surgery residents log their cases so implementing this change would be very easy. Then it would be possible to measure more accurately what the resident is actually doing during the cases he or she scrubs.

More fundamental but also somewhat harder to measure is the quality of surgical teaching and surgical learning. It is not enough merely to stand in the operating room a certain number of times and then graduate. Surgeons vary widely in interest and aptitude for teaching, just as residents vary in effort and aptitude for learning. A more comprehensive measure of the resident's performance as a trainee would include preparation, attitude, and aptitude. The ultimate, most relevant outcome is surgical proficiency and quality of surgical judgment. Reproducibly measuring this has proven elusive, but we have to keep working at it.